INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

ISSN: 2618-6209

IJONMES

VOLUME 9
NUMBER 2

2025

International Journal of Modern Education Studies [IJONMES]
ISSN: 2618-6209

June, 2025
Volume 9, No 2
http://www.ijonmes.net

The IJONMES is a refereed journal and has a double-blind review. Any manuscript submitted for consideration in publication in the IJONMES is reviewed by at least two international reviewers with expertise in the relevant subject area.

The IJONMES is published twice a year in the June and December months.

Publisher:
Dr. Mevlüt AYDOĞMUŞ
Necmettin Erbakan University,
Ahmet Keleşoğlu Education Faculty,
Department of Curriculum and Instruction
Konya, Türkiye
maydogmus@erbakan.edu.tr
editor@ijonmes.net

𝕏 IJONMES

International Journal of Modern Education Studies [IJONMES] is indexed in Ulrichsweb & Ulrich's Periodicals Directory, TRDIZIN, MLA and ERIC.

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Copy Editors

Dr. Marko Turk
University of Tyumen, School of Advanced Studies, Russian Federation
turk.marko1983@gmail.com https://orcid.org/0000-0001-9067-6757

Dr. Sevie Paida
Hellenic Open University, Greece
paida.sevasti@ac.eap.gr https://orcid.org/0000-0001-7181-072X

Dr. Lames Abdul Hadi
Zayed University, British University in Dubai, United Arab Emirates
lames.abdulhadi@gmail.com https://orcid.org/0000-0001-6328-0896

PhD Candidate Kirsten Michael Letofsky
New Mexico State University, United States
letofsky@nmsu.edu https://orcid.org/0000-0002-6465-5351

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

	CONTENTS	Pages
	Inside cover	I
	Generics Page	II
	Contents	VII
	Articles:	
1.	Investigation of Music Teacher Candidates' Technology Integration Self-Efficacy and Artificial Intelligence Literacy	356
2.	Effects of Child-Centered Play Therapy on Quality of Life, Depression and Anxiety in Children with Cancer	385
3.	21st Century Skills and Language Education: Metaverse Technologies and Turkish Education as a Case	414
4.	Evaluating the Effectiveness of the "Food Literacy Program" Designed for a Sustainable Future	434
5.	Evaluating Mathematical Reasoning Competence: In-Service Teacher Training in Mathematical Literacy Given via Distance Education	454
6.	The Effect of Socratic Questioning on Secondary School Students' Higher-Order Thinking	482
7.	Investigation of Digital Competencies and Artificial Intelligence Literacy of Special Education Students	501

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research Article

Investigation of Music Teacher Candidates' Technology Integration Self-Efficacy and Artificial Intelligence Literacy

Özlem Kılınçer[1]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 356-384
http://www.ijonmes.net

Article Info:

Received 28.04.2025
Revision 24.06.2025
Accepted 05.07.2025

Abstract:

The aim of this study is to examine the artificial intelligence (AI) literacy and technology integration self-efficacy of pre-service music teachers enrolled at various universities in Türkiye. The research employed a relational survey model, a quantitative research method. The sample consisted of 228 pre-service music teachers studying in music education departments. Data were collected using the Technology Integration Skills Scale and the Artificial Intelligence Literacy Scale.The findings revealed that participants had a high level of self-efficacy in technology integration. In terms of AI literacy, their scores were high in the awareness, evaluation, and ethics sub-dimensions, while a moderate level was observed in the usage sub-dimension. No significant differences were found between male and female participants in either variable. However, second-, third-, and fourth-year students demonstrated higher mean scores than first-year students in the 'computer use' sub-dimension of technology integration and the 'ethics' sub-dimension of AI literacy. No significant grade-level differences were observed in the remaining sub-dimensions or in overall scale scores.Based on these results, it is recommended that future studies adopt longitudinal and mixed-method approaches. Furthermore, teacher education programs are encouraged to revise their curricula to include course content that supports the development of competencies in technology integration and AI literacy.

Keywords: Music teaching, Pre-service teacher, Technology integration, Artificial intelligence literacy, Self-efficacy

Citation:
Kılınçer, Ö. (2025). Investigation of Music Teacher Candidates' Technology Integration Self-Efficacy and Artificial Intelligence Literacy. *International Journal of Modern Education Studies, 9*(2), 356-384. https://doi.org/10.51383/ijonmes.2025.417

[1] Assoc. Prof. Dr., Nevşehir Hacı Bektaş Veli University,Türkiye. ozlem.kilincer@nevsehir.edu.tr
http://orcid.org/0000-0001-8108-4282

INTRODUCTION

In the twenty-first century, technology integration has emerged as an essential component of teacher training programs. The innovations brought by technology facilitate both the diversification of teaching materials and the adoption of student-centered approaches. The Technopedagogical Content Knowledge (TPACK) model expresses the teacher's holistic use of pedagogical, content and technological knowledge. In this regard, technology integration requires not only the acquisition of technical skills but also the effective use of pedagogical and content knowledge (Koehler & Mishra, 2009). In terms of music education, technology plays a critical role in increasing student engagement and personalizing learning processes. Therefore, technology integration constitutes an essential dimension of contemporary music teacher education (Campanini, 2023).

The rapid diffusion of artificial intelligence (AI) technologies in education reinforces the need for teachers to make pedagogical sense of new digital tools. Laupichler et al. (2022) emphasize that AI literacy has become an interdisciplinary imperative in higher and adult education. Chiu et al. (2024) define AI literacy as the individual's ability to understand, critically evaluate and responsibly use artificial intelligence systems. The transformative role of technology in the context of music education is becoming more evident with the spread of learner-centered approaches, especially adaptive learning process and artificial intelligence-based feedback systems bring new perspectives in instructional design (Gall, 2017; Kibici & Sarıkaya, 2021). Teacher self-efficacy beliefs describe the perceptions of teachers or prospective teachers that they can successfully fulfill pedagogical tasks and predict their professional performance (Nyinge et al., 2024). Bandura's (1986) social cognitive theory suggests that self-efficacy belief is a fundamental variable that determines an individual's behaviors, efforts and performances. That’s is why the study aimed to examine the AI literacy and technology integration self-efficacy of music teacher candidates studying at different universities in Turkey in a relational way.

Research Problem and Its Importance

Although technology integration courses are available in music teacher training programs in Turkey, it remains unclear to what extent these courses reflect the practical self-efficacy levels of teacher candidates. Sarıkaya (2022) and Gudek (2019) state that teacher candidates' computer self-efficacy is at a moderate level, but their self-confidence in using advanced music technology tools is limited. Atabek and Burak (2020) show that early childhood teacher candidates develop positive attitudes towards technology, but they lack knowledge about choosing technological tools in music teaching. AI-supported music applications offer new creative opportunities to teacher candidates, but the pedagogical basis of these applications is often neglected. Chiu et al. (2024) argue that programs aimed at developing AI literacy should be adapted on a discipline basis. The number of studies addressing AI literacy in the context of music education is limited, and existing studies are generally limited to discussions at the conceptual level. Therefore, empirically examining

the relationship between music teacher candidates' technology integration self-efficacy and AI literacy indicates an important research gap. Understanding this relationship can guide the restructuring of content and pedagogical strategies of teacher training programs. The fact that teacher candidates do not feel technologically competent negatively affects their desire to use new digital tools in their classes. This situation limits students' digital music literacy gains and prevents their learning experiences from being enriched. In addition, teacher candidates' uncertainties about AI literacy limit their potential to use AI-based assessment and feedback systems for pedagogical purposes.

Clarifying the relationship between technology integration self-efficacy and AI literacy allows program coordinators to reorganize course content in a holistic manner. These findings increase the functionality of technology laboratories offered to preservice teachers and increase the pedagogical effectiveness of hardware investments. When preservice teachers' self-efficacy levels increase, resistance to using technology in classroom practices tends to decrease, leading to greater adoption of innovative pedagogical strategies (Wang, Ertmer, & Newby, 2004; Banas & York, 2014). Preservice teachers with high AI literacy are more likely to use adaptive systems that support students' personalized learning paths, which in turn may lead to increased student motivation and improved learning outcomes (Chiu et al., 2024; Dai, 2021; Salas-Pilco et al., 2022). Teacher training institutions can use research results as quality indicators in program accreditation processes. Based on the findings, policy makers can systematically add technology integration and AI literacy components to national curriculum frameworks. Professional development programs in the field of music education can organize targeted workshops by referencing the relationship patterns revealed by the research. In this way, the effectiveness of in-service training activities increases and sustainable learning communities are created. From the perspective of students, technology and AI-enabled learning environments encourage creativity and strengthen critical listening skills. The research is also important in terms of reducing the digital divide, supporting equal access to learning opportunities for students from different socioeconomic backgrounds. In addition, the findings make visible the central role of technological competencies in the development of professional identity of prospective teachers. In the long term, technology and AI-literate music teachers can make innovative contributions in the areas of digital music production and consumption in the cultural life of society. Therefore, the research has a wide-ranging impact by guiding both classroom practices at the micro level and educational policies at the macro level.

In this respect, the research aimed to examine the relationship between artificial intelligence literacy and technology integration self-efficacy among music teacher candidates studying at different universities in Turkey. The following five questions were investigated in the research.

1) What are the levels of AI literacy and technology integration self-efficacy of music teacher candidates?

2) Do AI literacy and technology integration self-efficacy of music teacher candidates differ according to gender?

3) Do AI literacy and technology integration self-efficacy of music teacher candidates differ according to grade level?

4) Does the technology integration self-efficacy of music teacher candidates significantly predict their AI literacy?

Theoretical Framework

Technology Integration in Music Education

The significance of technology integration in music teacher training programs has been increasing over the last few decades, and themes such as digital literacy, pedagogical content knowledge, and artificial intelligence-supported learning environments have taken a central position within the scope of interdisciplinary approaches. When the evolution of technology integration in the literature from early studies to the present day is examined, it is seen that technology is not only a tool but also a transformative factor that is at the core of music pedagogy (Gudek, 2019). Bauer, Reese, and McAllister (2003) state that technology transforms teachers' teaching strategies and positively affects student motivation. The inclusion of AI-based tools in music education offers innovative possibilities such as personalized feedback, automated notation, and performance analytics in instructional design. This creates the need to redefine pre-service teachers' technology integration self-efficacy (Dai, 2021).

Technology integration in music teacher education requires strategic planning in a broad framework from program design to implementation. Dorfman (2016) points out that technology integration should be embedded in the core courses of the program, and in these cases, pre-service teachers' attitudes towards technology turn significantly positive. Bauer and Dammers (2016) found that when technology courses are integrated with pedagogical content courses instead of offering them as a separate module, pre-service teachers' ability to adapt technology to classroom practices is higher. At the same time, instructors' technology competency levels play a critical role in program outcomes (Haning, 2016). TPACK-based project courses provide pre-service teachers with the opportunity to apply theoretical knowledge in practice and reinforce their self-efficacy to develop innovative instructional designs (Tejada & Morel, 2019). Partti, Weber, and Rolle (2021) state that sustaining communities of learners through digital platforms supports professional learning after graduation. Greher's (2011) music technology partnership model reports that university-school collaboration increases candidates' professional confidence by providing authentic experiences of technology integration in real classroom contexts. Tobias (2017) argues that technological tools in music pedagogy, with the suggestion of repositioning technology, should be considered as pedagogical meaning-making elements rather than

purely instrumental, and this approach contributes to pre-service teachers' development of critical technological literacy. In this context, it is emphasized in the literature that theoretical and practical components should be integrated in a balanced way in curriculum design, and the interaction among the courses of field, pedagogy, and technology should be given importance.

The sustainability of technology integration varies depending on multi-layered factors such as infrastructure facilities, academic staff quality and institutional support policies. O'Leary and Bannerman's (2023) analysis of the pandemic process shows that the capacity of technical support units to respond quickly in the transition to online teaching directly affects pre-service teachers' motivation to use technology. Zelenak (2015) highlights that pre-service teachers' participation in applied workshops reinforces their technology integration skills and increases the level of classroom innovation. Bauer (2013) analyzes the TPACK acquisition process in detail and states that interdisciplinary project designs improve pre-service teachers' technology literacy and creative problem-solving skills. Haning (2016) states in his research that the attitudes of mentor teachers in practice schools towards technology are directly reflected in the classroom practices of pre-service teachers and shape their self-efficacy perceptions. Therefore, technology integration in music teacher education necessitates a sustainable and systemic approach, and the success of this approach is shaped by holistic policies and practices.

Bauer and Dammers (2016) argue that the vast majority of music teacher education programs in the US include compulsory courses on technology, which systematically strengthen preservice teachers' digital competencies. Haning (2016) shows that pre-service teachers' readiness to use technology varies from program to program, and these differences are associated with factors such as curriculum design, instructor quality, and infrastructure facilities. The integration of technology into music education is not only limited to technical skills, but also includes student-centered teaching, creativity-supported applications, and data-based feedback processes. In this respect, the project-based course model developed by Tejada and Morel (2019) based on the TPACK framework allows prospective music teachers to construct pedagogical and technological knowledge simultaneously and reveals the importance of application-oriented learning experiences. The rapid spread of distance and hybrid teaching models during the pandemic period makes the requirements for technology integration even more visible; according to the findings of O'Leary and Bannerman (2023), the integration of online platforms into creative music production processes has become inevitable. Walls (2008) indicates that distance graduate music teaching experiences expand access to professional development by overcoming geographical barriers and encourages technology-enhanced instructional design. Thus, technology integration is not only embedded in course content but becomes part of institutional culture and professional learning communities.

Self-Efficacy in Technology Integration

Technology integration self-efficacy refers to music teacher candidates' beliefs and perceptions of competence in using digital tools for pedagogical purposes, and is accepted as one of the main determinants of learning motivation within the framework of Bandura's (1986) social cognitive theory. According to Bandura (1986), self-efficacy affects individuals' decisions to take action, their level of effort, their persistence in the face of difficulties and their emotional reactions. In the field of educational sciences, self-efficacy is examined in various dimensions such as teachers' classroom management, instructional design, and technology integration. It is reported that high self-efficacy perception is positively related to openness to innovative practices and professional satisfaction. A high self-efficacy perception reinforces pre-service teachers' tendencies to engage in innovative practices, cope with challenges, and set long-term professional development goals.

Wagoner (2015) reveals that there is a strong correlation between self-efficacy and professional commitment in terms of music teacher identity, and this finding emphasizes the role of self-efficacy in the construction of professional identity. Kılıç (2015) discusses the relationship between computer anxiety and self-efficacy and shows that teachers with low self-efficacy perception have high levels of anxiety towards technology, and this situation negatively affects integration efforts. Wang, Ertmer, and Newby's (2004) experimental study indicates that modeling and successful experiences increase self-efficacy, which is reflected in technology integration behavior. Banas and York (2014) examine the effect of authentic learning activities on self-efficacy and state that instructional design supported by authentic tasks reinforces preservice teachers' confidence in technology integration. Wang, Ertmer, and Newby (2004) state that pre-service teachers with high levels of self-efficacy for technology integration adopt more creative and student-centered methods in classroom practices. Sarıkaya's (2022) research on music teachers reports that technology integration self-efficacy shows significant relationships with the frequency of individual technology use and perceived infrastructure support. Gudek's (2019) computer self-efficacy study shows that music teacher candidates' attitudes towards digital technology affect their self-efficacy level and that these attitudes develop positively during the program. Doherty's (2021) research findings show that self-efficacy perceptions are strengthened and behavioral intention towards technology integration increases when content, pedagogical, and technological knowledge are taught in an integrated manner. Gomez et al. (2022) measured self-efficacy within the framework of ISTE standards and indicate that standards-based practices increase preservice teachers' digital pedagogical awareness and confidence levels. Thus, the concept of self-efficacy is a critical motivational element in pre-service teachers' professional learning processes and serves as a strategic lever in the context of technology integration (Kibici, 2022).

Longitudinal studies examining how self-efficacy perceptions change over the course of the program show that factors such as frequency of exposure to technology, depth of practice,

and quality of feedback are decisive. Zelenak (2015) reported that workshop-based interventions had lasting effects on self-efficacy growth and that candidates maintained positive attitudes towards technology use even after graduation. In addition, infrastructure inadequacies and limited technology access negatively affect the development of self-efficacy perception, highlighting the importance of institutional support policies (Sarıkaya, 2022). Wang, Ertmer, and Newby (2004) state that learning through modeling is especially effective in candidates with low initial self-efficacy levels, and increases the sense of confidence. Thus, technology integration self-efficacy, as a dynamic construct, is shaped by the interaction of program design, learning experiences, and environmental conditions. In the literature, the factors affecting pre-service music teachers' technology integration self-efficacy beliefs are discussed in individual, programmatic, and environmental dimensions. Wang, Ertmer, and Newby (2004) state that direct experience and success stories have strong effects on self-efficacy, while Banas and York (2014) state that authentic learning activities reinforce this effect. Among the environmental factors, institutional culture, policy support, and technological infrastructure indirectly affect self-efficacy beliefs and direct the integration behaviors of pre-service teachers. O'Leary and Bannerman (2023) explain that the ability of universities to provide rapid technical support in the online teaching process positively affects the attitudes of candidates towards technology and accelerates the increase in self-efficacy. Zelenak (2015) reports that continuous support and peer collaboration in professional development programs strengthen the perception of self-efficacy and increase the frequency of technology use. In addition, the attitudes of pre-service teachers towards technology are related to the amount of time and resources allocated to technology integration in the curriculum (Atabek and Burak, 2020). Haning (2016) highlights that in cases where the technology infrastructure in practice schools is inadequate, candidates' perception of self-efficacy may be negatively affected and integration efforts may be limited.

Artificial Intelligence Literacy in Teacher Education

Artificial intelligence (AI) literacy has emerged as a critical competency in contemporary teacher education, driven by the increasing integration of intelligent systems in educational contexts. This literacy encompasses not only technical understanding but also the ability to critically evaluate and ethically use AI tools in pedagogical settings.

The concept of artificial intelligence aims to bring human-like cognitive processes to the digital environment by encompassing subfields such as machine learning, deep learning and natural language processing (Smith, 2013; Miranda, 2021; Dai, 2021). In the context of educational sciences, artificial intelligence is transforming instructional design with innovative applications such as learning analytics, adaptive instructional systems, and automatic feedback mechanisms (Salas-Pilcove et al., 2022). In the field of teacher education, artificial intelligence literacy refers to the capacity of candidates to use these technologies effectively, ethically, and creatively for pedagogical purposes. This capacity includes the dimensions of technical knowledge, critical evaluation, and ethical responsibility in a

holistic way (Weivd., 2022). While existing studies mostly focus on general teacher education, the specific role of AI literacy in music education remains underexplored. Given the creative and performative nature of music teaching, it is crucial to investigate how future music teachers engage with AI technologies in ways that support both artistic expression and instructional design.

It is emphasized in the literature that interdisciplinary learning experiences play a critical role in the development of artificial intelligence literacy (Weive et al., 2022). The basic understanding by pre-service teachers of how artificial intelligence algorithms work facilitates the adaptation of these algorithms to classroom applications. In addition, the ability to transparently question the decision mechanisms of artificial intelligence-based tools strengthens the critical thinking competencies of the candidates (Gomez et al., 2022). In terms of ethics, the issues of data privacy and algorithmic bias are discussed in the teacher education curriculum to increase the candidates' awareness. International standards on artificial intelligence literacy provide reference frameworks for measuring and developing the competencies of pre-service teachers. These frameworks suggest comprehensive gains that include cognitive, affective and psychomotor goals (Chiu et al., 2024). For music teacher candidates, these ethical and critical competencies are particularly important when using AI tools that analyze student performances, collect audio-visual data, or provide automated feedback. Evaluating the transparency and fairness of such tools requires a solid understanding of both musical content and ethical considerations, ensuring that technological decisions do not override pedagogical values.

Research shows that programs that support artificial intelligence literacy also increase the technology integration self-efficacy of pre-service teachers. This increase paves the way for candidates to use artificial intelligence tools more boldly and creatively in classroom applications. Therefore, the conceptualization of artificial intelligence in the context of teacher education addresses pedagogical, technical, and ethical dimensions with a holistic approach. This holistic approach improves the skills of prospective teachers required to solve complex problems of the digital age. Accordingly, artificial intelligence literacy plays a decisive role in the future of teacher education. This role both increases student success and strengthens the professional identities of teachers (Dai, 2021). In the context of music teacher education, this means empowering candidates not only to use AI for technical tasks such as notation or performance tracking, but also to make informed pedagogical choices aligned with their musical and educational goals. As AI continues to influence the creative arts, equipping music educators with both confidence and critical awareness will be key to ensuring that technology enhances, rather than diminishes, musical learning and expression.

Artificial Intelligence and Music Education: Current Trends and Gaps

While AI literacy is gaining momentum in general teacher education, its role in music education is only beginning to be explored. Given the unique nature of music instruction—

blending creativity, performance, and pedagogy—artificial intelligence holds transformative potential but also presents distinct challenges. This section reviews current trends in AI applications in music teacher training and identifies key gaps in the literature.

The increasing use of technology in music teacher training programs brings new perspectives and methods to the education process. The rapid development of technology requires the inclusion of AI applications in the professional skill set and areas of interest of teacher candidates. Since music education is a field where theoretical knowledge and practice are intertwined, and creative processes are at the forefront, the concept of artificial intelligence literacy becomes increasingly important. AI literacy requires teacher candidates to understand not only the skills to use technology, but also the ethical, pedagogical, and practical innovations brought by this technology. It is especially important for music teacher candidates to be familiar with many dimensions of technology, from classroom management to measurement and evaluation, as well as its creative potential (Dorfman, 2016; Bauer & Dammers, 2016). However, despite this potential, few studies have addressed how AI literacy specifically supports pedagogical and artistic goals in music education. This gap highlights the need for further empirical investigation into how pre-service music teachers develop and apply AI-related competencies within their field.

Thanks to AI-based applications, prospective teachers can design materials for different learning styles and create music education environments customized to students' interests (Laupichler et al., 2022). At the same time, the feedback provided by AI-supported systems to prospective teachers also provides a continuous transformation cycle in their professional development. Therefore, artificial intelligence literacy is seen as a critical competence that future teachers in the field of music education should have. Understanding the pedagogical infrastructure of artificial intelligence technologies used in music lessons and the effective use of these technologies positively affects students' musical creativity and academic success. In addition, these technologies offer useful solutions in distance education processes. O'Leary and Bannerman (2023) state that the importance of technological tools and artificial intelligence-supported platforms in education has increased even more during the COVID-19 pandemic. In the context of music education, AI tools such as intelligent accompaniment generators, automated notation platforms, and real-time performance analysis systems offer powerful means to enhance creativity and motivation. These tools can help pre-service music teachers create more engaging, personalized, and data-informed instructional strategies. Thus, prospective music teachers need to develop both technology integration self-efficacy and artificial intelligence literacy in order to adapt to these changing educational dynamics. On the other hand, the ethical and security dimensions of artificial intelligence literacy should not be ignored. The data collection and analysis processes of various applications bring the principles of protection of students' personal data and ethical use to the forefront (Su et al., 2023).

Interdisciplinary projects produce innovative solutions by integrating the fields of music, computer science, and educational technology. These projects strengthen the creative thinking and problem-solving skills of teacher candidates. Collaborative learning environments facilitate the sharing of the candidates' experience and knowledge and support peer learning (Partti et al., 2021). In the evaluation processes, candidates' AI literacy competencies are measured using performance-based criteria and reflective portfolios. These measurement tools monitor candidates' learning processes and support the development of their self-regulation skills. The programs reinforce candidates' strengths with continuous feedback mechanisms and provide support for development areas (Han et al., 2025). For pre-service music teachers, these interdisciplinary approaches can foster not only technical fluency but also artistic experimentation—helping them design lesson plans that merge AI tools with musical creativity. In the context of music teacher education, AI literacy enables pedagogical innovations in areas such as composition, performance analytics, and musical data visualization. AI-supported composition software allows students to quickly put their creative ideas into notation and receive instant auditory feedback (Smith, 2013). Performance analytics tools provide personalized feedback to students by monitoring parameters such as rhythm accuracy, intonation, and dynamic control in real time (Dai, 2021). These tools, when critically and creatively used by teacher candidates, can transform traditional assessment models and support more individualized music instruction. The artificial intelligence literacy of music teacher candidates encourages a culture of data-based decision-making in course design processes. Visualization of student performance data allows teacher candidates to quickly identify learning gaps (Bauer, 2013). This detection provides an opportunity to individualize and differentiate teaching strategies. In addition, automatic assessment tools supported by artificial intelligence improve teacher candidates' time management (Han et al., 2025). This detection provides an opportunity to individualize and differentiate teaching strategies. In addition, automatic assessment tools supported by artificial intelligence improve teacher candidates' time management (Han et al., 2025).

Cui's (2023) augmented reality-based piano teaching application increases students' learning motivation and accelerates technical skill acquisition through multi-sensory feedback mechanisms. These innovative applications provide different perspectives on teacher candidates' pedagogical design competencies, improve their ability to interpret learning analytics data, and dynamically adapt the course flow. Yao and Li (2023) conducted a study on online music learning environments and emphasized that technological tools can support learning outcomes even in scenarios without teachers; however, teacher guidance is indispensable for pedagogical integrity. For music teacher candidates, these examples highlight the importance of developing both the technical ability to use such tools and the pedagogical judgment to apply them meaningfully. Without critical training, candidates may adopt AI tools without fully considering their alignment with instructional goals or the needs of diverse learners. Thus, the role of technology is not only instrumental, but also

stands out as a factor that shapes learning communities and redefines student-teacher interaction. In the constantly updated digital ecosystem, the ability of prospective teachers to make critical choices and ensure appropriate means-purpose alignment is of strategic importance. As stated by Haning (2016), pedagogical beliefs towards technology are one of the fundamental variables that determine the quality of integration; and learning experiences that support these beliefs should be included in program design. In addition, the impact of cultural context and school infrastructure on technology use cannot be ignored, and different socioeconomic conditions require integration strategies to be flexible and context-sensitive. In this regard, music teacher education programs must ensure that candidates not only learn how to operate AI-enhanced tools, but also how to evaluate their relevance, fairness, and artistic value in the context of music learning.

METHOD

In the study, the relational screening model, one of the quantitative research methods, was used, and the survey technique served as a measurement tool. In the relational screening method, it is determined whether there is a change among two or more research variables that may increase or decrease together (Piwowarski, 2001). Based on this method, the research will examine the relationships between the self-efficacy for technology integration and the literacy in artificial intelligence of the teacher candidates studying in the music teaching department of universities in Turkey. In this context, it aims to examine the relationship between demographic variables such as gender and class.

Participants

The population of the research consists of music teacher candidates studying in the education faculties of Turkish universities. Due to time, cost, accessibility, etc., constraints of reaching the overall population, the sample was formed from teacher candidates studying in music teaching departments of five universities. In this regard, the convenience sampling method, which is one of the non-random sampling methods, was employed. According to Emerson (2015), the sampling method is important to generalize and strengthen the representativeness of the sample regarding the population and the research results. As one of the non-probability sampling techniques, the convenience sampling method selects participants from the target population, according to the ease of access. For this purpose, the study was conducted with 228 participants based on convenience sampling. 149 of the participating music teacher candidates were female, and 79 were male. In addition, 67 of the participating music teacher candidates were in the first year, 38 in the second year, 70 in the third year, and 53 in the fourth year.

Data Collection Tools

'Technology Integration Skills Scale' and 'Artificial Intelligence Literacy Scale' were used as data collection tools in the study.

Technology Integration Self-Efficacy Perceptions Scale

In order to determine the technology integration self-efficacy perceptions of music teacher candidates, the "Technology Integration Self-efficacy Perception Scale" developed by Wang et al. (2004) and adapted to Turkish by Ünal (2013) will be used. The scale, which was prepared in the form of a five-point Likert type, has two dimensions as "Self-efficacy in Using Computer Technologies" and "Self-efficacy in Using Computer Technologies" and consists of 19 items. The scale allows for scores ranging from a minimum of 19 points to a maximum of 95 points. The Cronbach alpha coefficient for the reliability of the technology integration self-efficacy perception scale was calculated by Ünal (2013) as 0.94 and as 0.95 as a result of the reliability analysis conducted in this study.

Artificial Intelligence Literacy Scale

To assess AI literacy in a valid and reliable manner, a Likert-form measurement tool developed by Wang et al. (2022) and standardized for Turkish by Çelebi et al. (2023) was used. The scale, consisting of a total of 12 questions, has a five-point response form. Exploratory and confirmatory factor analyses conducted by Çelebi et al. (2023) show that the scale has strong construct validity consisting of four sub-dimensions. There are three questions in each sub-dimension of the AI literacy scale. In this respect, the AI literacy scale is easy to use. The Cronbach Alpha reliability coefficient for the sub-dimensions of the AI literacy scale varies between 0.77 and 0.85. The test reliability, including all items on the AI literacy scale, was calculated as 0.85.

Data Analysis

Before the analysis of the quantitative data obtained within the scope of the research, whether the data obtained meet the assumptions of parametric tests was tested. Based on the analysis results, it was determined that the scores obtained from the Technology Integration Self-Efficacy and Artificial Intelligence (AI) Literacy Scales met the assumptions of parametric statistics, and the differentiation status of the data obtained from this scale according to the gender variable was tested with independent sample t-Test analysis. Additionally, one-way ANOVA was used in the comparison according to the class level. In order to determine the source of the difference in the group differences detected as a result of ANOVA, the Scheffé test from post hoc tests was used. Multiple regression analysis was used to examine the technology integration self-efficacy and artificial intelligence (AI) literacy of music teacher candidates and to test the relationships between these variables. The data obtained for statistical analysis were evaluated using the SPSS 27.00 program.

FINDINGS

Table 1.

Descriptive Analyses of Prospective Music Teachers' Technology Integration Self-Efficacy

	N	Minimum	Maximum	Mean	Std. Deviation
Using the Computer	228	1,00	5,00	3,45	0,89
Letting Someone Else Use the Computer	228	1,00	5,00	3,55	0,89
Technology Integration	228	1,00	5,00	3,50	0,86

When Table 1 is examined, the mean scores of the sub-dimensions of the technology integration self-efficacy scale were calculated as 3.45 (SD=0.89), 3.55 (SD=0.89), and 3.50 (SD=0.86) for the entire scale. According to the mean scores, the results indicated that the technology integration self-efficacy of the music teacher candidates participating in the study was at a high level.

Table 2.

Descriptive Analyses on Artificial Intelligence Literacy of Music Teacher Candidates

	N	Minimum	Maximum	Mean	Std. Deviation
Awareness	228	2,00	5,00	3,53	0,61
Use	228	1,00	5,00	3,39	0,91
Evaluation	228	1,00	5,00	3,67	0,88
Ethics	228	1,67	5,00	3,61	0,73
AI Literacy	228	1,40	5,00	3,55	0,64

Upon examining Table 2, the mean scores of the sub-dimensions of the Artificial Intelligence Literacy Scale were found to be 3.53 (SD = 0.61) for the awareness sub-dimension, 3.39 (SD = 0.91) for the usage sub-dimension, 3.67 (SD = 0.88) for the evaluation sub-dimension, and 3.61 (SD = 0.73) for the ethics sub-dimension. The overall mean score for the scale was calculated as 3.55 (SD = 0.64). Based on these results, it can be concluded that the music teacher candidates who participated in the

study demonstrated a moderate level of competence in the usage sub-dimension and high levels in the other sub-dimensions as well as in overall artificial intelligence literacy.

Table 3.

Comparison of Technology Integration Self-Efficacy of Prospective Music Teachers According to Gender

	Gender	N	Mean	Std. Deviation	t	p
Using the Computer	Female	149	3,38	0,82	0,510	0,611
	Male	79	3,58	1,01		
Letting Someone Else Use the Computer	Female	149	3,52	0,85	-1,642	0,102
	Male	79	3,63	0,95		
Technology Integration	Female	149	3,45	0,80	-0,885	0,377
	Male	79	3,60	0,95		

Table 3 presents the comparative results of the technology integration self-efficacy scale scores of music teacher candidates according to gender. According to the unrelated sample t-test analysis, the mean scores calculated on the whole technology self-efficacy scale and its sub-dimensions did not show any significant difference based on the gender variable ($p>0.05$).

Table 4.

Comparison of Artificial Intelligence Literacy of Music Teacher Candidates Based on Gender

	Gender	N	Mean	Std. Deviation	t	p
Awareness	Female	149	3,49	0,59	-1,313	0,191
	Male	79	3,60	0,63		
Use	Female	149	3,39	0,86	-1,400	0,163
	Male	79	3,59	0,99		
Evaluation	Female	149	3,65	0,87	-1,585	0,114
	Male	79	3,70	0,89		

Ethics	Female	149	3,64	0,72	-0,441	0,660
	Male	79	3,56	0,74		
AI Literacy	Female	149	3,52	0,60	0,729	0,467
	Male	79	3,61	0,72		

Table 4 indicates the results of comparing the AI literacy scale scores of music teacher candidates according to gender. According to the unrelated sample t-test analysis, the mean scores calculated on the entire AI literacy scale and its sub-dimensions did not show any significant difference based on the gender variable ($p>0.05$).

Table 5.

Comparison of Technology Integration Self-Efficacy of Prospective Music Teachers According to Grade Level

	Class	**N**	**Mean**	**Std. Deviation**	**F**	**Sig.**
Using the Computer	1	67	3,40	0,83	1,782	0,152
	2	38	3,36	1,07		
	3	70	3,37	0,93		
	4	53	3,69	0,73		
Letting Someone Else Use the Computer	1	67	3,37	0,89	2,838	0,039
	2	38	3,51	1,00		
	3	70	3,55	0,85		
	4	53	3,83	0,80		
Technology Integration	1	67	3,47	0,83	2,366	0,072
	2	38	3,43	1,01		
	3	70	3,37	0,86		
	4	53	3,76	0,73		

Table 5 shows the comparison results of the self-efficacy scale scores for technology integration of music teacher candidates by grade level. According to the F test analyses, the mean scores calculated on the 'using the computer' subscale did not show a significant difference according to the grade level variable ($p>0.05$). According to further analyses, the participants studying in the second, third, and fourth grades had more advanced 'using the computer' skills compared to the participants in the first grade. However, no significant difference was found in the other dimension, and in the total, of the technology integration self-efficacy scale according to the grade level.

Table 6.

Comparison of Artificial Intelligence Literacy of Music Teacher Candidates According to Grade Level

	Class	N	Mean	Std. Devition	F	p
Awareness	1	67	3,35	0,57	3,337	0,020
	2	38	3,57	0,68		
	3	70	3,56	0,62		
	4	53	3,72	0,53		
Use	1	67	3,41	0,84	1,895	0,131
	2	38	3,36	1,06		
	3	70	3,37	0,94		
	4	53	3,72	0,79		
Evaluation	1	67	3,55	0,92	1,849	0,139
	2	38	3,85	0,89		
	3	70	3,56	0,90		
	4	53	3,82	0,75		
Ethics	1	67	3,46	0,66	3,037	0,030
	2	38	3,52	0,84		
	3	70	3,77	0,73		

	4	53	3,79	0,69		
AI Literacy	1	67	3,45	0,62	2,471	0,063
	2	38	3,63	0,74		
	3	70	3,48	0,66		
	4	53	3,73	0,54		

Table 6 presents the results of comparing the Artificial Intelligence (AI) literacy scores of music teacher candidates across different grade levels. According to the F-test analysis, significant differences were found in the 'awareness' and 'ethics' sub-dimensions based on grade level ($p < 0.05$). Post hoc analysis revealed that participants in the second, third, and fourth years had higher levels of awareness and ethical understanding related to AI literacy compared to first-year participants. However, no significant differences were observed in the 'use', 'evaluation' sub-dimensions, or in the overall AI literacy scores based on grade level ($p > 0.05$).

Table 7.

Results of Regression Analysis to Determine the Prediction Level of Technology Integration Self-Efficacy on Artificial Intelligence Literacy

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**B**	**T**	**Sig.**
(Constant)	1,150	0,073		15,681	0,000
Technology Integration	0,686	0,020	0,913	33,716	0,000

Dependent Variable: AI Literacy, R=0,913; R2=0,833; F=1136,786; p<0,05

Table 7 shows the results of the regression analysis conducted to determine the relationship between the technology integration self-efficacy of music teacher candidates and their artificial intelligence literacy. According to the analysis, it is understood that technology integration self-efficacy is an effective factor in the artificial intelligence literacy of the participating music teacher candidates ($\beta=0.686$, $p<0.05$). In addition, technology integration self-efficacy explains 83.3% of

artificial intelligence literacy. In this respect, the technology integration self-efficacy of music teacher candidates affects their artificial intelligence literacy positively and significantly.

DISCUSSION

The main purpose of this study is to reveal the capacity of teacher candidates to integrate technology into their pedagogical processes to meet the requirements of the digital age, and their competence in using artificial intelligence tools responsibly. According to the findings regarding the first research question of the study, the candidates' levels were generally high in these structures. This situation indicates that the candidates are willing to interact with digital pedagogical environments and have a strong belief in using technology effectively in teaching processes. The technology integration self-efficacy of the candidates overlaps with their skills in planning, implementing, and evaluating the use of digital tools. Artificial intelligence literacy supports the ability to comprehend the ethical, pedagogical, and practical dimensions of technology. The findings obtained show that the candidates see themselves as both competent in mastering technological tools and having positive expectations about integrating innovative technologies into classroom practices. The high level of competence perception suggests that the teacher candidates have acquired the necessary digital skills before starting their profession. The candidates' high levels of self-efficacy and AI literacy suggest that they perceive themselves as capable of utilizing digital technologies in course planning, and promoting student interaction. While the present study did not investigate the specific training experiences contributing to these perceptions, prior research highlights the role of professional development programs and practical coursework in shaping technology-related competencies (Wang et al., 2004; Haning, 2016; Tejada & Morel, 2019).

These findings are partially consistent with the views prominent in the existing literature. Studies indicate that music teacher candidates have high technology integration self-efficacy and artificial intelligence literacy levels The studies argue that this situation is supported by educational programs (Sarıkaya, 2022; Haning, 2016). In particular, studies emphasizing the role of technology integration in education indicate that candidates' skills in using digital tools for pedagogical purposes are reinforced through practical training processes (Tejada & Morel, 2019). It has been suggested in the literature that technology integration self-efficacy helps in adopting innovative pedagogical strategies in classroom practices (Bauer & Dammers, 2016). Similarly, studies on artificial intelligence literacy reveal that this competence supports candidates in using technology critically and creatively. Comparatively, the high level of perception obtained in our study is consistent with previous studies and shows that candidates' competence in adapting to technological developments is sufficiently supported. However, although some literature reports that

lower levels of perception are also observed among candidates, this difference varies depending on the training methods applied and sample characteristics (Gudek, 2019).

Within the scope of the second research question, the findings showed that the candidates had similar levels of self-efficacy and literacy perception based on gender. This suggests that male and female candidates exhibited a similar approach to interacting with digital technologies. It is understood that gender is not a determining factor in the development of technology use skills during the education process, and both groups benefit from similar support mechanisms. This equality may be because music teacher candidates have similar access to technological information and application opportunities within the scope of their education programs. The obtained results indicate that there are no gender-based differences, which are consistent with findings that gender effects are weak in some studies. Previous studies reported that gender differences are not evident in music teacher candidates' technology use skills and that both genders have similar learning experiences (Gudek, 2019; Atabek & Burak, 2020). This situation can be attributed to the implementation of common course contents, technological infrastructure, and teaching strategies in education regardless of gender.

The findings within the scope of the third research question show that senior candidates exhibit higher levels of performance, especially in subscales such as computer usage skills. This can be interpreted as the development of candidates' effective use of technology skills, with increasing experience and practical learning opportunities during the education process. Developing candidates according to their grade level, emphasizes the importance of gaining experience in putting theoretical knowledge into practice. In addition, with the increase in grade level, some significant differences emerged in artificial intelligence awareness and ethical behaviors. These results may reflect the cumulative impact of applied learning opportunities embedded in later stages of teacher education programs, such as project-based technology integration courses, practicum experiences with digital tools, and collaborative design of instructional materials (Tejada & Morel, 2019; Haning, 2016). Rather than suggesting that any curriculum would automatically lead to increased self-efficacy, these findings underscore the importance of structured, hands-on experiences and scaffolded exposure to educational technologies. Programs that integrate such components have been shown to foster not only technical proficiency but also confidence and openness toward innovative pedagogies (Bauer & Dammers, 2016; Wang et al., 2004). In the literature, the views that technological knowledge and practical skills increase as the education process progresses are supported, and this progression plays an important role in the professional development of candidates (Wang, Ertmer & Newby, 2004). The increase observed in sub-dimensions such as awareness and ethics in artificial intelligence literacy shows that comprehensive digital learning approaches implemented in education programs shape the attitudes of candidates positively. These findings are parallel to the literature supporting the idea that candidates gain more experience as the class

progresses, and that these experiences are reflected in their ability to use technology. Previous studies have stated that the participation of teacher candidates in applied training and mentoring programs accelerates the development of digital skills (Han et al., 2025).

The findings obtained in the study on whether the technology integration self-efficacy of music teacher candidates significantly explains artificial intelligence literacy showed that it has a strong and positive effect on artificial intelligence literacy. This finding suggests that the self-efficacy beliefs of the candidates regarding digital pedagogical applications increase their ability to use technology more effectively. The confidence of the candidates in using technology facilitates their adoption of the ethical, cognitive, and practical aspects of artificial intelligence tools. The high explanatory rate obtained underlines the interdependent relationship between digital competencies. This situation shows that the experiences of the teacher candidates regarding technology integration competencies during the education process are a determining factor in the development of artificial intelligence literacy. As the candidates are more exposed to technology-focused educational applications, they have also started to exhibit a more conscious and critical stance in using artificial intelligence. This finding reveals that technological skills are systematically integrated in the professional development processes of the candidates in accordance with the holistic application model of technology in education. In the literature, it has been suggested that technology integration self-efficacy supports pre-service teachers in using digital tools more effectively, and thus artificial intelligence-based applications can be implemented more successfully (Wang, Ertmer & Newby, 2004; Doherty, 2021). This shows that candidates' exposure to technology-focused applications enables them to use artificial intelligence technologies more consciously. Comparative analyses have revealed that this relationship is supported by interventions made within the scope of education programs and that candidates' digital competencies are complementary elements. In the literature, it is emphasized that technology integration increases the professional competencies of pre-service teachers and that artificial intelligence literacy is an important building block in the development of innovative pedagogical applications in education (Tejada & Morel, 2019). The findings show that these two structures positively affect each other in the development of candidates' digital pedagogical identities.

Limitations of the Study

There are some limitations to consider when interpreting the findings of this study. The sample used in the study was limited to data obtained from only five universities; this may constitute a restrictive factor in interpreting the general validity. In addition, the data collection tool was implemented via a survey method brings with it the risk of subjectivity based on self-assessment. Although the measurement tool was adapted to the cultural context, there may be limitations as to whether it fully reflects the experiences of candidates from different geographical regions. In addition, the quantitative method used in the study

may have been limited in revealing the in-depth individual experiences and perceptions of the candidates.

Conclusion and Recommendations

As a result, the research findings reveal a strong and positive relationship between the technology integration self-efficacy and artificial intelligence literacy, of music teacher candidates, providing an important theoretical and practical basis for the development of professional competencies required by the digital age. The high levels of self-efficacy and literacy perceptions obtained in the study supported the candidates' competencies in using digital tools, both technically and ethically, and this situation was parallel to similar findings in the existing literature. The data clearly obtained demonstrate that systematic support of technological competencies and their reinforcement with practical experiences play a decisive role in strengthening the professional identities of future teachers. In addition, the absence of gender differences in the study shows that egalitarian approaches in education can be successfully implemented. The development observed at the class level emphasizes that candidates' digital competencies will increase as they gain experience in the education process. Regression analyses revealed that technology integration self-efficacy is a critical determinant in explaining artificial intelligence literacy, proving that the two aspects are complementary processes. These results provide significant contributions, both theoretically and practically, to the development of current approaches to digital transformation strategies for teacher education programs.

Future studies should use larger samples to overcome the methodological limitations of this study. Generalizations should be made with data obtained from different universities. Longitudinal and mixed method approaches are valuable in terms of revealing the changes in digital competencies of teacher candidates over time, in detail. Supporting studies with qualitative methods to examine candidates' individual experiences in depth will provide richer data on technology integration and artificial intelligence literacy. In addition, examining the effects of support mechanisms and internship programs used in the pedagogical implementation process will make significant contributions to interpreting the obtained data. In future studies, analyzing the effects of different demographic variables in more detail will help reveal the reasons underlying the differences in candidates' digital competencies. It is recommended that the effects of factors such as the infrastructure provided by educational institutions be considered from multiple dimensions. Moreover, long-term studies should be conducted to evaluate how candidates' experiences with technology integration reflect on classroom practices.

Although the present study did not examine the specific content or instructional approaches of the teacher education programs at the five participating universities, the recommendations offered are grounded in the observed trends and supported by prior literature. The focus on pre-service music teachers is intentional, as music education

involves distinct pedagogical practices—such as real-time performance, creative composition, and multimodal feedback—that uniquely align with AI-supported instructional tools. The findings suggest that strengthening music teacher candidates' general technology integration skills may serve as a foundational step toward more effective and innovative use of discipline-specific digital tools in future classrooms. In practice, music teacher training programs need to update their current curricula in the areas of technology integration and artificial intelligence literacy and conduct studies that will increase candidates' digital competencies. These updates can be structured as interactive learning modules, project-based application workshops, and interdisciplinary collaboration projects. Educational institutions should create awareness about the ethical and responsible use of technological tools through continuing education seminars and mentor support programs for teacher candidates. Applied projects and laboratory studies that will increase candidates' digital pedagogical skills should be made an integral part of the program. The fact that faculty members constantly renew their digital competencies and follow current technological developments should be reflected in candidates' education. Education policymakers should provide the necessary infrastructure and resource support to adapt to the digital transformation process of teacher training programs. In practice, it is recommended that digital portfolio applications be used to support candidates' personal development in technology integration and artificial intelligence literacy. These portfolios can be important tools that document candidates' professional development processes and their progress in using technology.

REFERENCES

Atabek, O., & Burak, S. (2020). Pre-school and primary school pre-service teachers' attitudes towards using technology in music education. *Eurasian Journal of Educational Research*, *20*(87), 47–68.

Banas, J. R., & York, C. S. (2014). Authentic learning exercises as a means to influence preservice teachers' technology integration self-efficacy and intentions to integrate technology. *Australasian Journal of Educational Technology*, *30*(6). https://doi.org/10.14742/ajet.362

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs,* Prentice-Hall.

Bauer, W. I. (2013). The acquisition of musical technological pedagogical and content knowledge. *Journal of Music Teacher Education*, *22*(2), 51–64. https://dx.doi.org/10.1177/1057083712457881

Bauer, W. I., & Dammers, R. J. (2016). Technology in music teacher education: A national survey. *Research Perspectives in Music Education*, *18*(1), 2–15.

Bauer, W. I., Reese, S., & McAllister, P. A. (2003). Transforming music teaching via technology: The role of professional development. *Journal of Research in Music Education*, *51*(4), 289–301. https://dx.doi.org/10.2307/3345656

Bell, I. T. (2020). *The relationship between self-efficacy and music teachers' ability to use technology in the classroom*. University of Georgia.

Bowman, L. C. (2022). *Secondary school music teacher perceptions of music technology integration during a pandemic*. Northcentral University.

Burak, S. (2019). Self-efficacy of pre-school and primary school pre-service teachers in musical ability and music teaching. *International Journal of Music Education*, *37*(2), 257–271. https://dx.doi.org/10.1177/0255761419833083

Campanini, A. (2023). A place for TPACK in popular music education: A review of existing literature. *Journal of Popular Music Education*, *7*(3), 269-284. https://dx.doi.org/10.1386/jpme_00108_1

Chen, H. P. (2012). *The integration of information technology in music teacher education and school music education in Taiwan*. RMIT University.

Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. *Computers and Education Open*, *6*, 100171. https://dx.doi.org/10.1016/j.caeo.2024.100171

Cuervo, L., Bonastre, C., Camilli, C., Arroyo, D., & García, D. (2023). Digital competences in teacher training and music education via service learning: A mixed-method research project. *Education Sciences*, *13*(5), 459. https://dx.doi.org/10.3390/educsci13050459

Cui, K. (2023). Artificial intelligence and creativity: piano teaching with augmented reality applications. *Interactive Learning Environments*, *31*(10), 7017–7028. https://dx.doi.org/10.1080/10494820.2022.2059520

Çelebi, C., Yılmaz, F., Demir, U., & Karakuş, F. (2023). Artificial Intelligence Literacy: An Adaptation Study. *Instructional Technology and Lifelong Learning*, *4*(2), 291-306. https://doi.org/10.52911/itall.1401740

Dai, D. D. (2021). Artificial intelligence technology assisted music teaching design. *Scientific Programming*, *2021*(1), 9141339. https://dx.doi.org/10.1155/2021/9141339

Dammers, Richard J., 'The Role of Technology in Music Teacher Education', in Colleen M. Conway, and others (eds), *The Oxford Handbook of Preservice Music Teacher Education in the United States,*

Oxford Handbooks (2019; online edn, Oxford Academic, 6 Nov. 2019), https://doi.org/10.1093/oxfordhb/9780190671402.013.17, accessed 5 Aug. 2025

Doherty, B. (2019). *The role of content, pedagogical, and technological knowledge in explaining music teacher self-efficacy*. Manhattanville College.

Doherty, B. (2021). Technology in the classroom and music teachers' self-efficacy. *Journal of Music, Technology & Education*, *14*(2–3), 141–155. https://dx.doi.org/10.1386/jmte_00038_1

Dorfman, J. (2008). Technology in Ohio's school music programs: An exploratory study of teacher use and integration. *Contributions to Music Education*, 23–46.

Dorfman, J. (2016). Exploring models of technology integration into music teacher preparation programs. *Visions of Research in Music Education*, *28*(1), 6.

Emerson, R. W. (2015). Convenience sampling, random sampling, and snowball sampling: how does sampling affect the validity of research?. *Journal of visual impairment & blindness, 109*(2), 164-168. https://doi.org/10.1177/0145482X1510900215

Gall, M. (2017). TPACK and music teacher education. In *The Routledge companion to music, technology, and education* (pp. 329-342). Routledge.

Gomez, F. C., Trespalacios, J., Hsu, Y.-C., & Yang, D. (2022). Exploring teachers' technology integration self-efficacy through the 2017 ISTE Standards. *TechTrends*, 1–13. https://dx.doi.org/10.1007/s11528-021-00639-z

Greher, G. R. (2006). Transforming music teacher preparation through the lens of video technology. *Journal of Music Teacher Education*, *15*(2), 49–60. https://dx.doi.org/10.1177/10570837060150020107

Greher, G. R. (2011). Music technology partnerships: A context for music teacher preparation. *Arts Education Policy Review*, *112*(3), 130–136. https://dx.doi.org/10.1080/10632913.2011.566083

Gudek, B. (2019). Computer self-efficacy perceptions of music teacher candidates and their attitudes towards digital technology. *European Journal of Educational Research*, *8*(3), 683–696. https://dx.doi.org/10.12973/eu-jer.8.3.683

Han, Y., Han, L., Zeng, C., & Zhao, W. (2025). The innovation path of VR technology integration into music classroom teaching in colleges and universities. *Scientific Reports*, *15*(1), 12200. https://dx.doi.org/10.1038/s41598-025-97003-5

Haning, M. (2016). Are they ready to teach with technology? An investigation of technology instruction in music teacher education programs. *Journal of Music Teacher Education*, *25*(3), 78–90. https://dx.doi.org/10.1177/1057083715577696

Kibici, V. B., & Sarikaya, M. (2021). Readiness Levels of Music Teachers for Online Learning during the COVID-19 Pandemic. *International Journal of Technology in Education, 4*(3), 501-515. https://dx.doi.org/10.46328/ijte.192

Kibici, V. B. (2022). An Investigation into Music Teachers' Perceptions of Technological Competencies. *International Journal of Technology in Education and Science, 6*(1), 111-123. https://dx.doi.org/10.46328/ijtes.344

Kiliç, D. B. Ç. (2015). Music teachers' computer anxiety and self-efficacy. *Educational Research and Reviews*, *10*(11), 1547. https://dx.doi.org/10.5897/err2015.2235

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)?. *Contemporary issues in technology and teacher education*, *9*(1), 60-70.

Kosimov, A. (2025). Improving The Methodology of Using Simulative Technologies in The Training of Future Music Teachers Based on An Integrative Approach. *International Journal of Artificial Intelligence*, *1*(1), 129–131.

Laupichler, M. C., Aster, A., Schirch, J., & Raupach, T. (2022). Artificial intelligence literacy in higher and adult education: A scoping literature review. *Computers and Education: Artificial Intelligence*, *3*, 100101. https://dx.doi.org/10.1016/j.caeai.2022.100101

Miranda, E. R. (2021). *Handbook of artificial intelligence for music*. Springer.

Mohamed, A. A. S., Mahmoud, S. M., & Khalladi, Y. M. (2025). Artificial Intelligence in Teaching Music Skills and Teachers' Attitudes Towards It in the Sultanate of Oman. *Journal of Lifestyle and SDGs Review*, *5*(3), e05582–e05582. https://dx.doi.org/10.47172/2965-730x.sdgsreview.v5.n03.pe05582

Nart, S. (2016). Music software in the technology integrated music education. *Turkish Online Journal of Educational Technology-TOJET*, *15*(2), 78–84.

Nyinge, B., Matete, R., & William, F. K. (2024). Exploring the Relationship between Authentic Assessment and Teaching Professional Competence Acquisition among Undergraduate Science Student-Teachers in Higher Education Institutions in Tanzania. *International Journal of Current Educational Studies*, *3*(1). https://dx.doi.org/10.46328/ijces.95

O'Leary, E. J., & Bannerman, J. K. (2023). Technology integration in music education and the COVID-19 pandemic. *Bulletin of the Council for Research in Music Education*, (238), 23–40. https://dx.doi.org/10.5406/21627223.238.02

Partti, Heidi, 'Building a Broad View of Technology in Music Teacher Education', in S. Alex Ruthmann, and Roger Mantie (eds), *The Oxford Handbook of Technology and Music Education*, Oxford Handbooks (2017; online edn, Oxford Academic, 10 Aug. 2017), https://doi.org/10.1093/oxfordhb/9780199372133.013.10, accessed 5 Aug. 2025.

Partti, H., Weber, J., & Rolle, C. (2021). Learning a skill, or learning to learn? Supporting teachers' professional development in music education technology. *Journal of Music, Technology & Education*, *14*(2–3), 123–139. https://dx.doi.org/10.1386/jmte_00037_1

Piwowarski, W. (2001). Relational model-survey results as related to quantitative description of random process. *Gospodarka Surowcami Mineralnymi-Mineral Resources Management,17*(1), 75-90.

Reese, S. (2001). Integration of On-line Compostion Mentoring into Music Teacher Education. *Contributions to Music Education*, 9–26.

Salas-Pilco, S. Z., Xiao, K., & Hu, X. (2022). Artificial intelligence and learning analytics in teacher education: A systematic review. *Education Sciences*, *12*(8), 569. https://dx.doi.org/10.3390/educsci12080569

Sarıkaya, M. (2022). An investigation of music teachers' perceived self-efficacy for technology integration. *International Journal of Technology in Education and Science (IJTES)*, *6*(2), 204-217. https://dx.doi.org/10.46328/ijtes.369

Sevan, N. (2025). A Bibliography Study on Academic Publications about Artificial Intelligence in Music Education. *Turkish Online Journal of Educational Technology*, *24*(1), 1-11.

Smith, B. (2013). Artificial intelligence and music education. In *Readings in Music and Artificial Intelligence* (pp. 221–237). Routledge.

Souliotis, M. (2024). Mapping the Way: Teaching Music Information Literacy in the Contemporary Information Landscape. *Notes*, *81*(1), 66–85. https://dx.doi.org/10.1353/not.2024.a934840

Stolpe, K., & Hallström, J. (2024). Artificial intelligence literacy for technology education. *Computers and Education Open*, *6*, 100159. https://dx.doi.org/10.1016/j.caeo.2024.100159

Su, J., Ng, D. T. K., & Chu, S. K. W. (2023). Artificial intelligence (AI) literacy in early childhood education: The challenges and opportunities. *Computers and Education: Artificial Intelligence*, *4*, 100124. https://dx.doi.org/10.1016/j.caeai.2023.100124

Tejada, J., & Morel, T. T. (2019). Design and validation of a music technology course for initial music teacher education based on the TPACK framework and the project-based Learning approach. *Journal of Music, Technology & Education*, *12*(3), 225–246. https://doi.org/10.1386/jmte_00008_1

Tobias, E. S. (2017). Re-situating technology in music education. *The Oxford Handbook of Technology and Music Education*, 291–308. https://dx.doi.org/10.1093/oxfordhb/9780199372133.013.27

Ünal, E., Yamaç, A., & Uzun, A. M. (2017). The effect of the teaching practice course on pre-service elementary teachers' technology integration self-efficacy. *Malaysian Online Journal of Educational Technology*, *5*(3), 39-53.

Wagoner, C. L. (2015). Measuring music teacher identity: Self-efficacy and commitment among music teachers. *Bulletin of the Council for Research in Music Education*, (205), 27–49. https://dx.doi.org/10.5406/bulcouresmusedu.205.0027

Walls, K. C. (2000). Technology for future music educators. *Journal of Music Teacher Education*, *9*(2), 14–21. https://dx.doi.org/10.1177/105708370000900204 (Original work published 2000)

Walls, K. C. (2008). Distance learning in graduate music teacher education: Promoting professional development and satisfaction of music teachers. *Journal of Music Teacher Education*, *18*(1), 55–66. https://dx.doi.org/10.1177/1057083708323137

Wang, B., Rau, P.-L. P., & Yuan, T. (2022). Measuring user competence in using artificial intelligence: validity and reliability of artificial intelligence literacy scale. Behaviour & Information Technology, 42(9), 1324–1337. https://doi.org/10.1080/0144929X.2022.2072768

Wang, L., Ertmer, P. A., & Newby, T. J. (2004) Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education, 36*(3), 231-250. https://dx.doi.org/10.1080/15391523.2004.10782414

Wei, J., Karuppiah, M., & Prathik, A. (2022). College music education and teaching based on AI techniques. *Computers and Electrical Engineering*, *100*, 107851. https://dx.doi.org/10.1016/j.compeleceng.2022.107851

Yao, B., & Li, W. (2023). The role of a teacher in modern music education: can a student learn music with the help of modernized online educational technologies without teachers? *Education and Information Technologies*, *28*(11), 14595–14610. https://dx.doi.org/10.1007/s10639-023-11786-6

Zelenak, M. S. (2015). A Professional Development Program for Integrating Technology: Examining the Impact On K-12 Music Teachers. *Journal of Technology in Music Learning*, *5*(2), 45-68.

Zhang, X., & Yang, D. (2021). *Research on music assisted teaching system based on artificial intelligence technology* (Vol. 1852). IOP Publishing. https://dx.doi.org/10.1088/1742-6596/1852/2/022032

Zhao, X., Guo, Z., & Liu, S. (2021). Exploring key competencies and professional development of music teachers in primary schools in the era of artificial intelligence. *Scientific Programming*, *2021*(1), 5097003. https://dx.doi.org/10.1155/2021/5097003

Zhang, X., & Yang, D. (2021). *Research on music assisted teaching system based on artificial intelligence technology.* Journal of Physics: Conference Series, 1852(2), 022032. https://doi.org/10.1088/1742-6596/1852/2/02203

Data Availability Declaration

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

The sole author of this research, Özlem Kılınçer, was responsible for the conceptualization, methodology formulation, data collection, analysis, and interpretation. Furthermore, [Özlem Kılınçer took charge of drafting the initial manuscript, revising it critically for vital intellectual content, and finalizing it for publication. The author has read and approved the final manuscript and takes full accountability for the accuracy and integrity of the work presented.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Biographical notes:

Özlem Kılınçer: Currently a Assoc. Prof. Dr. in the Music Education Department at Nevşehir Hacı Bektaş Veli University.

Scopus Author Identifier Number: N/A

Web of Science Researcher ID: FDJ-3268-2022

Google Scholar Researcher ID:

https://scholar.google.com/citations?user=W4nbM68AAAAJ&hl=tr&oi=ao

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Effects of Child-Centered Play Therapy on Quality of Life, Depression and Anxiety in Children with Cancer[1]

Esra Coşkun[2] Şaziye Senem Başgül[3]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 385-413
http://www.ijonmes.net

Article Info:

Received 25.05.2025
Revision 05.06.2025
Accepted 18.06.2025

Abstract:

The aim of this study is to examine the effect of child-centered play therapy on quality of life, depression, and anxiety levels of 8- to 12-year-old children. The study was conducted using a control group pretest-posttest design. Child-centered play therapy was applied in the experimental group, while no experimental procedure was performed in the control group. The experimental applications of the study lasted between June and October 2024. The whole therapeutic procedure lasted 12 sessions of 45 minutes, 1-2 times a week. In the experimental group, child-centered play therapy was carried out for approximately 5 months. The study included 34 children between the ages of 8 and 12 who were diagnosed with cancer. These children were randomly assigned to the experimental and control groups. 'Quality of Life Scale for Children' and 'Depression and Anxiety Scale for Children' were used to collect the research data. According to the analyses performed on the posttests, child-centered play therapy was found to have significant and positive effects on the quality of life, depression, and anxiety levels of children with cancer.

Keywords: Child-Centered Play Therapy, Quality of Life, Depression, Anxiety, Children with Cancer

Citation:
Coşkun, E., Başgül, Ş., (2025). The Effect of Child-Centered Play Therapy on Self-Compassion and Emotion Regulation Skills in Children with Cancer. *International Journal of Modern Education Studies, 9*(2), 385-413. https://doi.org/10.51383/ijonmes.2025.422

[1] This article is derived from the PhD dissertation of Esra Coşkun, conducted under the supervision of Şaziye Senem Başgül.

[2] Ph.D. Candidate, Hasan Kalyoncu University, Gaziantep, Türkiye. esra.coskun@std.hku.edu.tr,
https://orcid.org/0000-0001-9592-0341

[3] Professor, Hasan Kalyoncu University, Gaziantep, Türkiye. senem.basgul@hku.edu.tr,
https://orcid.org/0000-0002-9843-8048

INTRODUCTION

Cancer affects children as well as adults, and the number of children diagnosed with cancer is increasing worldwide. Both the disease itself and the treatment pose many physical and psychosocial problems in the lives of children with cancer. The presence of challenging treatments and complications resulting from cancer and its treatment can lead to physiologically, psychologically, and socially negative effects and new problems that are difficult to cope with, ultimately affecting the patients' quality of life (Abecassis et al., 2016; Momani & Berry, 2017; Schultz et al., 2017). It has been found that children experience mental symptoms at the time of diagnosis, during and after treatment, which can be traumatic and life-threatening (Kazak & Noll, 2015).

In the past, the main principle in childhood cancers was to keep the child alive, whereas today, it is to ensure that the surviving child lives a quality life. Innovations in the treatment of chronic diseases such as cancer have prolonged the life expectancy of patients and increased the importance of quality of life (Kemper, 2017). With the implementation of cancer treatment, the prolongation of life expectancy has started to have a greater impact on the physical and psychological conditions of these children and their social and school life. However, since this disease forces children to cope with its side effects, the effects of the treatment process on quality of life have become the subject of research. In recent years, developed and developing countries have started to emphasize the concept of quality of life in health promotion policies (Abecassis et al., 2016; Schultz et al., 2017). As the survival rate increases in childhood cancers, new problems emerge, needs change, and the psychosocial and long-term effects of the disease increase. These long-term effects lead to a rise in the need for support to children and families.

Quality of Life in Children with Cancer

During cancer treatment, children often experience emotional and psychological distress as well as physical effects. These include anxiety, fear, hopelessness and worry. Difficulties during treatment can make children feel worthless. In terms of social effects, children undergoing cancer treatment often have to stay away from school and friends, which can make them feel lonely or isolated. Problems such as depression, hypochondriasis, behavioral and adaptation problems, physical limitation, and excessive anxiety are often observed in children who survive childhood cancers (Kalaycı, 2019).

During cancer treatment, children often experience emotional and psychological distress as well as physical effects. These include anxiety, fear, hopelessness and worry. Difficulties during treatment can make children feel worthless. In terms of social effects, children undergoing cancer treatment often have to stay away from school and friends, which can make them feel lonely or isolated. Problems such as depression, hypochondriasis, behavioral and adaptation problems, physical limitation and excessive anxiety are often observed in children who survive childhood cancers (Kalaycı, 2019).

Clinical psychiatric studies during cancer treatment have generally focused on depression. The rate of depression in children undergoing cancer treatment is between 12% and 20%. It has also been reported that depressive symptoms are more common in children who experience severe pain during treatment. It has been reported that children diagnosed with cancer at an early age are better adapted to the disease process and, with the positive and supportive approach of their families, and mental problems such as depression are less common.

The psychological effects of illness and hospitalization differ for each child. Determinant factors include individual differences; the nature and age of the child; the nature of the difficulties to be experienced; the level of information provided to the family and the child; the time spent in the hospital; the behavior of the hospital team; the duration and type of separation from the mother; and the family's level of anxiety. Children's personal experiences and beliefs are also important in defining the concept of illness. For example, the reaction of a child who has been very ill and suffered during treatment may be more pronounced than the reaction of a child who has never had a serious illness. These factors constitute sources of psychological stress in patients. Behavioral reactions such as anger and defiance can be observed as problems in adapting to treatment, and these often negatively affect school attendance and performance. For some children and young people with cancer, the sense of being perceived as different can lead to withdrawal from society, make it difficult to establish relationships with friends, and negatively affect sexual identity development. Not all children react to cancer in the same way. While some children and adolescents may be resigned to the situation and take their medication with extreme caution, others may exhibit dangerous and rebellious behavior as a way of asserting their independence. Reactions such as depression and agitation are common

Play Therapy for Children with Cancer

For children diagnosed with cancer and their families, accepting a diagnosis that requires long-term and continuous treatment is quite challenging. When working with children diagnosed with cancer, researchers have emphasized that these individuals often have difficulty in expressing their intense emotions, are unable to use the necessary words and concepts, and find that words are insufficient for their inner feelings. The diagnosis of cancer causes a variety of reactions, ranging from simple stress to a grief and loss reaction, and emotional strain in which the integrity of the self is threatened. Reactions such as fear of separation, fear of the future, fear of death, fear of damage to the body, organs, and parts, and feelings of regret and guilt affect the child's emotional state, mental functioning, balance, physical and emotional autonomy, body image, and social sphere (Last & Grootenhuis, 1998; Li et al., 2010).

In a study conducted in Hong Kong with Chinese children aged 7-12 years and their parents, the effectiveness and applicability of therapeutic play in surgical interventions were evaluated. According to the results of the study, children and their families in the

therapeutic play group had significantly lower levels of anxiety before and after surgery compared to the control group. In addition, it was determined that the postoperative satisfaction level of the families in the therapeutic play group was higher (Li & Lopez, 2008). In order for a game to be accepted as "therapeutic play", it should encourage the expression of emotions, educate children about hospital experiences, and provide physiological benefits. The main aim of play therapy is to prevent or solve psychosocial difficulties and contribute to optimal child health, growth, and development, regardless of the child's condition. Play enriches children's physical, social, cognitive, and emotional abilities and sense of well-being (Elbeltagi et al., 2023).

Play therapy helps the child overcome the different obstacles encountered in the development process and in his/her life, helps the child to be more responsible in his/her behavior, and to develop successful strategies and creative solutions to problems. It also teaches children to respect themselves and others, to accept reality, to express their feelings and emotions, and to respect the thoughts and feelings of others; Elbeltagi et al., 2023). Play therapy can be used as a diagnostic and therapeutic tool. Initially, the play therapist observes the child during play to identify the child's main problems and assesses these. The therapist then carries out a problem-oriented process by scaffolding and supporting the child to learn to express himself or herself and communicate through his or her inner world thoughts. The therapist helps the child to overcome the unresolved trauma. It enables the child to master a new coping mechanism, review inappropriate behaviors, and enrich adaptive behavioral responses (Lane et al., 2019, Koukourikos et al., 2021).

Play therapy is examined in three categories. These can be expressed as directive, or structured play therapy, family play therapy, and non-directive play therapy or child-centered play therapy. Directive play therapy is an approach in which the therapist actively directs the process. In family play therapy, the parent-child relationship is supported and parents are taught skills to reduce children's problematic behaviors. In non-directive play therapy, the therapist does not intervene, and the child is allowed to self-direct the process. The most well-known example of this type is child-centered play therapy.

Child-Centered Play Therapy (CCPT) is a method based on the client-centered therapy approach first introduced by Carl Rogers. This approach was developed, and adapted to play therapy by Virginia Axline. Later, this approach developed by Virginia Axline was further developed and conceptualized by Garry Landreth; thus, the child-centered play therapy approach was introduced (Landreth, 2011).

CCPT is a therapy approach in which the client is trusted and the therapist does not aim to control or change, allowing the child to self-manage and explore. In this approach, relationship building is the most important factor. The CCPT focuses on relationships instead of problems, and this relationship is considered the trigger of the healing process. The materials used in therapy are toys in a carefully prepared playroom. The choice of which toys to play with and how to set up the game is left entirely to the individual. It is believed

that the client's guidance of the game by his/her inner feelings and thoughts is more effective than the guidance of the counselor.

CCPT is the belief that children have an innate ability to solve problems and increase their self-efficacy. Therefore, it is believed that it is the child who provides guidance. In this approach, great emphasis is placed on the potential for intrinsic well-being. It is also noted that the therapist is not passive or submissive; on the contrary, the therapist is active in this approach. The therapist empathizes in a reassuring and unconditionally accepting manner, thus providing an environment for the child to explore and manage themselves (Meany-Walen & Teeling, 2016). The focus is on the individual instead of the problem, living in the moment instead of the past, accepting instead of directing, understanding instead of explaining, and emotions instead of perceptions and actions. The main power for healing and change lies in the individual's inner resources and wisdom (Vanfleet et al., 2018).

CCPT is used as a functional intervention method to address children's social, emotional and behavioral problems. This therapy usually works with children between the ages of 2 and 10 and is effective in treating problems such as anxiety, depression, obsessions, and compulsions (Landreth, 2011; Vanfleet et al., 2018). Especially in coping with conditions such as Attention Deficit and Hyperactivity Disorder (ADHD), CCPT is preferred in addition to or as an alternative to drug treatment, which is among the common problems (Orhan, 2022).

CCPT can be used in many situations, such as depression, obsessions, trauma, attention deficit hyperactivity disorder, behavioral problems, sexual and physical abuse, divorce, anxiety disorders, chronic diseases, urinary and fecal incontinence, and perfectionist attitudes. The effects of cancer, which is a serious health problem that profoundly affects life, can be especially sensitive for children and entail psychosocial needs that change periodically. For this reason, play is used as a therapy method to reduce these negative effects in children, and CCPT is one of the most widely used play therapies in this field (as cited in Manav, 2013).

By putting the child diagnosed with cancer at the center, CCPT allows the play therapist to fully focus on them. This therapy aims to help the child cope with anxiety, worry, social isolation and fear caused by the illness, develop a positive sense of self, and become aware of their behavior. In CCPT, the therapist gains the child's trust and does not intervene while giving the child the freedom to make decisions within set boundaries. This approach involves being the child's companion and not taking a leadership role. Research shows that this therapy method reduces anxiety levels in children (Manav, 2013).

CCPT is a form of non-directed play therapy which is a fully empowering approach for children diagnosed with cancer. This approach is based on the premise that children diagnosed with cancer can solve their own problems in their own way (Landreth, 2012).

– Child-centered play therapy helps children diagnosed with cancer.

- Understand your emotions better
- Express their feelings by expressing their needs
- Development of problem solving skills
- Reduction of problematic behaviors
- Increasing skills to deal with conflicts
- Increased self-confidence
- The aim is to develop self-control.

According to Bratton et al. (2005), CCPT has a positive effect on children diagnosed with cancer in areas such as self-perception, behavioral adjustment, emotional adjustment, intelligence, and anxiety/fear, and social skills. In a study conducted by Godino-Iáñez et al. (2020), it was revealed that therapeutic play practice reduced postoperative pain, improved behavior and attitudes, and significantly reduced anxiety during hospitalization in children. A study conducted by Boucher et al. (2014) revealed that play therapy practices for children with chronic, life-threatening, and life-limiting disorders had significant effects on improving the clinical symptoms of the disease and reducing the psychological impact of the disease on the child. In a study conducted by Zareapour et al. (2009), it was shown that the application of play therapy provided a significant improvement in the depression of children aged 6-15 years with cancer and that it can be an effective intervention. Asghari Nekah et al. (2015) found that structured cognitive-behavioral group play therapy applied to children with cancer (8-14 years old) who were treated in a hospital in Iran was effective in reducing anxiety and depression levels. In a study conducted by Godino-Iáñez et al. (2020), it was revealed that play therapy, as an intervention for hospitalized children, reduced postoperative pain, improved behavior and attitudes, and reduced anxiety during hospitalization. In a study conducted by Teber (2015), it was observed that child-centered play therapy reduced children's social and psychologically-based behavioral problems. In addition, it was found that the therapy method applied reduced somatic complaints and depression levels and had positive effects on attention problems.

The studies presented above in the literature show that play therapy methods have effects on children's psychosocial development, and that especially CCPT can have positive effects on depression, anxiety and quality of life. Child survivors during and after cancer treatment often need additional motivation, inner dynamism and environmental support to cope with the challenges of the treatment process. Without such support, children may show less compliance with treatment recommendations, interruptions in medical follow-up, development of medical complications or deterioration in overall health. In this context, CCPT can provide important opportunities multidimensional psychological support to these children, both at the onset of cancer, at during the process, and outside the hospital. However, studies on children diagnosed with cancer are limited and more research is needed in this field. In this context, the aim of the study was to examine the effect of the Child-Centered Play Therapy (CCPT) approach applied to children aged 8-12 years

diagnosed with cancer on their depression, anxiety, and quality of life levels. In relation to this purpose, answers to the following questions were sought:

1. Is there a significant difference between the levels of depression and anxiety in children aged 8-12 years in the experimental group that received play therapy and the control group that did not receive any therapy?

2. Is there a significant difference between the quality of life levels of 8-12 year old children in the experimental group who received play therapy and the control group who did not receive any therapy?

METHOD

The independent variable in this study is the "Child-Centered Playful Therapy Practice" applied to children aged 8-12 years with cancer. The dependent variables in the study are "quality of life" and "depression and anxiety" levels of 8- to 12 children with cancer. The aim of the research is to determine whether the independent variable affects the dependent variables. In this context, the study was conducted using the pretest-posttest experimental method and a control group, following the real experimental models (pretest-posttest control and experimental group design). Within the scope of this model, subjects were randomly assigned to the groups. According to Witte and Witte (2017), randomization is one of the most important features of true experimental models. This ensures that each participant or group of subjects has an equal chance of being placed in any group.

While examining the effects of child-centered play therapy on depression-anxiety and quality of life (dependent variables), no therapeutic intervention was performed in the control group. The use of the experimental method in the research is appropriate to test the effects of Child-Centered Play Therapy (CCPT) on depression, anxiety, and quality of life of 8-12-year-old children diagnosed with cancer. The research design is presented in Table 1.

Table 1.

Research Design

Groups	Pre-test	Experimental Procedure	Post-test
GE	M1.1	X+Y	M1.2
GC	M2.1	-	M2.2

EG: Experimental Group; CG: Control Group

X-Y: Child-Centered Play Therapy

M1.1; M1.2: Pretest-posttest measurements of the experimental group (Depression and Anxiety Scale in Children, Quality of Life Scale)

M2.1; M2.2: Pretest-posttest measurements of the control group (Depression and Anxiety Scale in Children, Quality of Life Scale)

Research Group

In this study, in which the effect of Child-Centered Play Therapy on the depression, anxiety, and quality of life levels of the participants was examined, participants were selected through a two-group randomized controlled study process. At this stage, experimental and control groups were formed according to expert opinions and research in the literature. In this context, it was decided to randomly assign the groups and to use a blocked-stratified assignment method. According to Zareapour et al. (2009), the sample size for an experimental study is recommended to be 20 (experimental and control groups in total) using a significance level of .05, $\beta = 0.1$, and 90% power. In this context, the sample size required to determine that Cohen's d effect size was 0.6, in the experimental and control groups was calculated. Considering a loss rate of up to 15%, a total of twenty-five participants in the research groups were considered sufficient to observe an effect with at least 80% power at a 5% significance level. However, due to the nature of childhood cancer, a total of 40 participants were enrolled in the experimental and control groups to account for an anticipated dropout or exclusion rate. The enrolled children were informed about the study and its purpose. Those who agreed to participate signed an informed (parental) consent form.

After signing the informed consent form, children aged 8-12 years with cancer, within the scope of the study, were sequentially numbered based on the blocked-stratified method. The assignment was done completely randomly according to the hospital patient lists, with 20 children in each group (experimental and control). In the experimental group, 2 patients were excluded due to absenteeism during the experimental interventions and 1 participant was excluded due to the exacerbation of their illness. In the control group, two patients were excluded because they did not complete the post-tests and one participant died. Thus, the study was conducted with the participation of 34 children (17 experimental + 17 control group). These children completed the pre-test and post-test of the study. The distribution of the participants in the research group according to demographic characteristics is presented in Table 2.

Table 2.

Distribution of Research Participants According to Demographic Variables

	Experimental Group		Control Group		-p-
Gender of the Child	-n-	%	-n-	%	

Male	8	47,1	9	52,9	0,732
Female	9	52,9	8	47,1	p>0,05
Educational Status of the Child					
Primary School	12	70,6	13	76,5	0,500
Secondary School	5	29,4	4	23,5	p>0,05
Mother's Educational Status					
Primary School graduate	3	17,6	3	17,6	
Secondary School Graduate	2	10,8	-	-	
High School Graduate	8	47,1	11	64,7	
University Graduate	4	23,5	3	17,6	
Father's Education Status					
Primary School Graduate	3	17,6	1	5,9	
Secondary School Graduate	2	11,8	-	-	
High School Graduate	5	29,4	4	23,5	
University Graduate	7	41,2	12	70,6	
Total	17	100,0	17	100,0	

	Experimental Group		Control Group		
	$\bar{X}$	*Sd*	$\bar{X}$	*Sd*	-p-
Age of Child	9,47	1,51	9,41	1,28	0,973
Age of Mother	38,09	3,92	37,26	3,99	0,306
Age of Father	41,47	2,76	40,53	2,29	0,245

p>0,05

Table 2 shows the distribution of participants in the experimental and control groups according to demographic variables. In the experimental group, 8 of the participants were boys and 9 were girls; in the control group, 9 were boys and 8 were girls. Twelve of the children in the experimental group were attending primary school and five were attending middle school. In the control group, 13 participants were attending primary school and 4

were attending middle school. Chi-square analysis performed on the gender and the education level variables of the children in the experimental and control groups shows that there is no significant difference between the groups in terms of these variables. There is no significant difference between the gender-based and educational status distributions of the groups at the beginning of the experimental procedures. The experimental and control groups are equal in terms of gender and educational status. Examining the distribution of children in the experimental and control groups in terms of parental education level, 3 of the mothers in the experimental group graduated from primary school, 2 from secondary school, 8 from high school, and 4 from university. In the control group, three of the mothers graduated from primary school, 11 from high school, and three from university. Three of the fathers in the experimental group graduated from primary school, two from middle school, five from high school, and seven from university. In the control group, one of the fathers graduated from primary school, four from high school, and 12 from university. In general, it is seen that the experimental and control groups are equivalent in terms of demographic variables.

The average age of the children was 9.47 in the experimental group and 9.41 in the control group. In terms of maternal age distribution, the average age of the experimental group was 38.09, while the average age of the control group was 37.26. Finally, the average age of the fathers of the children in the study was 41.47 in the experimental group and 41.43 in the control group. The Mann Whitney U test, analyses performed between the age, maternal age and paternal age variables of the groups did not show a significant difference ($p>0.05$). According to these data, it is observed that the children in the experimental and control groups showed an equal distribution in terms of age and parental age.

Ethical approval was obtained from the ethics committee of Hasan Kalyoncu University to conduct this research. Necessary application permissions were obtained from the Dean of the Faculty of Medicine at Necmettin Erbakan University, where the research would be implemented. The announcement was made to inform children, their families, and doctors at the pediatrics department of the relevant faculty. Participants were children between the ages of 8 to 12 who had cancer and were receiving outpatient or inpatient treatment at the hospital. Participants were children receiving long-term cancer treatment at the Department of Pediatrics at Necmettin Erbakan University, Faculty of Medicine. Eligibility criteria were determined based on previous studies on this subject. Participants were included in the study based on the inclusion and exclusion criteria and the order of hospitalization of children receiving cancer treatment.

Experimental Application

Within the scope of the experimental procedure, 12 sessions of child-centered play therapy were applied to the experimental group. In the control group, no therapy was performed, and free time was spent instead of play therapy. At the beginning of the

experimental procedures, the measurement scales of the study were applied to both groups as a pre-test. After the experimental procedures, the same scales were applied to both groups simultaneously as a post-test.

The experimental applications lasted between June and October 2024. The entire therapeutic procedure consisted of 12 sessions of child-centered play therapy, once or twice a week, and the therapy lasted for approximately 5 months. All scales in the experimental group, which received child-centered play therapy, were filled in before and after the therapy procedure. In the control group, the research scales were applied both as pre-test and post-test.

In this study, the child-centered play therapy method, planned as 12 sessions, was applied to the participants in the experimental group. The control group received regular health care without any therapy. Regular health care consisted of routine disease care and daily expressions of comfort and encouragement from medical personnel. The child-centered play therapy was conducted in the hospital once or twice a week and lasted 45 minutes for each subject. In the study, precautions were taken, aligned with the hospital's visiting hours, so that the children with cancer in the experimental and control groups would not exchange information during the study period. The research was conducted at Necmettin Erbakan University at the Faculty of Medicine Hospital in Konya. A child-centered play therapy room was established in the pediatrics department. The room was arranged in line with expert opinions.

In the child-centered play therapy applications carried out in the experimental group, toys were used in each session. The toys used in the sessions are as follows: dramatic/role-playing tools; creative expression tools; tablets and digital tools; classical play therapy toys; expressive art tools; cards, gift cards; mandala; balls (large, small); counseling balls; sand boxes, sand; art tools; sensory tables; handicraft materials; magic wand; costume clothes; musical instruments; animal mascots; blackboard-chalk; easel; brushes, pencil; children's furniture; story books; medical kit.

The target outcomes of child-centered play therapy were first determined. The targets determined within this scope are as follows; Target 1: To establish an emotional and friendly relationship with children and to create trust; Target 2: To enable the child to manage and believe in his/her own inner wisdom; Target 3: To reduce the emotional and behavioral problems of children. Target 4: To gradually improve the negative emotions and behaviors of children, to bring them to enthusiasm and calm them down; Target 5: To eliminate all symptoms of emotional and behavioral problems of children.

The main themes and topics of the child-centered play therapy sessions in the study were determined according to the child-centered play therapy models suggested by Bratton et al. (2015), Landreth (2012), Post et al. (2019), Ray (2011), Sweeney & Landreth (2009), VanFleet et al. (2010), and Wilson, Kendrick & Ryan (2005). According to these models,

child-centered play therapy follows a specific procedure and can be adjusted according to the therapy situation. In this study, only one child was admitted to the playroom at a time to ensure that the sessions were effective. Before the session began, the therapist took the child through a strict hand hygiene procedure and introduced, in a soft and gentle voice, the play treatment room and the process to be performed. After becoming familiar with the environment, the therapist guided the child to get used to the play activity and relax. The therapist emphasized that the play could be anything and that the child would not be judged. While the child was playing the game, the therapist recorded the child's behavior and the miniatures used. The therapist adopted the "silent witness" approach, accepted, appreciated and accompanied the child, and created a safe, tolerant and supportive atmosphere so that the child could devote himself wholeheartedly to the process of making play creations. After the treatment session, the therapist asked the child to introduce the play and their creations according to the child's psychological state, communicated with the child, and guided them to appreciate and explore their inner world.

After the experimental applications in the study, depression, anxiety, and quality of life scales were applied to the experimental and control groups as posttests.

Data Collection Tools

Depression, anxiety, and quality of life variables used in the pre-test and post-test applications of the study were measured with standard psychological scales.

Pediatric Quality of Life 4.0 Inventory (PedsQL 4.0)

PedsQL 4.0 Pediatric Quality of Life Inventory is a modular assessment tool developed by Varni et al. (2001) to measure health-related quality of life in children. This inventory consists of 23 items covering physical, emotional, social, and school functions. It consists of sections covering 8 physical functions, 5 emotional functions, 5 social functions, and 5 school functions. The inventory was prepared in two different forms for age groups of children (5-7 years, 8-12 years, 13-18 years) and families (2-4 years, 5-7 years, 8-12 years, 13-18 years). The scale is scored using a five-point Likert system, responses are graded from 0 to 4 (0 = no problem, 4 = always a problem). The total score is converted into the range of 0-100, and higher scores indicate better health-related quality of life.

The validity and reliability study of the Turkish form of this inventory was conducted by Sönmez and Başbakkal (2007). In a study conducted by Varni et al. (2001) on children with rheumatological diseases, the reliability analyses found that the total score was α = .92, for children and α = .94, for families. For physical functions, α = .89 for children and α = .91 for families, and for psychosocial functions, α = .87 for children and α = .90 for families. In addition, in another study conducted on children with cancer, the reliability of the total score in the 8-12 age group was found to be α = .89 for children and α = .92 for

families. For physical functions, α = .84 for children and α = .90 for families, and for psychosocial functions, α = .85 for children and α = .87 for families.

In addition to these studies, Sönmez and Başbakkal (2007) reported the reliability coefficient for the family form as α = .90 and for the child form as α = .88 in their general validity and reliability studies. When the total score of children and families is calculated on the scale, the lowest possible score is 0 and the highest score is 2300. The internal consistency coefficient (Cronbach's Alpha) of the pediatric quality of life 4.0 inventory, based on this study's data, was calculated as 0.91. This finding shows that the scale has high reliability in the group of 8- to 12-year-old children with cancer.

Children's Anxiety and Depression Scale (CADS-Y)

The Children's Anxiety and Depression Scale (CADS-Y) is a comprehensive assessment tool developed to measure anxiety and depression symptoms in children and adolescents aged 8-17. The Turkish validity and reliability study of this scale, which was first developed by Chorpita et al. (2005), was conducted by Görmez et al. (2017). The scale was prepared based on DSM-IV criteria and is used specifically to assess depression and anxiety symptoms in children and adolescents.

The CADS-Y consists of 47 items and is answered in a 4-point Likert-type format. Participants indicate how often they experience symptoms by scoring the items between 0 (never true) and 3 (always true). The total score that can be obtained from the scale varies between 0 and 141, and the scale consists of six subscales: Separation Anxiety Disorder (7 items), Social Phobia (9 items), Generalized Anxiety Disorder (6 items), Panic Disorder (9 items), Obsessive Compulsive Disorder (6 items), and Major Depressive Disorder (10 items). The raw score calculated for each subscale is converted to the corresponding T-score, and a T-score of 65 or above is considered indicative of a clinically significant disorder.

In the Turkish adaptation, the cut-off score was determined as 7.5 for generalized anxiety disorder, 5.5 for separation anxiety disorder, 9.5 for social phobia, 6.5 for panic disorder, 11.5 for major depressive disorder, and 7.5 for obsessive-compulsive disorder. The internal consistency coefficient for the Turkish version of the scale was found to be quite high. Cronbach's α value for the general scale was .95, and for the subscales, α ranged from .75 to .86. These results show that the scale is highly reliable in terms of internal consistency.

Görmez et al.'s (2017) study proved that the scale was successful in terms of both reliability and validity. The confirmatory factor analysis supported the original six-factor structure of the scale and determined that the CADS-Y gave more consistent results in recognizing anxiety and depression disorder compared to other measurement tools. These findings show that the scale can be used safely in clinical practice and academic research.

The internal consistency coefficient (Cronbach's alpha) of the anxiety and depression scale in children, based on the data from this study, was calculated as 0.94 for the entire

scale. The reliability coefficients calculated for the sub-dimensions were 0.85 for the 'Separation Anxiety Disorder' sub-dimension, 0.89 for the 'Social Phobia' dimension, 0.75 for the 'Generalized Anxiety Disorder' dimension, 0.71 for the 'Panic Disorder' dimension, 0.87 for the 'Obsessive Compulsive Disorder' dimension, and finally 0.71 for the 'Major Depressive Disorder' dimension. These findings show that the anxiety and depression scale in children with cancer aged 8-12 years has high reliability in both its entirety and in its sub-dimensions.

Data Analysis

The analysis of the research data was carried out with SPSS 25.0 statistical software. According to the normality test results, neither the pre-test nor the post-test scores had a normal distribution (See Table 3). In this context, the Mann Whitney U Test was used among the non-parametric tests in the analysis phase of the data obtained as a result of the quality of life, anxiety, and depression subtests applied to the experimental and control groups. The data were analyzed using appropriate techniques to test the hypotheses stated in the study.

Table 3.

Normality Test Results

		Kolmogorov-Smirnov		
		Z	Sd	p
Quality of life	Pre-test	0,16	34	0,02
	Post-test	0,13	34	0,13
Separation anxiety disorder	Pre-test	0,18	34	0,01
	Post-test	0,15	34	0,04
Social phobia	Pre-test	0,28	34	0,00
	Post-test	0,15	34	0,04
Obsessive compulsive disorder	Pre-test	0,19	34	0,00
	Post-test	0,19	34	0,00
Panic disorder	Pre-test	0,11	34	0,20
	Post-test	0,23	34	0,00
Generalized anxiety disorder	Pre-test	0,19	34	0,00

	Post-test	0,18	34	0,01
Major depressive disorder	Pre-test	0,13	34	0,18
	Post-test	0,17	34	0,01
CADS-Y Total	Pre-test	0,14	34	0,11
	Post-test	0,15	34	0,04

Ethical Considerations

Before starting the research, ethical principles were applied to the Hasan Kalyoncu University Scientific Research and Publication Ethics Committee, and an ethics committee approval certificate numbered was obtained.

Ethical Review Board: [Hasan Kalyoncu University Scientific Research and Publication Ethics Committee]

Date of Ethics Review Decision: [05.12.2023]

Ethics Assessment Document Issue Number: [E-97105791-050.01.01-47349]

FINDINGS

In this section of the study, findings related to the research hypotheses are discussed. First, the pretest findings of the scales, applied to the children who will form the experimental and control groups, are compared. Then, in the second stage of the study, comparisons are included between the posttests applied to the experimental and control groups.

Comparison of Pre-Test Results of Groups

Table 4.

Quality of Life of Experimental and Control Groups, Descriptive Values of Pre-Test Scores

		Group			
		Experimental		Control	
Variables	Test	Average	Sd	Average	Sd
Quality of life	Pre-test	551,82	340,34	668,53	225,27

Table 4 shows the pre-test results of the quality of life of the experimental and control groups. The mean of the experimental group is 551.82 and its standard deviation is 340.34. The mean of the control group is 668.53 and its standard deviation is 225.27. These results show the difference between the pre-test values of the quality of life of both groups.

Table 5. Pre-test Mean Ranks and Mann-Whitney U Test Results for Quality of Life of Experimental and Control Groups

Variables		Group	N	SO	ST	U	z	p
Quality of life	Pre-test	Experimental	17	14,21	241,5	88,5	-1,93	0,06
		Control	17	20,79	353,5			

Table 5 shows the results of the comparison of the pre-test scores of the quality of life of the experimental and control groups using the Mann-Whitney U test. The mean rank of the experimental group was calculated as 14.21, and that of the control group as 20.79. The Mann-Whitney U test result was U=88.5, z=-1.93, and p=0.06. Although the p-value obtained was above the 0.05 level of significance, it was quite close to the threshold of significance. This finding showed that there was no significant difference between the experimental and control groups in terms of the pre-test scores of the quality of life, and that the groups were equivalent in terms of quality of life before the experimental procedure.

Table 6.

Descriptive Values of Anxiety and Depression Pre-Test Scores of Experimental and Control Groups

		Group			
		Experimental		Control	
Variables	Test	Average	Sd	Average	Sd
Separation anxiety disorder	Pre-test	15,71	1,83	14,24	3,88
Social phobia	Pre-test	22,82	3,19	20,71	3,95
Obsessive compulsive disorder	Pre-test	7,29	0,92	6,59	2,06
Panic disorder	Pre-test	13,24	2,11	12,29	2,76
Generalized anxiety disorder	Pre-test	13,94	2,86	12,53	2,83
Major depressive disorder	Pre-test	20,65	3,22	19,24	2,44

CADS-Y Total	Pre-test	92,53	12,20	85,59	14,93

Table 6 shows descriptive values for the anxiety and depression pretest scores of the experimental and control groups. The mean and standard deviation values of the experimental and control groups are shown for the subscales of separation anxiety disorder, social phobia, obsessive compulsive disorder, panic disorder, generalized anxiety disorder and major depressive disorder. The mean total score of the experimental group on the CAS-Y was 92.53 and that of the control group was 85.59. These values indicate that there are differences in anxiety and depression levels between the groups.

Table 7.

Anxiety and Depression Pre-Test Rank Means and Mann-Whitney U Test Results of Experimental and Control Groups

Variables	Group	N	SO	ST	U	z	p
Separation anxiety disorder pretest	Experimental	17	18,85	320,5	121,5	-0,8	0,42
	Control	17	16,15	274,5			
Social phobia pretest	Experimental	17	20,21	343,5	98,5	-1,6	0,11
	Control	17	14,79	251,5			
Obsessive compulsive disorder pretest	Experimental	17	18,59	316	126	-0,65	0,51
	Control	17	16,41	279			
Panic disorder pretest	Experimental	17	19,24	327	115	-1,02	0,31
	Control	17	15,76	268			
Generalized anxiety disorder pretest	Experimental	17	20	340	102	-1,48	0,14
	Control	17	15	255			
Major depressive disorder pretest	Experimental	17	19,97	339,5	102,5	-1,46	0,14
	Control	17	15,03	255,5			
CADS-Y Total pretest	Experimental	17	20	340	102	-1,47	0,14
	Control	17	15	255			

Table 7 shows the Mann-Whitney U test comparison of the pre-test results of the experimental and control groups regarding the anxiety and depression sub-dimensions. For separation anxiety disorder, the mean rank of the experimental group was 18.85 and that of the control group was 16.15. The Mann-Whitney U value was calculated as 121.5, z=-0.8, and p=0.42, and no significant difference was found between the groups. In the social phobia sub-dimension, the mean rank of the experimental group was 20.21, while the control group was 14.79, with U=98.5, z=-1.6, and p=0.11. No significant difference was observed for this dimension either. In the obsessive-compulsive disorder sub-dimension, the mean rank of the experimental group was 18.59, while the control group was 16.41, with U=126, z=-0.65, and p=0.51. Again, no significant difference was found between the two groups. In the panic disorder subdimension, the mean rank of the experimental group was 19.24 and the control group was 15.76, with U=115, z=-1.02, and p=0.31. In the generalized anxiety disorder subdimension, the mean rank of the experimental group was 20, and the control group was 15, with U=102, z=-1.48, and p=0.14. Similarly, in the major depressive disorder subdimension, the mean rank of the experimental group was 19.97 and the control group was 15.03, with U=102.5, z=-1.46, and p=0.14. Finally, in the total score of the Anxiety and Depression Scale for Children, the mean rank of the experimental group was 20 and the control group was 15, with U=102, z=-1.47, and p=0.14. These findings show that there are no statistically significant differences in pre-test scores in terms of anxiety and depression sub-dimensions between the experimental and control groups. As a result, it was understood that the participants in the experimental and control groups were equivalent in terms of anxiety and depression sub-dimensions before the experimental procedure.

Comparison of Post-Test Results of Groups

Table 8.

Descriptive Values of Post-Test Scores for Quality of Life of Experimental and Control Groups

		Group			
		Experimental		Control	
Variables	Test	Average	Sd	Average	Sd
Quality of life	Post-test	947,24	217,50	679,06	216,23

Table 8 presents descriptive values of the post-test scores regarding the quality of life for the experimental and control groups. The mean score of the quality of life of the experimental group is 947.24 and its standard deviation is 217.50, while the mean score of the control group is 679.06 and its standard deviation is 216.23. These results show that there

is a significant increase in the quality of life of the experimental group compared to the control group in the post-test.

Table 9.

Quality of Life Post-Test Mean Ranks and Mann-Whitney U Test Results of Experimental and Control Groups

Variables		Group	N	SO	ST	U	z	p
Quality of life	Post-test	Experimental	17	23,88	406	36,00	-3,74	0,00*
		Control	17	11,12	189			

*p<0,05

Table 9 shows the Mann-Whitney U test results regarding the post-test scores of the quality of life of the experimental and control groups. The mean rank of the experimental group to which Child-Centered Play Therapy was applied, was calculated as 23.88, while that of the control group was calculated as 11.12. The Mann-Whitney U test results were found as U=36.00, z=-3.74, and p=0.00 (p<0.05). These results show that there is a statistically significant difference between the experimental and control groups in terms of quality of life. The quality of life scores of the experimental group are significantly higher than those of the control group. This suggests that Child-Centered Play Therapy positively affects the quality of life of children diagnosed with cancer.

Table 10.

Descriptive Values of Anxiety and Depression Post-Test Scores of Experimental and Control Groups

		Group			
		Experimental		Kontrol	
Variables	Test	Average	Sd	Average	Sd
Separation anxiety disorder	Post-test	11,59	2,32	14,29	3,77
Social phobia	Post-test	12,94	2,56	20,18	3,88
Obsessive compulsive disorder	Post-test	5,06	2,36	7,59	1,84
Panic disorder	Post-test	9,65	1,27	12,12	2,57
Generalized anxiety disorder	Post-test	5,76	1,30	12,53	2,40

Major depressive disorder	Post-test	11,18	2,19	19,41	2,15
CADS-Y Total	Post-test	56,18	5,70	85,18	13,82

Upon examining Table 10, it can be seen that, descriptive values of the anxiety and depression post-test scores of the experimental and control groups are shown. The scores of the experimental group in the subscales of separation anxiety disorder, social phobia, obsessive compulsive disorder, panic disorder, generalized anxiety disorder, and major depressive disorder are significantly lower than those of the control group. The total score of the CADS-Y was calculated as 56.18 in the experimental group and 85.18 in the control group. These results reveal a significant decrease in the anxiety and depression levels of the experimental group.

Table 11.

Anxiety and Depression Post-Test Rank Means and Mann-Whitney U Test Results of Experimental and Control Groups

Variables	Group	N	SO	ST	U	z	p
Separation anxiety disorder post-test	Experimental	17	13,62	231,5	78,50	-2,30	0,02*
	Control	17	21,38	363,5			
Social phobia post-test	Experimental	17	10,03	170,5	17,50	-4,40	0,00*
	Control	17	24,97	424,5			
Obsessive compulsive disorder post-test	Experimental	17	12,00	204	51,00	-3,26	0,00*
	Control	17	23,00	391			
Panic disorder post-test	Experimental	17	12,74	216,5	63,50	-2,84	0,00*
	Control	17	22,26	378,5			
Generalized anxiety disorder post-test	Experimental	17	9,03	153,5	0,50	-5,00	0,00*
	Control	17	25,97	441,5			
Major depressive disorder post-test	Experimental	17	9,06	154	1,00	-4,97	0,00*
	Control	17	25,94	441			
CADS-Y Total post-test	Experimental	17	9,18	156	3,00	-4,88	0,00*
	Control	17	25,82	439			

*p<0,05

Table 11 presents the Mann-Whitney U test results regarding the anxiety and depression posttest scores of the experimental and control groups. For separation anxiety disorder, the mean rank of the experimental group was calculated as 13.62, and the control group as 21.38, with U=78.50, z=-2.30, and p=0.02 (p<0.05), indicating a significant difference between the experimental and control groups. In the social phobia sub-dimension, the mean rank of the experimental group was 10.03 and that of the control group was 24.97, with U=17.50, z=-4.40 and p=0.00 (p<0.05). For obsessive-compulsive disorder, the mean rank of the experimental group was 12.00 and the control group was 23.00, with U=51.00, z=-3.26, and p=0.00 (p<0.05), indicating a significant difference. Similarly, in the panic disorder subdimension, the mean rank of the experimental group was 12.74 and the control group was 22.26, calculated as U=63.50, z=-2.84, and p=0.00 (p<0.05). In the generalized anxiety disorder subdimension, the mean rank of the experimental group was 9.03, and the control group was 25.97, calculated as U=0.50, z=-5.00, and p=0.00 (p<0.05), indicating significantly lower scores in the experimental group compared to the control group. In the major depressive disorder subdimension, the mean rank of the experimental group was 9.06 and the control group was 25.94; with U=1.00, z=-4.97, and p=0.00 (p<0.05), and a significant difference was found. In terms of the total scores of the Children's Anxiety and Depression Scale, the mean rank of the experimental group was 9.18 and that of the control group was 25.82, with a significant difference of U=3.00, z=-4.88 and p=0.00 (p<0.05). These findings show that Child-Centered Play Therapy significantly reduced the anxiety and depression levels of children in the experimental group compared to the control group.

DISCUSSION

This study examined the effects of the CCPT approach applied to children aged 8-12 diagnosed with cancer on their depression, anxiety, and quality of life levels. When the findings regarding whether the CCPT application provided a significant improvement in the quality of life of children diagnosed with cancer were examined, it was observed that the quality of life scores of the children in the experimental group who received CCPT were significantly higher than those of the children in the control group who did not receive any therapy. This finding shows that the children to whom CCPT was applied tended to approach the disease processes and treatment more positively. While Landreth (2012) stated that play therapies were effective in understanding the emotional and cognitive processes of children, these results also emphasized the importance of therapy as a factor that increases the quality of life of children. This increase observed in the quality of life of the children in the experimental group shows that play therapy strengthens their coping mechanisms against stress. Especially in long-term and stressful diseases such as cancer, children's emotional resilience and participation in the treatment process are of critical importance.

One of the main reasons underlying the positive effect of CCPT on quality of life is that children can release their emotional expressions through play. Play therapy provides a

safe space for children to understand their inner worlds and express emotional stress through play. Play can help children understand their emotional experiences and develop coping strategies that will positively affect their quality of life (Lin & Bratton, 2015). In cases where children have difficulty expressing themselves, play therapy provides them with a safe space which supports an increase in their quality of life (Muro et al., 2006). Loftin (2022) determined that CCPT increases children's quality of life and their ability to participate in medical treatment. CCPT supports children's developmental level by alleviating functional impairments (Ray et al., 2013). Perryman and Bowers (2018) emphasized that this method is effective in preventing negative behaviors in at-risk children, while Pester et al. (2019) found that CCPT was moderately effective in reducing common childhood mental health symptoms.

Bratton et al. (2005) emphasize that play therapy improves children's social skills and self-confidence. From this perspective, the increase observed in the quality of life of children who received CCPT may indicate that they have developed a more positive perspective on the disease process and gained stronger self-confidence. Since chronic diseases such as cancer can undermine children's self-confidence, play therapy can serve an important role in addressing this issue. Another reason for the significant increase in the quality of life of the experimental group in the study is that play therapy supports social relationships and interactions among children. This positive effect of play therapy can be explained by the fact that children develop positive perceptions of themselves and their environment during the therapy process. During play therapy, children get to know themselves better, become more competent in understanding the emotions of others, and become more competent at increasing their empathy skills. This can be seen as an improvement in their perception of quality of life. Research have shown that play therapy has a relaxing effect on children under psychological stress and provides a safe space for them to express their trauma (Kottman, 2011). The fact that there was no significant change in the quality of life of children in the control group emphasizes the need for professional support in helping children cope with stressful life events. Children who are not supported by CCPT may have difficulty overcoming the effects of stressful experiences. This can be evaluated as a finding that emphasizes the effect of play therapy not only on the emotional quality of life but also on the general quality of life of children.

According to the findings of this study, CCPT applications significantly reduce the anxiety and depression levels of children with cancer. The fact that the post-test scores of the children in the experimental group for separation anxiety, social phobia, obsessive compulsive disorder, panic disorder, generalized anxiety disorder, and major depressive disorder were lower than those in the control group reveals that CCPT is effective in the treatment of emotional disorders. According to Bratton, Ray et al. (2005), the fact that the therapy is play-based can accelerate recovery by facilitating children's self-expression. The stress and anxiety that children diagnosed with cancer encounter throughout their illness

process can be managed with this therapy method (Reddy, Files-Hall & Schaefer, 2005). Studies in the literature suggest that CCPT improves children's emotional regulation skills and provides a significant decrease in depression and anxiety levels, findings that are parallel to this result (Asghari Nekah et al., 2015; Bratton et al., 2005; Bratton & Lin, 2015; Landreth, 2012; Ray et al., 2013). Since problems such as depression include behavioral, cognitive, emotional, and social components, CCPT is suitable for approaching these symptoms with a holistic intervention (Burgin & Ray, 2021). It is also used in many conditions such as depression, trauma, attention deficit, behavioral problems, divorce, anxiety disorders, and chronic diseases (Wilson et al., 2005).

Ray (2011) reported significant improvements in depressive symptoms and behavioral problems in children who received CCPT. When children encounter incompatibility between environmental demands and their own self-perception, they can experience a self-actualization process aimed at resolving these incompatibilities through CCPT (Landreth, 2012; Ray, 2011). The safe and relationally supportive environment provided by CCPT allows children with depressive symptoms to accept themselves and learn healthier ways of coping (Burgin & Ray, 2021). Semerci (2022) states that the effectiveness of this therapy stems from the fact that it contributes to the development of children's ability to express themselves and process their emotional experiences through play. Symbolic expressions and repeated games that emerge during the play process allow the child to re-interpret traumatic experiences. In addition, the trusting relationship established with the therapist supports the child's emotional healing process.

The safe and accepting environment provided by CCPT for children who have difficulty coping with anxiety can help them heal their emotional wounds and reduce their anxiety levels. The decrease in conditions such as separation anxiety, social phobia, and generalized anxiety disorder in the study suggests that CCPT may be an effective intervention in alleviating children's internal distress. The decrease in separation anxiety disorder scores shows that CCPT is effective in reducing children's anxiety about separation from their parents. Children who have to stay in the hospital for a long time can greatly benefit from play therapy to cope with this situation. Play therapy provides a safe space and allows children to express such anxieties through play (Gil, 2011). This allows children to become emotionally stronger during the treatment process. According to the findings of this study, CCPT applications significantly reduce anxiety and depression levels. The fact that the post-test scores of the children in the experimental group for separation anxiety, social phobia, obsessive compulsive disorder, panic disorder, generalized anxiety disorder, and major depressive disorder were lower than those in the control group shows that CCPT is effective in the treatment of emotional disorders. According to Bratton, Ray and Rhine (2005), the play-based nature of the therapy can accelerate recovery by facilitating children's self-expression. The stress and anxiety that children diagnosed with cancer encounter throughout their illness can be managed with this therapy method (Reddy, Files-Hall &

Schaefer, 2005). Studies in the literature indicate that CCPT improves children's emotional regulation skills and provides a significant decrease in depression and anxiety levels, which are parallel to this result (Bratton et al., 2005; Landreth, 2012; Lin & Bratton, 2015; Zareapour et al., 2009). This therapy method aims to understand the psychological state of children by considering their physical, emotional, social, behavioral, and cognitive aspects as a whole (Landreth, 2012; Ray, 2011). In the CCPT approach, children's behavior is considered to be a reflection of their emotional health and self-perception. Since problems such as depression include behavioral, cognitive, emotional and social components, CCPT is suitable for approaching these symptoms with a holistic intervention (Burgin & Ray, 2021). It is also used in many conditions such as depression, trauma, attention deficit, behavioral problems, divorce, anxiety disorders, and chronic diseases (Wilson et al., 1992).

In general, when the experimental and control groups are compared, the effect of the therapy can be clearly seen. The anxiety and depression reducing effect of CCPT on the children in the experimental group shows that this therapy is a strong intervention option, especially for children with emotional problems. The lack of such a healing effect in the control group supports the idea that the periods spent without intervention do not contribute to the emotional health of the children. However, the limited observations in the control group indicate the need for further studies. The need for studies examining the long-term effects of anxiety and depression disorders in childhood emphasizes the importance of this study.

CONCLUSION AND RECOMMENDATIONS

Based on the results of this study, CCPT should be integrated into the therapy processes for children diagnosed with cancer. BCCPT is effective in improving the quality of life of children. It is recommended that CCPT be used as a standard treatment approach in clinical practices to reduce the anxiety and depression levels of children. CCPT, which has been observed to be effective especially in the social phobia sub-dimension, should be considered as a recommended therapy method for children with high social anxiety. Given that CCPT is effective in reducing the symptoms of obsessive-compulsive disorder, panic disorder, and generalized anxiety disorder, it should be included in treatment plans. Studies can be conducted to monitor the effects of CCPT on the quality of life of children diagnosed with cancer over an extended period and to investigate its permanent effects after therapy. Studies investigating the effects of CCPT on anxiety and depression in chronic diseases other than cancer should be initiated.

REFERENCES

Abecassis, I. J., Nerva, J. D., Barber, J., Rockhill, J., Ellenbogen, R. G., Kim, L. J., & Sekhar, L. N. (2016). Effects of child-centered play therapy on quality of life, depression, and anxiety in children with cancer. *Neurosurgery, 79*(2), 269–279. https://doi.org/10.1227/neu.0000000000001097

Asghari Nekah, S. M., Kamali, F., & Jansouz, F. (2015). The effects of structured cognitive-behavioral group play therapy on anxiety and depression in children with cancer: A pilot study. *Evidence Based Care, 5*(3), 39–50. https://doi.org/10.22038/EBCJ.2015.4849

Boucher, S., Downing, J., & Shemilt, R. (2014). The role of play in children's palliative care. *Children, 1*(3), 302–317. https://doi.org/10.3390/children1030302

Bratton, S. C., Ray, D., & Landreth, G. (2005). The efficacy of play therapy with children: A meta-analysis of school-based play therapy studies. *Journal of School Counseling, 3*(1), 1–13. https://psycnet.apa.org/buy/2005-09654-006

Burgin, E. E., & Ray, D. C. (2021). Child-centered play therapy and childhood depression: An effectiveness study in schools. *Journal of Child and Family Studies, 30*(7), 1742–1756. https://doi.org/10.1007/s10826-021-02198-6

Chorpita, B. F., Yim, L., & Piacentini, J. C. (2005). The revised child anxiety and depression scale (RCADS): A test of its psychometric properties. *Journal of Clinical Child & Adolescent Psychology, 34*(3), 487–497. https://doi.org/10.1207/s15374424jccp3403_2

Elbeltagi, E. H., Abdelkarim, H., Yassin, F., & Al-Tawil, S. A. (2023). The effect of play therapy on the quality of life of children with cancer: A randomized controlled trial. *Journal of Pediatric Oncology Nursing, 40*(1), 42–49. https://doi.org/10.1177/10434542221105951

Gil, E. (2011). *Helping abused and traumatized children: Integrating directive and nondirective approaches*. Guilford Press.

Godino-Iáñez, M. J., Padial-Ramos, M., & Rodriguez-Molina, M. (2020). Therapeutic play for hospitalized children: A systematic review. *Journal of Advanced Nursing, 76*(4), 1083–1095. https://doi.org/10.1111/jan.14324

Görmez, V., Kılınçaslan, A., Orengul, A. C., Ebesutani, C., Kaya, I., Ceri, V., & Chorpita, B. (2017). Psychometric properties of the Turkish version of the revised child anxiety and depression scale–child version in a clinical sample. *Psychiatry and Clinical Psychopharmacology, 27*(1), 84–92. https://doi.org/10.1080/24750573.2017.1297494

Kalaycı, E. (2019). *Çocuk onkoloji-hematoloji polikliniğinde tedavi gören 8–12 yaş çocuklarda yaşam kalitesi ve etkileyen faktörlerin belirlenmesi* [Determination of quality of life and affecting factors in 8–12-year-old children treated in pediatric oncology-hematology outpatient clinic] [Master's thesis, Nevşehir Hacı Bektaş Veli Üniversitesi, Fen Bilimleri Enstitüsü]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Kazak, A. E., & Noll, R. B. (2015). The integration of psychology in pediatric oncology research and practice: Collaboration to improve care and outcomes for children and families. *American Psychologist, 70*(2), 146–158. https://doi.org/10.1037/a0035695

Kemper, K. J. (2017). Chronic disease? Healthy habits in a healthy habitat—Research on dietary therapies. *Complementary Therapies in Medicine, 35*, A2–A3. https://doi.org/10.1016/j.ctim.2017.09.008

Kottman, T. (2011). *Play therapy: Basics and beyond* (2nd ed.). American Counseling Association.

Koukourikos, K., Tsaloglidou, A., Tzeha, L., Iliadis, C., Frantzana, A., Katsimbeli, A., & Kourkouta, L. (2021). An overview of play therapy. *Materia Socio-Medica, 33*(4), 293–297. https://doi.org/10.5455/msm.2021.33.293-297

Landreth, G. L. (2011). *Oyun terapisi ilişki sanatı* [Play therapy: The art of the relationship]. Altın Kalem Yayınları.

Landreth, G. L. (2012). *Play therapy: The art of the relationship* (3rd ed.). Brunner-Routledge.

Lane, S. J., Mailloux, Z., Schoen, S., Bundy, A., May-Benson, T. A., Parham, L. D., & Schaaf, R. C. (2019). Neural foundations of Ayres sensory integration®. *Brain Sciences, 9*(7), 153. https://doi.org/10.3390/brainsci9070153

Last, B. F., & Grootenhuis, M. A. (1998). Emotions, coping, and the need for support in families of children with cancer: A model for psychosocial care. *Patient Education and Counseling, 33*(2), 169–179. https://doi.org/10.1016/S0738-3991(97)00077-3

Li, H. C., & Lopez, V. (2008). Effectiveness and appropriateness of therapeutic play intervention in preparing children for surgery: A randomized controlled trial study. *Journal of Specialist Pediatric Nursing, 13*(2), 63–73. https://doi.org/10.1111/j.1744-6155.2008.00138.x

Li, H. C. W., Chung, O. K. J., & Chiu, S. Y. (2010). The impact of cancer on children's physical, emotional, and psychosocial well-being. *Cancer Nursing, 33*(1), 47–54. https://doi.org/10.1097/NCC.0b013e3181aaf0fa

Loftin, S. M. (2022). Child-centered play therapy and chronic illness with outcome data: A retrospective case study. *International Journal of Play Therapy, 31*(3), 174–183. https://doi.org/10.1037/pla0000177

Manav, G. (2013). *Kanserli çocuklarda oyun temelli hemşirelik modeli* [Play-based nursing model in children with cancer] [Doctoral dissertation, İstanbul Üniversitesi, Çocuk Sağlığı ve Hastalıkları Hemşireliği Anabilim Dalı]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Meany-Walen, K. K., & Teeling, S. (2016). Adlerian play therapy with students with externalizing behaviors and poor social skills. *International Journal of Play Therapy, 25*(2), 64–77. https://doi.org/10.1037/pla0000022

Momani, T. E. G., & Berry, D. L. (2017). Integrative therapeutic approaches for the management and control of nausea in children undergoing cancer treatment: A systematic review of literature. *Journal of Pediatric Oncology Nursing, 34*(3), 173–184. https://doi.org/10.1177/1043454216688638

Muro, J., Ray, D., Schottelkorb, A., Smith, M. R., & Blanco, P. J. (2006). Quantitative analysis of long-term child-centered play therapy. *International Journal of Play Therapy, 15*(2), 35–50. https://doi.org/10.1037/h0088914

Orhan, E. (2022). *Çocuk merkezli oyun terapisinin dikkat eksikliği hiperaktivite bozukluğu tanılı çocukların duygu ve davranışlarına etkisi* [The effects of child-centered play therapy on the emotions and behaviors of children diagnosed with attention deficit hyperactivity disorder] [Master's thesis, Trabzon Üniversitesi]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Perryman, K. L., & Bowers, L. (2018). Turning the focus to behavioral, emotional, and social well-being: The impact of child-centered play therapy. *International Journal of Play Therapy, 27*(4), 227–239. https://doi.org/10.1037/pla0000078

Pester, D., Lenz, A. S., & Dell'Aquila, J. (2019). Meta-analysis of single-case evaluations of child-centered play therapy for treating mental health symptoms. *International Journal of Play Therapy, 28*(3), 144–156. https://doi.org/10.1037/pla0000098

Post, P. B., Phipps, C. B., Camp, A. C., & Grybush, A. L. (2019). Effectiveness of child-centered play therapy among marginalized children. *International Journal of Play Therapy, 28*(2), 88–98. https://doi.org/10.1037/pla0000096

Ray, D. C. (2006). Evidence-based play therapy. In C. E. Schaefer & H. G. Kaduson (Eds.), *Contemporary play therapy: Theory, research, and practice* (pp. 136–137). Guilford Press.

Ray, D. C. (2011). *Advanced play therapy: Essential conditions, knowledge, and skills for child practice*. Routledge.

Ray, D. C., Stulmaker, H. L., Lee, K. R., & Silverman, W. K. (2013). Child-centered play therapy and impairment: Exploring relationships and constructs. *International Journal of Play Therapy, 22*(1), 13–27. https://doi.org/10.1037/a0030403

Reddy, L. A., Files-Hall, T. M., & Schaefer, C. E. (2005). *Empirically based play interventions for children*. American Psychological Association. https://doi.org/10.1037/11086-001

Schultz, A., Janson, S. L., & Salmond, S. W. (2017). Quality of life in children with chronic health conditions: A review of the literature. *Journal of Pediatric Nursing, 32*, 28–39. https://doi.org/10.1016/j.pedn.2016.08.006

Semerci, D. (2022). *Çocuk merkezli oyun terapisinin 48–72 aylık çocukların davranış problemlerine ve sosyal beceri düzeylerine etkisinin incelenmesi* [Examining the effects of child-centered play therapy on behavioral problems and social skill levels of 48–72-month-old children] [Doctoral dissertation, Marmara Üniversitesi]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Sönmez, D. B., & Başbakkal, Z. (2007). The validity and reliability of the Turkish version of the pediatric quality of life inventory version 4.0 (PedsQL 4.0). *Turkish Journal of Psychiatry, 18*(3), 209–216.

Sweeney, D. S., & Landreth, G. L. (2009). Child-centered play therapy. In K. J. O'Connor & L. M. Braverman (Eds.), *Play therapy: Theory and practice: Comparing theories and techniques* (pp. 123–162). John Wiley & Sons.

Teber, M. (2015). *Çocuk merkezli oyun terapisinin çocuklarda görülen davranış sorunlarının çözümüne etkisi* [The effect of child-centered play therapy on the solution of behavioral problems in children] [Master's thesis, Hasan Kalyoncu Üniversitesi]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Vanfleet, R., Sywulak, A. E., & Sniscak, C. C. (2018). *Child-centered play therapy*. Guilford Press.

VanFleet, R., Sywulak, A., & Snoscak, C. (2010). *Child-centered play therapy*. Guilford Press.

Varni, J. W., Seid, M., & Kurtin, P. S. (2001). The PedsQL 4.0: Reliability and validity of the pediatric quality of life inventory version 4.0 generic core scales in a large sample of children with and without chronic health conditions. *Medical Care, 39*(8), 800–811. https://doi.org/10.1097/00005650-200108000-00006

Wilson, K., Kendrick, P., & Ryan, V. (2005). *Play therapy: A nondirective approach for children and adolescents* (2nd ed.). Bailliere Tindall.

Witte, R. S., & Witte, J. S. (2017). *Statistics*. John Wiley & Sons.

Zareapour, A., Falahi Khoshknab, M., Kashaninia, Z., Biglarian, A., & Babashahabi, R. (2009). Effect of group play therapy on depression in children with cancer. *Scientific Journal of Kurdistan University of Medical Sciences, 14*(3), 64–72. https://sjku.muk.ac.ir/article-1-219-en.html

Data Availability Declaration

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

All authors, Esra Coşkun and Prof. Dr. Şaziye Senem Başgül, contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. Both authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements: The authors would like to thank the children and their families who voluntarily participated in this study, as well as the healthcare staff at Necmettin Erbakan University, Faculty of Medicine, Department of Pediatrics, for their valuable support during the research process. Special thanks are extended to the Hasan Kalyoncu University Scientific Research and Publication Ethics Committee for their guidance and approval.

Biographical notes:

Esra Coşkun: Holds a B.A. in Psychology from San Francisco State University and an M.A. in Clinical Psychology from Dicle University. She is a Ph. D. candidate at Hasan Kalyoncu University, researching play therapy in children with cancer.

*Şaziye Senem Başgül*2**:** Graduated from Trakya University Faculty of Medicine, specialized in Child and Adolescent Psychiatry at Kocaeli University. Currently a Professor in the Psychology Department at Hasan Kalyoncu University.

Web of Science Researcher ID: AAK-3628-2021

Scopus Author Identifier Number: 35589589700

Google Scholar Researcher ID: https://scholar.google.com.tr/citations?user=Tuu98NgAAAAJ&hl=tr

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

21st Century Skills and Language Education: Metaverse Technologies and Turkish Education as a Case

Elif Ermağan[1]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 414-433
http://www.ijonmes.net

Article Info:

Received 16.03.2025
Revision 13.07.2025
Accepted 28.07.2025

Abstract:

As the forthcoming iteration of the Internet, the metaverse is positioned to transform the technological landscape on a global scale. This study explores why and how the metaverse language education model is growing globally. In this research, a qualitative approach is used for the document review method. The theoretical framework draws from world literature, mainly English works, and in the analysis part from the studies of Turkish academics. The study underlines that the field of language education has made notable developments, particularly in the context of technological advancement. The metaverse language education model could bring some effective solutions for distance education, personalized learning, and for visual, engaging, and active learning that does not rely on memorization. This study reveals the indisputable impact of 21st-century innovative technologies on language education, along with the associated risks. It further postulates that more efficacious language education may be attainable in the future by addressing the identified shortcomings. The experience of language education in the metaverse of the Turkish language, which is currently experiencing a period of growth the number of people learning it, can also provide an opportunity for comparison with other languages and related literature from around the world.

Keywords: Education, Language Education, 21st Century Skills, Metaverse Technologies, Türkiye

Citation:
Ermağan, E. (2025). 21st Century Skills and Language Education: Metaverse Technologies and Turkish Education as a Case. *International Journal of Modern Education Studies, 9*(2), 414-433. https://doi.org/10.51383/ijonmes.2025.411

[1] Dr., Istanbul Medeniyet University, IMU TOMER, Istanbul, Türkiye. elifermagan2020@gmail.com, https://orcid.org/0000-0002-2827-0155

INTRODUCTION

The primary objective of language studies is to enhance efficiency by addressing the various challenges inherent to educational processes. To facilitate the acquisition of a language in a more expeditious, enjoyable, and enduring manner, a variety of tools are required. The digital revolution, which has impacted various sectors through the advent of new technologies in the Industry 4.0 era of the 21st century, has also brought about significant shifts in language teaching globally (Aldossari & Alsuhaibani, 2021, pp. 1-8). Despite the continued importance of books as a language teaching tool, there is a growing recognition of the value of interactive virtual content. The Fourth Industrial Revolution has brought about profound changes in the field of education, with the advent of new technologies such as artificial intelligence, machine learning, the Internet of Things, cloud computing, 3D printers, speech recognition systems, and virtual world technologies (Ağaoğlu & Demir, 2020). The term "virtual world technologies" encompasses a range of innovative concepts, including virtual reality (VR), augmented reality (AR), mixed reality (MR), the metaverse, holograms, wearable technologies, and smart personal assistants (Büyükkarabacak & Balyer, 2024). These technologies represent an artificial projection of reality (Díaz et al., 2020, pp. 94-109; Reisoğlu et al., 2017). This study will investigate the impact of metaverse technology, which seeks to bridge the divide between the physical and virtual realms, offering users unprecedented freedom in space and time through the construction of an alternative reality, on language teaching, with a particular focus on its application within the context of Turkish education, thereby contributing original insights to the field (Yıldırım & Keçeci 2024). Determining the current status of metaverse language education technologies in Turkey and the extent to which these applications have transformed language education will not only measure their benefits to education in the country but also test their institutionalization within the global and European spheres.

The metaverse is an environment created by a computer (Ng, 2022). The metaverse, which has become increasingly significant, particularly in light of the proliferation of distance education, offers users the chance to engage with experiences in a virtual domain that they may otherwise be unable or unwilling to pursue in the physical world (Guo & Gao, 2022). One illustrative example of the potential impact of the metaverse on language education is the capacity for students to engage in real-time interaction with educators and peers from diverse geographical locations. It is possible to envisage delivering language education not only through textbooks but also through interactive environments such as the metaverse (MacCallum & Parsons, 2019).

The incorporation of visual elements, repetition, sampling, and vocalization technologies enhances the field of language education in e-learning. Furthermore, the utilization of virtual or video techniques in conjunction with artificial intelligence technologies has the potential to facilitate transformative impacts on learners (Ural, 2021, pp. 145-161; Bostancı & Uncu, 2021, pp. 154-169). Concurrently, the relationship between

virtual reality and language education has been a subject of investigation in the academic literature worldwide, particularly over the past decade. However, the majority of studies in this field are theoretical in nature. In other words, although virtual reality applications have attracted considerable attention, they remain a relatively niche phenomenon in Turkey, as in the wider global context (Alyaz & Demiryay, 2023, p. 116).

The pivotal role of the metaverse in language education is exemplified by the work of Garrido-Iñigo and Rodríguez-Moreno (2015), who created a virtual airport for teaching French as a second language to tourism students. Their observations indicated that student engagement in activities enhanced motivation. In their study with 104 teachers, Han and Hong (2022) found that the metaverse was perceived positively in terms of effectiveness, interest, and engagement. However, they also drew attention to the issue of distractions and limited teacher experience. This emphasizes the significance of teachers' expertise and experience in language education within the context of the metaverse. In a study conducted with Japanese language learners, Tamai et al. (2022) devised activities within the Second Life gaming environment, wherein traditional Japanese architectural and cultural elements were incorporated, including virtual representations of Shinto and Buddhist temples. By establishing a collaborative learning environment between native Japanese speakers and Japanese learners, they facilitated the transmission of Japanese traditions and provided international students with the opportunity to experience these virtual temples. Kim et al. (2022) devised communication-oriented scenarios within the metaverse for Korean language classes and developed bespoke teaching models for each scenario. In conclusion, there is an increasing body of research on the topic of language education in the metaverse, with studies being conducted in a variety of countries (Şimşek et al., 2019).

The primary argument put forth by the study is that despite the inherent risks associated with Metaverse education methodologies, there will be unquestionable losses if they are not incorporated into the learning landscape of our era. It is therefore recommended that, when teaching both mother tongue and foreign languages, learning methods and environments that will enhance learner motivation or facilitate communication across different geographical locations be employed. This article will initially present an explanation of the theoretical and conceptual studies on the metaverse and language education on a global scale. It will then focus on similar studies conducted in Turkey as part of field research. In conclusion, a comprehensive evaluation and recommendations for metaverse language education will be presented.

METHOD

This research employs a methodology based on document analysis using secondary sources. Document analysis is the collection, review, questioning, and analysis of various forms of written text as a source of primary research data (O'Leary, 2017). This method

includes the processes of finding, reading, taking notes, and evaluating sources for a specific purpose, and data is obtained by examining existing records and documents.

This article focuses on 21st century skills in language learning. In this context, Metaverse technologies have been selected, and the effects and contributions of these technologies to language learning activities have been investigated. In this sense, the Turkish language will be examined as an example.

The basic question is how new technologies affect language learning. Various countries are conducting studies in this context in the relevant literature. For new technological language learning, both the number of academic studies and the technological infrastructure of that country should be adequate and developed. The critical point here is that the technological infrastructure should be solid. Otherwise, the academic studies conducted will remain unutilized in the literature. The other point is that literature research should be conducted with a comparative perspective.

The majority of relevant literature, books, articles, and web publications were consulted in English, with a smaller number also consulted in German and Turkish. Internet bibliographies and media publications, which report on new infrastructure works, were also included among Turkish sources.

A theoretical and conceptual data set was created based on the studies conducted in different parts of the world. Conversely, this research is less prevalent within the social sciences (Tlili et al., 2022). Nevertheless, the aforementioned educational model requires further development in the social sciences (Öner, 2022; Cheng et al., 2017).

Recent research indicates that metaverse research within the field of education is predominantly undertaken in the USA, Brazil, Japan, Spain, and South Korea. Furthermore, a comparison of the shortcomings and opportunities of metaverse language education was finalized with a specific perspective. At this point, the Turkish case will contribute to the expansion of the existing literature on this topic.

As developments in Turkey are still in their infancy, the examples and developments presented are primarily drawn from news sources and institutional websites. Gün and Delen examine the metaverse application as an exemplar of digitally-based material design in the context of teaching Turkish as a foreign language (Gün & Delen, 2022, pp. 4467-4486). The article by Uzdu Yıldız and Bilgisu, entitled "How can Metaverse Tools be Used in Teaching Turkish as a Foreign Language to Children?" is more conceptual (Uzdu Yıldız & Bilgisu, 2023). In Bıçak's master's thesis, the views of teachers and students were examined in the context of designing ideal environments for language learning in the metaverse. The subjects comprised 20 students studying in secondary schools in Malatya in the 2022-2023 academic year, and 19 English teachers working in secondary schools. The present study focuses on the field of metaverse studies in the context of Turkish education, with the aim of providing a comparative perspective for similar studies in a global context.

When evaluated overall, it is thought that researching this innovative, technology-supported education and language teaching tool around the world will contribute to the relevant literature. The Turkish example could also make various contributions in that context.

Ethical considerations

This research was conducted using the document analysis method, which involves the systematic review and interpretation of existing documents. Since the study did not include human participants or the collection of personal data, ethical concerns such as informed consent or confidentiality were not applicable.

All analyzed documents were publicly available or obtained from open-access sources. The researcher ensured that all materials were cited appropriately and that the integrity of the original sources was preserved.

The study was carried out in compliance with the "Higher Education Institutions Scientific Research and Publication Ethics Directive." No violations of ethical principles—such as plagiarism, falsification, or misrepresentation—occurred during the research proces

FINDINGS AND DISCUSSION

In this section, a theoretical framework will be developed for the current study based on theories in the world literature on education and language education. In this field study, the infrastructure works in Turkey, will be explained, and in the context of Metaverse-Turkish education, opportunities and developments will be determined. Finally, the Turkish example will be discussed according to theoretical frameworks.

Conceptual and Theoretical Framework: Metaverse, Education and Language Education

The metaverse has considerable potential in a number of areas, including education, business meetings (Durana et al., 2022), volunteer-entertainment-centred sporting, artistic, and cultural activities in virtual environments (Bayram, 2022: 1-7), and medical examination environments (Schweitzer & Rizzo, 2022). The potential of the metaverse in the field of education is particularly evident in its capacity to simulate concrete experiences in a range of disciplines, including geography, medicine, and visual arts. To illustrate, in geography classes, students can undertake virtual visits to diverse countries and regions, which can enhance the appeal of the subject matter and make learning more engaging.

Similarly, in the field of medical education, virtual internships or surgical simulations can facilitate students' acquisition of practical knowledge, enabling them to gain experience in a realistic setting. The impact of the metaverse on education is transformative, affecting numerous areas, including language learning and the overall learning experience. The metaverse is particularly well-suited to Generation Z, who are accustomed to rapid change

as evidenced by research (Park & Kim, 2022). Indeed, 67% of Roblox, which offers a virtual gaming experience and has 43.2 million daily active users, users are under the age of 16, while only 14% of the platform users are over the age of 25 (Dean, 2022). It is evident that e-learning and the metaverse can play a pivotal role in this framework.

Sutopo's book discusses how the metaverse could provide immersive and engaging learning experiences, personalized training, and access to education for anyone with an internet connection (Sutopo, 2023). The metaverse education model (Dwivedi et al., 2022) is notable for a number of distinctive functional outcomes, the first of which is interaction. The metaverse enables individuals to engage in virtual interactions with avatars generated within virtual environments. Consequently, individuals can virtually observe, practice, and discuss physical experiences with a diverse range of others. The integration of senses such as taste, touch, and smell, which are currently being developed in the virtual world, into the relevant system would significantly enhance the experience and learning that takes place within the metaverse, elevating it to a new level of engagement and understanding. 2) Decentralisation and Compatibility: The advantages will be optimized when different platforms and applications are compatible with one another. 3) Persistence, Accessibility, and Concurrency: The metaverse is designed to be independent of both temporal and spatial constraints. Consequently, a global community will be created in which individuals from all over the world can participate. Consequently, activities pertaining to culture, art, education, psychology, business, and the economy can be conducted virtually rather than physically anytime. Accordingly, the metaverse comprises numerous technological components such as augmented reality, virtual reality, extended reality, mixed reality, web 3.0 technology, blockchain technology, and artificial intelligence (Çilek, 2023, p. 81).

The following methods are particularly efficacious in the context of the metaverse when teaching languages: These methods include virtual interactive lessons, game-based learning, virtual reality tours, foreign language teaching applications, and virtual language buddies. These are based on an approach that emphasizes problem-solving, task-based learning, and scenario-based activities. In a metaverse educational environment, the most crucial element is the sense of social presence, which is essential for learners to feel connected with their peers. In this regard, it is important that the interaction is three-dimensional (Cruz-Lara et al., 2010).

The virtual platform created by the Metaverse provides students with the opportunity to interact with other users through social chat and to communicate effectively through environmental objects, gestures, poses, facial expressions, and explicit or implicit references. This demonstrates the importance of communicating both verbal and non-verbal expressions to students. Furthermore, research indicates that the metaverse is aligned with contemporary educational methodologies, including virtual learning, collaborative learning, game-based learning, and problem-based learning (Das et al., 2024). The metaverse provides students with an active and global learning experience.

The metaverse represents a technology that allows users to be in multiple locations and time zones simultaneously (Duan et al., 2021). This offers significant benefits in distance education by eliminating the necessity for students to be physically present in a specific location (Mystakidis, 2022). To illustrate, a student in Bolivia who aspires to acquire Chinese language proficiency may have the opportunity to do so through engagement with a virtual Chinese language environment within the metaverse digital realm. Virtual environments can facilitate language acquisition by enabling the formation of rich social interactions and the undertaking of problem-solving activities, which are essential for effective social constructivist learning. Furthermore, they provide students with novel avenues for acquiring a foreign language and engaging in cross-linguistic communication. For educators, platforms such as the metaverse present novel avenues for facilitating learning. Consequently, educators are able to facilitate and encourage students' social interactions and learning processes. It is crucial for educators to adapt to this novel environment and utilize it effectively (Kye et al., 2021, p. 1).

The metaverse provides a developable feature that can be used to address and overcome the challenges inherent to the learning process for students. Using interactive learning tools, such as task-based games, enables students to assimilate the course material more effectively. Furthermore, it enables students to enhance their linguistic abilities.

Conversely, the metaverse may present certain difficulties with regard to language learning. However, these challenges can be mitigated through the implementation of efficacious solutions. Technical issues, such as those pertaining to internet connectivity and the lack of a user-friendly interface, can be resolved. Furthermore, the incorporation of interactive elements has the potential to enhance engagement and motivation. It is anticipated that the use of metaverse language learning will become more prevalent.

In their analysis of the metaverse model of education, Hirsh-Pasek et al. identify a pivotal aspect that warrants further examination. The potential of augmented reality, virtual reality, and 3D technology to transport children into new environments that they may never be able to explore or visit represents a significant opportunity for educational advancement. In terms of critical thinking skills, students have the opportunity to solve real-world problems and showcase their products not only at their school, but also to a broader community. With regard to enduring questions pertaining to Greek culture, learners may choose to explore different historical periods or even gain first-hand experience in scientific laboratories, thereby facilitating a meaningful integration of theoretical knowledge with practical applications (Hirsh-Pasek et al., 2022, p. 10).

The advent of the metaverse, a technological revolution, offers students the opportunity to engage in game- and scenario-based learning experiences, particularly in the domain of language education. This innovative approach can facilitate the development of diverse language skills. Students may engage in the practice of new languages within simulated environments through real-time conversational interactions with virtual

characters or their fellow students. Technologies such as virtual reality and augmented reality provide realistic scenarios for the practical utilization of language. This approach to language learning is more engaging and facilitates greater fluency. The utilization of the metaverse for language learning offers a multitude of advantages. Students can enhance their capacity for critical thinking and problem-solving by engaging in cognitive processes within the target language. Additionally, the platform fosters collaborative learning through interactions with other students or native speakers. Moreover, this system enables students to express themselves more freely through their virtual avatars, thereby facilitating a language education that is free from concerns about communication or making mistakes. Despite the advantages of the metaverse in the field of education, issues such as the cost of the platforms and hardware, as well as limitations in access for students, have yet to be addressed (Uzdu Yıldız & Bilgisu, 2023, p. 284).

The metaverse encompasses virtual reality, which is currently the most prevalent and effective technology in the field of education. The use of virtual reality encourages the more widespread incorporation of three-dimensional environments in educational settings, wherein emotional engagement is heightened, and students are afforded a more nuanced and immersive learning experience. This can assist in the mitigation of issues such as boredom and distraction, particularly within the context of asynchronous learning environments. The utilization of conventional 2D online educational instruments provides students a constrained perception of self and engagement. Nevertheless, the potential for interaction and emotional expression is greater in 3D environments within the metaverse. Consequently, the utilization of metaverse platforms facilitates enhanced learning and interaction among students. When the metaverse is evaluated in terms of its impact on the field of education, it emerges as a promising avenue for addressing the challenges inherent to online learning. Using virtual reality and three-dimensional environments has the potential to enhance the efficacy of the educational process, offering students a more immersive and engaging learning experience. It has the potential to enhance the learning experience by offering an environment in which students and educators can engage with experiences that are not feasible in the physical world. Moreover, the diversification and personalization of learning materials can facilitate a more effective adaptation to students' diverse learning styles and rates of acquisition.

Ultimately, using the metaverse in an educational context has the potential to alter the learning experience significantly. Nevertheless, meticulous planning, training, and pedagogical methodologies must be devised to actualize this potential fully.

Metaverse in Turkey and Turkish Education

Metaverse Works in Turkey

Despite the current lack of sufficient infrastructure and educational initiatives pertaining to the metaverse in Turkey, there is a discernible increase in interest (Turan et al., 2022; Üçgül et al., 2022; Hürriyet Daily News, 2021). In recent years, Turkey has been

identified as a leading nation in Google search results for the metaverse. Both private and public institutions in Turkey are engaged in monitoring the advancement of this technology. Turkey's inaugural metaverse-oriented pre-incubation facility designated the "Metaverse Venture Studio" was inaugurated at Süleyman Demirel University. The university boasts facilities for avatar creation, virtual reality, non-fungible tokens (NFTs), and environmentallyconscious studios. Virtual visits to Atatürk's NFT studio, the first of its kind in Turkey, are available (Süleyman Demirel University, 2023). Furthermore, a workshop on "Metaverse Mixed Reality" was initiated within the Ministry of Education (MoE) in Gaziantep. The objective is to facilitate students' access to historical artifacts within the metaverse and to provide an alternative educational experience that transcends the limitations of traditional memorization-based learning (MoNE, 2022).

The following examples illustrate the successful implementation of metaverse technologies in various sectors within the Turkish context: Ankara has become the fourth test city of the Open AR Cloud Association, preceded by Los Angeles, Helsinki, and Bari. In 2022, the state broadcaster TRT announced the advent of the world's first public broadcasting metaverse application. In 2022, the Turkish gaming industry received 20 million dollars of investment related to blockchain and the metaverse. Vodafone Turkey became the first telecommunications operator to establish a physical presence in Decentraland, a metaverse platform. Cerebrum Tech's objective is to construct a three-dimensional virtual smart city that can facilitate the achievement of sustainable development goals (Deloitte, 2022, p. 15).

In 2023, the first metaverse office was established within the Communications Directorate of the Presidency of the Republic of Turkey. The primary objective of this office is to conceptualize the Web3 transformation and elucidate the country's metaverse strategy. Its overarching aim is to highlight the significance of developments within the metaverse on a global scale (Daily Sabah, 2023).

However, to gain a comprehensive understanding of the evolution of metaverse technology in Turkey, it is essential to highlight some of the challenges and limitations that have emerged. In 2021, 97.5% of citizens aged 16-64 who use the Internet in Turkey indicated that they own a smartphone, while 68.9% stated that they own a computer. Furthermore, the cost of AR/VR devices is approximately equivalent to two minimum wages in Turkey. Furthermore, it is notable that in 2020, only 19% of citizens in Turkey had a fixed broadband subscription, which is below the EU average of 36%. In terms of mobile internet coverage, 92% of Turkey is covered by 4G networks. Given that developed countries have already begun to deploy 5G technology, Turkey must make the necessary investments without delay. Furthermore, in the initial stages of metaverse development, the significance of computing power is becoming increasingly evident. The ratio of secure servers in the EU to the number of people per million is 50,289:1, whereas in Turkey, the figure is 6,758:1. Furthermore, 41% of the Turkish population possesses fundamental IT competencies, 30% have attained intermediate proficiency, and only 3% have advanced abilities. To develop

digital skills, the Human Resources Office of the Presidency has devised training programs for public employees, which have been viewed 11.8 million times (Deloitte, 2022, pp. 32-36).

Ovesis, a company working in the metaverse, aims to become the first Turkish company to achieve unicorn status in this field. It is estimated that the global metaverse market will reach a valuation of between 700 and 900 billion dollars by 2030. It is anticipated that metaverse technology will contribute between $19.9 billion and $37.5 billion to the Turkish economy by 2035. Consequently, the company is pursuing accelerated efforts in the field of the metaverse in Turkey. The company is engaged in research activities in the fields of virtual reality (VR) and augmented reality (AR), as well as the metaverse. To illustrate, Ovesis has established the inaugural virtual shopping and living center. The objective of the metaverse strategy is to create 40,000 jobs in the virtual world by 2024 (World Newspaper, 2024).

One of the most significant eco-political issues currently facing Turkey is that of income distribution. One of the most significant contributions of the metaverse is its potential to enhance inclusion and diversity. Education can be examined in relation to this topic. As reported by the World Bank, Turkey achieved a score of 4.3 in the domain of education and social inclusion, which is below the Organisation for Economic Co-operation and Development (OECD) averages of 6.4 for education and 6.1 for social inclusion, respectively (Deloitte, 2022, p. 29). It is acknowledged that 23% of Turkey's population resides in rural areas, where access to education is more constrained. The use of the metaverse can facilitate the participation of rural areas in educational activities.

Metaverse and Turkish Education: Opportunities and Developments

The advent of metaverse technology will render the necessity for individuals seeking to learn Turkish to physically travel to a particular location obsolete. In other words, a student in Nigeria will be able to learn Turkish in the metaverse without having to travel to Turkey (Akkaya & Şengül, 2022, p. 319). Furthermore, the language teaching programs that are to be developed will enable participants to practice Turkish in a virtual city environment, in locations such as a bakery, post office, market, and bank, using avatars and different roles. Those wishing to learn Turkish may be offered the opportunity to engage in mutual language learning with avatars of Turkish masters or famous individuals, developed with the use of artificial intelligence, within virtual rooms. This approach has the potential to enhance students' motivation and concentration (Uzdu & Bilgisu, 2023, pp. 271-294). Another proposed application is the "artificial intelligence-supported speech companion" project. The Yunus Emre Institute, a language institution in Turkey, and the Turkish Language Institute, could potentially collaborate on this project through a joint program. Foreign students will have the opportunity to engage in spoken language practice with a virtual friend at any point during their daily routine. The application of artificial intelligence technology that is capable of self-improvement based on user input has the potential to facilitate the teaching of Turkish to a significant number of non-native speakers. For

instance, the presentation of Turkish traces of the historical Silk Road route to all citizens in a virtual environment is a potential application of VR/AR support. Those engaged in the study of the Turkish language, both globally and within the country, will be able to interact with one another, for instance, at a concert of the famous Turkish pop singer Tarkan, on the basis of the principle of "co-presence".

The "Turkish TV Series" application offers users the opportunity to engage with Turkish TV series in a virtual setting, replicating the experience of watching these series in their original context. It is also noteworthy that in 2023, Turkish TV series became the third most exported television content in the world. Between 2020 and 2023, there was an 183% increase in demand for Turkish TV series. While the export value of the series reached 600 million dollars, it is asserted that the series reached 750 million people in more than 170 countries. Turkish TV series are widely consumed in regions including the United States, East Asia, Russia, and Latin America (The Economist, 2024). Consequently, individuals in these geographical areas may be motivated to learn Turkish. In the context of metaverse development, the integration of language education programs for non-native Turkish speakers is a promising avenue for fostering linguistic proficiency. The use of TV series as a pedagogical tool in this endeavor holds particular promise, as it offers a convenient and engaging method of language acquisition. It is challenging for non-Turkish speakers in Latin America to identify educational resources that offer instruction in Turkish. However, the metaverse presents a potential solution, enabling individuals to engage with the language from the comfort of their homes as though they were residing in Turkey. Additionally, a Turkish language education program may be made available to the children of families who watch Turkish TV series. The establishment of appropriate virtual classrooms for children will facilitate the provision of interactive Turkish language education, incorporating games and songs.

The education of non-native speakers of the Turkish language is a significant concern for the Turkish government. The utilization of metaverse technology as an instrument for this purpose may be facilitated through the establishment of consulates and the creation of Turkish institutes. Those who have taken up residence abroad have the option of engaging in language learning with Turkish citizens in virtual classrooms. Furthermore, they may have the opportunity to gain a first-hand appreciation of the cultural riches of Turkey. This approach has the potential to address the issue of language decline as generations progress.

Furthermore, the metaverse has the potential to facilitate collective action among Turkic states in various domains, including education, health, culture, and politics (Akıllı, 2023). To achieve this, it is necessary for these states to establish a common language learning system. The establishment of a common "Turkoverse" in a virtual reality environment by Turkic states would facilitate more frequent interaction among the Turkic world's 300 million inhabitants through a range of language-culture programs. It would also provide opportunities for employment, attendance at live concerts, participation in sports

activities, viewing of films and theatre, and museum visits (Smart, 2023, p.41). Consequently, the ability to speak Turkish will become more natural for Turkic peoples.

Similarly, in the virtual language college being set up in the metaverse, citizens can experience the various dialects that exist in different cities across the country. In addition, foreigners who have learned Turkish will be able to anticipate the environments in which they will have difficulty communicating when traveling in Turkey.

At the Middle East Technical University (METU) in Turkey, Assoc. Prof. Tuğba Tokel and her students created a 3D virtual campus in 2010 (Kasap, 2021). During the pandemic, children, in particular, were unable to concentrate fully on their lessons because they were far away from school and could only use Zoom for their lessons. At this point, it has been found that interactive participation, in which students create avatars for themselves using Metaverse technology, will increase concentration. In the created virtual classrooms, all students listen to the lesson and interact with the teacher and their friends as they would in real life. In this way, students' participation in the lesson can be increased, and their social relationships with their friends can be maintained (Kasap, 2021). These new opportunities have been adapted to Turkish education.

The British Language Institute also opened a metaverse language program in Türkiye; British cities, museums, and culture are used to teach English in a virtual environment (British, 2024). These also have an impact on Turkish teaching methods.

DISCUSSION

The 21st century is often referred to as the Information Age. The development of computers, the Internet, and artificial intelligence, as well as innovative studies and investments by technology companies, have brought the world into a structure that is changing and developing more rapidly. The Metaverse, as one of these technologies, offers the possibility to change our daily activities. Business, hobbies, education, and cultural activities can be experienced in the virtual world. The aim is for the physical and virtual worlds to work together. With the rapid advancement of technological applications, including the Internet, humanity will use these tools more interactively. Therefore, a more useful universe will be created in the fields of education, health, economy, politics, psychology, and sociology (Rahman et al., 2023).

The Metaverse, as a new technology for language teaching, is increasingly being explored in various disciplines, of world literature. Improving skills and raising cultural awareness are two important aspects of language teaching that are addressed by these applications; Despite the negative performance in reading, virtual reality-based activities in listening, speaking, writing, grammar, and vocabulary teaching generally show positive results. Again, students are given the opportunity to explore and experience their learning

process; students from different cultures come together to provide an interactive educational experience, as Han and Hong have observed (2022).

The metaverse can facilitate the expression of identity and reflection of culture among language learners through the use of avatars. This, in turn, engenders a greater sincerity, comfort, and motivation on the part of the learners in the language learning process. As the use of the metaverse becomes more prevalent, it is anticipated that the very concepts of reality and self will transform, potentially giving rise to a novel societal and global order. Consequently, there may be significant alterations to the educational sector, with a need for adaptation in areas such as educational philosophy and curriculum, as underlined by Kye et al. (2021).

It is crucial to highlight some pivotal considerations regarding the utilization of the metaverse in the field of education (Park & Kim, 2022; Dwivedi et al., 2022). It is of the utmost importance that teachers and students receive comprehensive training and guidance to enable them to adapt to and utilize this novel environment. Furthermore, it is essential to recognize that this technology is merely a tool and should facilitate the development of effective pedagogical strategies by educators. Finally, the opportunities and challenges that the metaverse brings to education should be evaluated together.

Turkey has also initiated studies for the metaverse world, both at the state level and through the private sector (Kasap, 2021). To ensure the growth of the metaverse, the necessary technological infrastructure should be created, training should be provided, and institutions and organizations should carry out work with short, medium, and long-term planning. In addition, practices should be formulated with other developed countries regarding the efficient use of the learned technology in various sectors. Users in the country demand the ability to share infrastructure, hardware, platforms, and applications. However, Turkey has a long way to go in terms of infrastructure and talent. For the metaverse to be successful, a good internet infrastructure, advanced computers, and useful and affordable AR/VR devices are essential.

As demonstrated in the studies of Gün & Delen (2022) and Uzdu Yıldız & Bilgisu (2023), it can be seen that metaverse applications can enhance the ability of Turkish language learners to apply what they have learned with the spaces and scenarios that can be created in virtual worlds. For example, students can establish communication in virtual environments such as home, hospital, school, and cafe. Language teaching can be activated through a more active experience of Turkish culture in virtual environments that include various cultural practices such as weddings, funerals, and hospitality. Similarly, Turkish educators and parents' association can discuss their problems and suggestions regarding education in a virtual environment. In addition, participants from Turkey and abroad will have the opportunity to attend a conference in Turkish simultaneously, regardless of their geographical location, across different time zones. It should be noted that if a metaverse application in Turkey such as MetaAge wants to be a player in a wider metaverse system, it

should consider flexibilities such as allowing seamless movement and exchange of information across platforms.

For foreigners who want to learn Turkish, the metaverse offers the potential to gain insight into the language and culture through a variety of scenarios and settings. By communicating in Turkish in virtual worlds, these students can gain familiarity with situations they may encounter in daily life and explore Turkey's touristic regions through virtual trips. In this way, the metaverse has the potential to enhance the efficacy and enjoyment of the learning process with regard to the Turkish language. During the pandemic, the issues encountered, particularly in the context of online education, can be attributed to a decline in active student participation and an inability to derive the intended benefits from training programs that necessitate practical application. To surmount such challenges, educational platforms supported by the metaverse are capable of enhancing students' active engagement by integrating theoretical instruction with practical application. To illustrate, using practical applications, such as 3D-based aircraft maintenance simulations, can facilitate the transfer of knowledge to students and enhance their engagement. For example, 3D-based practical applications can effectively transfer information to students and increase student engagement in classes.

CONCLUSION

This study emphasizes that technology has been especially groundbreaking in the last decade. Developing educational technologies are also enhancing language education. In particular, artificial intelligence virtual environments have recently become common tools in language education, and various applications make language education more interactive, engaging, and less reliant on memorization. Despite these advancements, technological language methods are not yet widely used, both globally and in Turkey, due to their cost, applicability, and negative psychological-pedagogical effects.

As a result, the relationship between education and technology has transformed into an undeniable reality. Innovative language teaching tools and techniques promise significant contributions to both language learners and teachers. Related to this point, this study generates insights into how emerging technologies, particularly virtual and artificial intelligence-supported environments, are shaping the future of language education. However, technological transformation is a process that requires coordinated adjustment of both cost variables and the involvement of teaching staff. Currently, suboptimal infrastructural and pedagogical data create various constraints. Creating technology-integrated language learning environments can now be considered essential for a sustainable, participatory, and student-centered approach. And it should be noted that emphasizing the roles of teacher preparation, individualized learning strategies, and interdisciplinary collaboration within the vision of an effective metaverse-based education system will add productive depth.

Based on the findings of the study, the following suggestions can be made for metaverse language education both in the world and in Turkey:

For virtual education, the learner should be informed in detail, and both physical and mental preparation should be completed for the intended benefit. Pre-service teachers should be especially aware of new technological applications.

Separate studies should be conducted for each of the basic language learning skills, such as reading, writing, listening, and speaking, while comprehensive materials and content should be created in the virtual environment. Moreover, video or virtual technology should be utilized whenever possible in critical language teaching processes such as exemplification, pronunciation, and interaction. Through these applications, it ought to be determined how metaverse applications can be used in a personalized, active way, without relying on memorization.

In virtual education, content creators should be supported by diverse disciplines, including social (e.g., education, philosophy) and numerical (e.g., data scientists, artificial intelligence analysts). The technological transformation and design of virtual learning platforms should be regularly improved.

In distance education, language centers with uninterrupted Internet and constant assistance should be considered.

The development of technology-based material design in Turkish language education should be handled with an interdisciplinary approach, especially in engineering, philosophy, and education. It is valuable to gather opinions from teachers and students when designing ideal learning environments for these applications. Technological developments in the relevant field worldwide should be followed, and staying informed about new applications ensures the process is not missed.

In closing, it is anticipated that the relationship between the metaverse and education will be explored in future studies, both from technological and pedagogical perspectives. In this context, experimental and longitudinal studies can be conducted to examine the effectiveness of metaverse environments in developing the four basic language skills (reading, writing, listening, and speaking) individually. On the one hand, studies will be conducted to optimize the system by examining teacher and student perspectives on metaverse-based language education. Here, it is also important to examine the type of training and support both in-service and pre-service teachers need to use these tools effectively. On the other hand, it should be investigated how these technologies affect student motivation, attention span, and cognitive load. Studies comparing the advantages and disadvantages of virtual-technological language learning with traditional classroom instruction may be considered. Studies focusing on equal opportunities in technological access, including field observations and policy recommendations, are also worth exploring. The psychological and emotional impacts of virtual learning, such as avatar identity, fatigue, and isolation, as well as the integration of artificial intelligence into the system for

customized learning objectives, should be investigated. Finally, intercultural communication, gamification, and feedback systems in virtual learning environments should be analyzed, and efforts should be made to develop reliable assessment tools specific to virtual environments.

REFERENCES

Ağaoğlu, O., & Demir, M. (2020). The integration of 21st century skills into education: an evaluation based on an activity example. *Journal of Gifted Education and Creativity*, 7(3), 105-114.

Akkaya, N., & Şengül, L. (2022). Metaverse ve dil eğitimi [Metaverse and language education]. *Eğitim ve Yeni Yaklaşımlar Dergisi*, 5(2), 314-326. https://dx.doi.org/10.52974/jena.1194504

Akıllı, E. (2023). *Türk dünyası gençlerinin bütünleşmesinde miras diplomasisi ve metaverse* [Heritage diplomacy and the metaverse in the integration of Turkish world youth]. Ahmet Yesevi University. Retrieved from https://www.ayu.edu.tr/mypanel/_app/upload/-yayin/dosya/c24cd76e1ce41366a4bbe8a49b02a028.pdf

Aldossari, S., & Alsuhaibani, Z. (2021). Using augmented reality in language classrooms: The case of EFL elementary students. *Advances in Language and Literary Studies*, 12(6), 1-8. https://dx.doi.org/10.7575/aiac.alls.v.12n.6.p.1

Alyaz, Y., & Demiryay, N. (2023). Yabancı dil öğrenimi ve öğretiminde sanal gerçeklik uygulamaları [Virtual reality applications in foreign language learning and teaching]. *Diyalog*, 2023(1), 107-127. https://dx.doi.org/10.37583/diyalog.1312776

Bayram, A. (2022). Metaleisure: Leisure time habits to be changed with metaverse. *Journal of Metaverse*, 2(1), 1-7.

Bıçak, T. N. (2023). *Metaverse'de dil öğrenmeye yönelik ideal ortamların tasarlanmasına ilişkin öğretmen ve öğrenci görüşleri* [Teacher and student opinions on the design of ideal environments for language learning in the metaverse] [Master's thesis, İnönü University]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Bostancı, M., & Uncu, G. (2021). Metaverse: Sanal mı gerçek mi? [Metaverse: Virtual or real?] In Y. Adıgüzel & M. Bostancı (Eds.), *Dijital iletişimi anlamak-2* [Understanding digital communication – 2] (pp. 154-169). Palet Yayınları.

British. (2024). Türkiye'nin ilk metaverse kampüsü – Eğitimde büyüleyici yeni bir devrim. [Turkey's first metaverse campus – A fascinating new revolution in education]. Retrieved from https://british.com.tr/turkiyenin-ilk-metaverse-kampusu-egitimde-buyuleyici-yeni-bir-evrim

Büyükkarabacak, N., & Balyer, A. (2024). Metaverse ve Metaverse'ün Eğitim Ortamlarına Yansımaları [Metaverse and its reflections in educational environments]. *Alanyazın*, 5(2), 224-234. https://doi.org/10.59320/alanyazin.1573637

Cheng, A., et al. (2017). Teaching language and culture with a virtual reality game. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, 541-549. https://dx.doi.org/10.1145/3025453.3025857

Çilek, E. (2023). Yabancı dil öğretiminde yeni bir dünya: Metaverse (sanal gerçeklik) [A new world in foreign language teaching: Metaverse (virtual reality)]. In S. Karabatak (Ed.), *Eğitim & Bilim 2023-I* [Education & Science 2023-I] (pp. 77-95). Efe Yayıncılık.

Cruz-Lara, S., et al. (2010). Language teaching in virtual platforms: Advances, problems, and future directions. *Language and Technology Journal*, 5(2), 87-102.

Daily Sabah. (2023). Turkey officially launches its 1st metaverse office. Retrieved from https://www.dailysabah.com/business/tech/turkiye-officially-launches-its-1st-metaverse-office

Das, T., Ganesh Kondamudi, S., Dawood Babakerkhell, M., Pal, D., Roy, R., & Funilkul, S. (2024). Intention for enhancing metaverse-based learning using gamification among university students: a study using Delphi and structural equation modelling approaches. *Cogent Business & Management*, 11(1). https://doi.org/10.1080/23311975.2024.2380016

Dean, R. (2022). Roblox user statistics. *Digital Game Studies*, 8(4), 45-60.

Deloitte. (2022). *The metaverse and its potential for Türkiye*. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/tr/Documents/consulting/Deloitte-The-Metaverse-and-its-Potential-for-Turkiye.pdf

Díaz, J. E. M., Saldaña, C. A. D., & Avila, C. A. R. (2020). Virtual world as a resource for hybrid education. *International Journal of Emerging Technologies in Learning*, 15(15), 94-109. https://dx.doi.org/10.3991/ijet.v15i15.13025

Duan, Y., et al. (2021). Metaverse and education: New approaches in distance education. *Educational Technologies Research*, 6(3), 72-89.

Dünya Newspaper. (2024). Ovesis, Türkiye'nin metaverse alanındaki ilk unicorn'u olmayı hedefliyor. [Ovesis aims to become Turkey's first unicorn in the metaverse sector]. Retrieved from https://www.dunya.com/sektorler/teknoloji/ovesis-turkiyenin-metaverse-alanindaki-ilk-unicornu-olmayi-hedefliyor-haberi-716567

Durana, C., Krulicky, M., & Taylor, E. (2022). Metaverse and business meetings: New transformations. *Business and Technology Journal*, 11(2), 103-118.

Dwivedi, Y. K., et al. (2022). Metaverse and work environments: Innovation and implementation. *International Business Research Journal*, 15(1), 89-105.

Garrido-Iñigo, P., & Rodríguez-Moreno, M. (2015). The impact of virtual airport usage on tourism students' motivation to learn French. *Tourism Research Journal*, 2(1), 45-56.

Guo, H., & Gao, W. (2022). Metaverse-powered experiential situational English-teaching design: An emotion-based analysis method. *Frontiers in Psychology*, 13. https://doi.org/10.3389/fpsyg.2022.859159

Gün, M., & Delen, K. (2022). A design example of digital-based material in teaching Turkish as a foreign language: The use of metaverse applications. *Journal of History School*, 61, 4467-4486.

Hirsh-Pasek, K., et al. (2022). Metaverse in education: Future visions. *Educational Technology and Innovation Journal*, 10(2), 5-18.

Hürriyet Daily News. (2021). Istanbul's virtual lands sold in scramble in metaverse world. Retrieved from https://www.hurriyetdailynews.com/istanbuls-virtual-lands-sold-in-scramble-in-metaverse-world-170449?utm_source=chatgpt.com

Kasap, S. (2021). Turkish researchers develop technology that brings schools into the metaverse. Retrieved from https://www.aa.com.tr/tr/bilim-teknoloji/turk-arastirmacilardan-okullari-metaverse-ortamina-tasiyan-teknoloji/2446867

Kim, M., Sim, J., & Ryu, S. (2022). A Study on foreign students'perception of Metaverse-Based Korean language course as General Education. *Korean Journal of General Education*, 16(6), 183-195.

Kye, B., et al. (2021). Metaverse and distance education: New opportunities and challenges. *Technology in Education Association Journal*, 12(4), 54-67.

MacCallum, K., & Parsons, D. (2019). Teacher perspectives on mobile augmented reality: The potential of metaverse for learning. In *World Conference on Mobile and Contextual Learning* (pp. 21-28).

MEB (Turkish Ministry of National Education). (2022). Metaverse karma gerçeklik atölyemiz açıldı [Our metaverse mixed-reality workshop has opened]. Retrieved from https://orgm.meb.gov.tr/www/metaverse-karma-gerceklik-atolyemiz-acildi/icerik/2076

Mystakidis, S. (2022). Metaverse and education: New perspectives and applications. *Educational Technology Research*, 7(1), 88-104.

Ng, D. T. K. (2022). What is the metaverse? Definitions, technologies, and the community of inquiry. *Australasian Journal of Educational Technology*, 38(4), 190-205. https://dx.doi.org/10.14742/ajet.7945

O'Leary, Z. (2017). *The essential guide to doing your research project*. SAGE Publications Inc.

Öner, G. (2022). Sosyal bilgiler eğitiminde metaverse [Metaverse in social studies education]. In Y. Doğan & N. Şen Ersoy (Eds.), *Eğitimde metaverse: Kuram ve uygulamalar* [Metaverse in education: Theory and practices] (pp. 115-132). Efe Yayınları.

Park, H., & Kim, S. (2022). Metaverse and Generation Z: New approaches in education. *Digital Education Research*, 9(3), 134-150.

Rahman, K. R., Shitol, S. K., Islam, M. S., Iftekhar, K. T., et al. (2023). Use of Metaverse Technology in Education Domain. *Journal of Metaverse*, 3(1), 79-86. https://doi.org/10.57019/jmv.1223704

Reisoğlu, I., Topu, B., Yılmaz, R., Karakuş Yılmaz, T., & Göktaş, Y. (2017). 3D virtual learning environments in education: A meta-review. *Asia Pacific Education Review*, 18(1), 81100. https://doi.org/10.1007/s12564-016-9467-0

Schweitzer, J., & Rizzo, A. (2022). Metaverse and examination environments: Innovations in health education. *Health Education Research*, 5(2), 42-58.

Sutopo, A. H. (2023). *The future of education: How the metaverse is changing the learning*. Large print.

Süleyman Demirel University. (2023). Türkiye'nin ilk metaverse odaklı ön kuluçka merkezi 'Metaverse Girişim Stüdyosu' SDÜ'de açıldı [Turkey's first metaverse-focused pre-incubation center 'Metaverse Entrepreneurship Studio' opened at SDÜ]. Retrieved from https://w3.sdu.edu.tr/haber/11462/turkiyenin-ilk-metaverse-odakli-on-kulucka-merkezi-metaverse-girisim-studyosu-sdude-acild

Şimşek, İ., Erbay, H. N. ve Kirişçi, M. (2019). Üç boyutlu sanal öğrenme ortamında 5. Sınıf düzeyinde kesirlerin öğretimi: Second life örneği. [Teaching fractions at the 5th-grade level in a three-dimensional virtual learning environment: The Second Life example] *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 20(1), 139-154. https://dx.doi.org/10.29299/kefad.2018.20.01.005

Tamai, M., et al. (2011). Constructing Situated Learning Platform for Japanese Language and Culture in 3D Metaverse. *Second International Conference on Culture and Computing*, 189–190. http://doi.org/10.1109/Culture-Computing.2011.59

The Economist. (2024). The third-largest exporter of television is not who you might expect. Retrieved from https://www.economist.com/culture/2024/02/15/the-third-largest-exporter-of-television-is-not-who-you-might-expect

Tlili, A., Huang, R., Shehata, B., Liu, D., Zhao, J., Metwally, A. H. S., Wang, H., Denden, M., Bozkurt, A., Lee, L.-H., Beyoglu, D., Altinay, F., Sharma, R. C., Altinay, Z., Li, Z., Liu, J., Ahmad, F., Hu, Y., Salha, S., Abed, M., & Burgos, D. (2022). Is metaverse in education a blessing or a curse: A combined content and bibliometric analysis. *Smart Learning Environments, 9*(1), 24. https://doi.org/10.1186/s40561-022-00205-x

Turan, U. N., Emre, İ. E., & Kıran, S. (2022). Metaverse İle İlgili Türkçe Dilindeki Çeşitli Sosyal Medya Platformu Verileri İle Duygu Analizi [Sentiment analysis using Turkish-language social media data about the metaverse]. *Journal of Information Systems and Management Research*, 4(2), 1-16.

Uzdu Yıldız, F., & Bilgisu, F. (2023). Metaverse araçları çocuklara yabancı dil olarak Türkçe öğretirken nasıl kullanılabilir? [How can metaverse tools be used to teach Turkish as a foreign language to children?]. *Aydın TÖMER Dil Dergisi*, 8(2), 271-294. https://doi.org/10.17932/IAU.TOMER.2016.019/tomer_v08i2004

Ural, N. (2021). Yabancı dil öğretiminde sanal gerçeklik kullanımı [The use of virtual reality in foreign language teaching]. In H. Asutay (Ed.), *Dil öğretiminde yeni teknik ve yöntemler* [New techniques and methods in language teaching] (pp. 145-161). Paradigma Akademi.

Üçgül, M., Lüy, Z., Baskaya, M., Keleş, E. (2022). Tarih Öğretimine Yönelik 3B Sanal Ortamın Değerlendirilmesi: Pilot Çalışma [Evaluation of a 3D virtual environment for history teaching: A pilot study]. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 18(1), 96-115. https://doi.org/10.17860/mersinefd.935407

Yıldırım, P., & Keçeci, G. (2024). Metaverse ve eğitim: Yeni bir dönem başlıyor [Metaverse and education: A new era begins]. *Millî Eğitim*, 53(243), 1635-1654. https://dx.doi.org/10.37669/milliegitim.1240070

Author Contributions

The sole author of this research, Elif Ermağan, was responsible for the conceptualization, methodology formulation, data collection, analysis, and interpretation. Furthermore, Elif Ermağan took charge of drafting the initial manuscript, revising it critically for vital intellectual content, and finalizing it for publication. The author has read and approved the final manuscript and takes full accountability for the accuracy and integrity of the work presented.

Author(s)' statements on ethics and conflict of interest

Ethics statement: I hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. I take full responsibility for the content of the paper in case of dispute.

Statement of interest: The author declares that there is no conflict of interest regarding the publication of this paper.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Biographical notes:

Elif Ermağan: Lecturer Dr. Elif Ermağan teaches Turkish to foreigners at Istanbul Medeniyet University and studies in the same field. She has many books and articles. Her main areas of study are teaching Turkish as a foreign language, bilingualism, migration, and language learning.

Scopus Author Identifier Number: N/A

Web of Science Researcher ID: MBH-5504-2025

Google Scholar Researcher ID: 7ogAPeYAAAAJ

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Evaluating the Effectiveness of the "Food Literacy Program" Designed for a Sustainable Future

Mehmet Yıldırım[1] Semra Demir Başaran[2]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 434-453
http://www.ijonmes.net

Article Info:

Received 28.05.2025
Revision 17.06.2025
Accepted 13.07.2025

Abstract:

This study was carried out to evaluate the development, implementation, and effectiveness of the "Food Literacy Program" which was designed using the Morrison, Ross, and Kemp instructional design model and includes the principles of sustainable and ethical food consumption. The "Food Literacy Program", designed for this study, was implemented with 26 students for 12 lesson hours. In order to examine the changes in students' knowledge, skills, and awareness about food literacy, a single-group pre-test-post-test quasi-experimental design was selected. For the analysis of the data, the pre-test and post-test scores, which were normally distributed, were subjected to a t-test. The results of the analyses indicated that there was a significant difference between the post-test and pre-test scores of the students. According to these results, it can be said that the "Food Literacy Program" which was designed by the researchers in accordance with the Morrison, Ross and Kemp instructional design model, is effective in providing students with food literacy behaviors. In the light of these findings, it is suggested that the "Food Literacy Program" designed for primary school students can be designed for other education levels and that food literacy programs should be included in the education system as elective courses.

Keywords: Food literacy, instructional program, program development, sustainability, ethical food consumption

Citation:
Yildirim, M., Demir-Başaran, S. (2025). Evaluating the Effectiveness of the "Food Literacy Program" Designed for a Sustainable Future. *International Journal of Modern Education Studies, 9*(2), 434-453. https://doi.org/10.51383/ijonmes.2025.419

[1] PhD. Candidate, Erciyes University, Institute of Educational Sciences, Kayseri, Türkiye, mehmety2323@gmail.com https://orcid.org/0000-0001-9635-0184
[2] Prof.Dr. Semra Demir-Basaran, Erciyes University, Kayseri, Türkiye, sdemir@erciyes.edu.tr https://orcid.org/0000-0002-5245-7657

INTRODUCTION

Food systems are one of the triggers of climate change and increasing health problems and the effects of which are felt on a global scale (Smith et al., 2022). Despite 735 million people suffering from hunger in the world, 1.8 billion people, which is approximately 20% of the world's population, are overweight due to excessive calorie intake. This situation is no different in Turkey. 17% of the country's population is defined as obese (Türkiye Ministry of Health, 2024; UNICEF Türkiye, 2024; WHO, 2024). Obesity, which is considered one of the causes of life-threatening diseases such as type 2 diabetes, cardiovascular diseases, and many types of cancer (Jin et al., 2023), is closely related to eating habits (Honda et al., 2020). Irregular meals, lack of vegetable consumption, and frequent snacking have been identified as causes of obesity (Lim & Lee, 2023; Mendoza et al., 2020). As a result, adopting healthy eating habits plays an important role in preventing obesity (Bounihi et al., 2023; Honda et al., 2020; Onofriescu et al., 2025). To secure the future of both people and the planet, sustainable development plans should be carefully monitored, and food literacy skills that offer a holistic perspective in food consumption preferences should provide people.

Sustainable development, which has sociological, economic and environmental dimensions, represents not only the activities carried out for the protection of natural resources, but also a system in which people can contribute even through their food preferences (Şahin, 2024). The concept of "sustainability" which aims to meet the needs of today's people without compromising the ability of future generations to meet their own needs (Ceyhun Sezgin et al., 2023), serves the aforementioned perspective. Rachel Carson's 1962 book Silent Spring written, the permanent damage caused by human activities to nature was expressed, and in 1987, the concept of sustainability was announced to the whole world by the official authorities in the Bruntland Report (Mızık & Avdan, 2020). The purpose of sustainable development is to remind countries that they are using resources that belong to present and future generations when setting their social and economic development goals in order to prevent irreversible environmental problems (Presidency of Strategy and Budget, 2024). Sustainable development is directly related to food consumption. Food production and consumption cause many sustainability issues, such as the use of natural resources, environmental pollution, climate change, and biodiversity loss. In addition, healthy and balanced nutrition is critical for economic development and public health (Fanzo, 2019; Kumar et al., 2022; Mathys et al., 2022). The United Nations' goals of “Ending Hunger” and “Responsible Consumption and Production” prioritize the sustainability of food systems and healthy nutrition (Mensah et al., 2023). However, today's food consumption habits and production methods pose significant obstacles to achieving these goals (Fanzo, 2019; Nichifor et al., 2025). To secure the future of both people and the planet, sustainable development plans must be carefully monitored, and food literacy skills that offer a holistic perspective on food consumption choices must be imparted to people.

There is a change in the paradigm regarding food. This change has led to an approach in which people are not only focused on their body mass index, but also take into account social, cultural and environmental conditions in their food preferences in the name of healthy eating (Block et al., 2011). People could not remain silent in order to protect nature, which is destroyed by the ever-expanding agricultural lands, increasing irrigation needs, and fossil fuel residues used for food transportation to feed the increasing human population. For this purpose, the World Wide Fund for Nature (WWF) has presented principles on nutrition, with its Livewell for Low Impact Food in Europe (LIFE) project. According to these principles, less meat should be consumed, and more vegetables and fruits should be consumed instead. Wasted food should be reduced by expanding the range of nutrients. Certified foods should be preferred, and processed foods containing high sugar, salt, and fat should be avoided (WWF, 2014). At this point, food literacy skills come into play enabling people to regulate their food preferences and diets with a holistic approach. Food literacy is a concept that was first defined by Vidgen and Gallegos (2014). The aforementioned authors described food literacy as a set of knowledge, skills and behaviors that people should have while meeting their food needs. Food literacy encompasses not only nutritional knowledge, but also practical skills such as budget management, shopping, meal preparation, and ethical food choices (Begley et al., 2018; Poelman et al., 2018). The foundation for lifelong healthy eating habits depends on food literacy skills acquired during childhood and adolescence (Philippe et al., 2023). Yetersiz gıda okuryazarlığı bilgisi, sağlıksız beslenme alışkanlıklarına ve sağlık eşitsizliklerine neden olarak ciddi sağlık sorunlarına etki etmektedir (Silva et al., 2023). Aktaş and Özdoğan (2016) stated that food-literate individuals should have a certain attitude towards food choices, including food safety, and that they should have gained the necessary knowledge and skills.

Importance and Purpose of the Study

Food literacy occupies a significant place in the literature. Some of these studies (Aktaş & Özdoğan, 2016; Block et al., 2011; Vidgen & Gallegos, 2014; Yıldırım et al., 2021), involve an effort to define food literacy, identify its components, and combine different definitions. The issue that is most prominent in many studies on food literacy is the necessity of training in food literacy. In recent years, studies (Ceyhun Sezgin et al., 2023; Mızık & Avdan, 2020; Yolcuoğlu & Kızıltan, 2021) have shown that sustainable food consumption will contribute to creating a lifestyle that can support sustainable development goals. The need for education about food literacy has attracted the attention of many researchers (Dülger & Ayaz-Alkaya, 2024; Meyn et al., 2022; Şanlıer & Güler, 2005; Scazzocchio et al., 2021; Ünver & Ünüsan, 2005) and it has been observed that food literacy training given for different age groups have yielded positive results in research on this subject.

The current research stands out from the previously mentioned studies in many aspects. *The Food Literacy Program (FLP), designed within the scope of the research, targets the primary school ages where food literacy will be most effective.* In addition, this program has been

designed to serve sustainable development goals, taking into account the principles of sustainable and ethical food consumption. It is seen that food literacy education to be given to primary school students with the FLP will be important in terms of raising individuals who prioritize the environment, community, and personal health and well-being recommended in previous research.

In this study, an instructional design process was carried out for the food literacy program. Instructional design is the use of instructional practices that take into account scientific data and processes (Küçükoğlu, 2022). Even though instructional design is expressed with various definitions, the common point is that the teaching path is determined based on the teaching paths appropriate to achieve the instructional objectives (Fer, 2015). The Morrison-Ross-Kemp Effective Instructional Design Model is student-centered and stands out with its flexible structure. Unlike linear design models, the model, which has a circular structure, consists of 9 independent steps (Morrison et al., 2012). This model was used as an instructional design model in the creation of the "Food Literacy Program" designed by the researchers with its flexible and learning features.

The aim of this study is to examine the effect of the "Food Literacy Program," which includes sustainable development goals prepared according to the Morrison-Ross-Kemp instructional design model, on the food literacy knowledge levels of primary school students. In this regard, the aim of the study is to evaluate the effect of FLP on the food literacy achievement levels of primary school students based on the achievement test scores obtained before and after the application.

Limitations

This study is limited to the achievement test scores of fourth-grade students attending a primary school in Kayseri Province during the 2024-2025 academic year, as assessed by the '*Food Literacy Program* (FLP)' developed according to the Morrison-Ross-Kemp instructional design model. The sample group for this study consists of 26 students. The data obtained from these students, selected using the typical case sampling method, limit the generalisability of the study but is considered sufficient to represent the population. No control group was used in this study. The main reason for this was to examine the effects of the FLP designed by the researchers on the target group and to minimise time and space constraints during implementation.

METHOD

Research Model

This research uses a single-group pre-test-post-test quasi-experimental design which is one of the quantitative research models. Quasi-experimental designs are generally used in the field of education, as they cannot be randomly assigned to control and experimental groups. This pattern, which is considered to be pre-experimental designs, is one in which the researcher observes the effectiveness of a new teaching method or an innovation in the

educational program (Cohen et al., 2021). In the single-group pre-test-post-test quasi-experimental design, the experimental procedure is performed. Before the intervention, a pre-test is applied to the group. After the independent variable (FLP) manipulated by the researcher is applied, the post-test is administered to the same group, and it is observed to what level the students achieve the food literacy knowledge determined as the dependent variable in the research (Büyüköztürk et al., 2021). A symbolic representation of the research design is given in Table 1.

Table 1

Single-Group Pre-Test-Post-Test Quasi-Experimental Pattern Modeling

Group	Pre-test	Intervention	Post-test
Experimental group	Achievement Test Score	FLP	Achievement Test Score

Independent Variable

In the research planned to be carried out, in the quasi-experimental design, FLP was accepted as an independent variable. It is a curriculum designed by the FLP researchers based on the Morrison-Ross-Kemp model. This model differs from other instructional design models in that it is cyclical, allows flexible transitions between program design stages, and prioritizes learner characteristics. The model consists of nine phases and eight processes that continue throughout the design process and cover the basic phases. At this stage of the research, the path followed by the researchers of the Morrison-Ross-Kemp model is described.

Identifying the need for teaching

In the Morrison-Ross-Kemp instructional design model, identifying instructional problems is the first stage of design. Correctly determining the teaching problem is a fundamental requirement for an effective training program. In this model, three different approaches are used to determine the training problem: needs assessment, goal analysis, and performance evaluation. In this study, needs assessment and target analysis approaches were used. The needs assessment consists of four stages: planning, data collection, data analysis and final report:

Planning: The Morrison-Ross-Kemp model identified six categories of needs. It is thought to fall into the categories of Felt Needs and Projected or Future Needs for the "Food Literacy Program". *Felt Needs:* It refers to the performance gap felt by the target audience or instructional designer in terms of improving the current performance. In this context, it suggests that primary school students do not have complete healthy eating habits and that education on this subject should be provided. *Projected or Future Needs:* It indicates the needs that are thought to arise in the future. This curriculum will be needed to minimise nutrition-related health problems of primary school students in later ages and to prevent the wrong

nutritional behaviours that may be imposed through both the environment and social media during adolescence.

It was decided to collect data for these two different types of needs (felt and projected needs). Primary school 4th grade students are the target audience for the needs analysis. The data were obtained with a questionnaire prepared by the designers. The questionnaire used in the needs analysis consists of 10 yes/no questions presented in Table 2, which aim to assess students' knowledge and behaviour regarding nutrition literacy. The questionnaire was administered to the students as a written document, and sufficient time was given after the necessary explanations were made for them to answer. The needs analysis was completed by calculating the frequency percentages of the survey items.

Data collection and data analysis: The participants of the needs analysis consisted of 28 students attending the 4th grade of primary school. The needs analysis form was developed by analyzing the Turkish Nutrition Guide (TÜBER) published by the Republic of Türkiye Ministry of Health Directorate General of Public Health (2022), the Turkish Food Literacy Strategy and Action Plan 2022-2028 published by FAO (2023), and various studies (Aktaş & Özdoğan, 2016; Bahar & Yılmaz, 2021; Öztürk, 2010) . Table 2 shows the needs, in line with these results, in the next Goal Analysis step:

Table 2

Needs Analysis Results Frequencies an Percentages Table

QUESTIONS	YES (f)	YES(%)	NO (f)	NO (%)
1. Is there a relationship between healthy eating and food literacy?	17	60,7	11	39,3
2. Should people with diseases such as diabetes and celiac disease change their diet?	19	67,9	9	32,1
3. Do you know what should be on a healthy dinner plate?	23	82,1	5	17,9
4. Should vegetables and fruits be on a healthy dinner plate?	23	82,1	5	17,9
5. Are meat and milk grain group foods?	13	46,4	15	53,6
6. Should your fluid consumption be higher when doing a physical activity?	3	10,7	25	89,3
7.Would you rather eat popcorn without oil and salt?	10	35,7	18	64,3

8. Have you ever read the portion information written on the nutrition label of a packaged food?	19	67,9	9	32,1
9. Do you have any information on what the ALO 174 line is about?	5	17,9	23	82,1
10. Do you prefer healthy snacks like vegetable chips for your birthday?	19	67,9	9	32,1

Final report: According to the information obtained from the questionnaire applied for the needs analysis, the students were found to have very little information about the safe food line ALO 174, the importance of fluid consumption in different conditions, and the special diets of genetic and non-communicable chronic diseases. In addition, they did not provide the expected level of responses in terms of food groups, nutrition label reading behavior and preference for healthy foods. In light of these results, it is thought that the target audience's needs can be met with the Food Literacy Program.

Goal analysis

Goal analysis is applied as a complement to a needs assessment or assuming a teaching need. The target analysis of this study was carried out through a literature review. Goal analysis is cascaded as Setting Goals, Reviewing Goals, Ranking Goals, Revisiting Goals and Final Order of Goals. From the goal analysis, the objectives are listed as having healthy nutrition knowledge, being able to list food groups, preparing healthy eating plates, defining food literacy, defining food safety, preferring sustainable and ethical food consumption, and recognizing healthy food preparation methods.

Learner characteristics and context analysis

One of the most important steps of the Morrison-Ross-Kemp instructional design approach is the correct analysis of the characteristics of the people who will participate in the training, as they significantly influence the general structure of the education program. In the model, various factors that may affect teaching positively or negatively are analyzed under the heading of context analysis.

In this study, the learners are primary school fourth-grade students. The target group of the training is 17 girls (60.7%) and 11 boys (39.3%) between the ages of 9–10. Students do not have a chronic illness that would prevent them from participating in food literacy education. Due to their age, students show behaviors such as preparing their own lunch boxes, shopping for food from the school canteen, and preparing foods that do not require long cooking, at home. Considering this training program and student characteristics, it is recommended that techniques such as group work, direct lecture, question-answer, demonstration and project-based activities can be used, and individual learning techniques should not be included because there are no students with learning difficulties. There are

two Syrian refugee students in the class, who are the target audience of the training. These two students speak and understand Turkish fluently because they have been living in Turkey for many years. In the activities to be held during the training program, examples of neighboring countries' or world cuisine dishes were given to appreciate the richness that arises from ethnic differences. There are no learners with disabilities in the classroom where the training program is implemented. These analyses of students were used during the design of the educational program. According to Morrison et al. (2012), cultural differences, in addition to personal and social characteristics, should be taken into account in the design phase of educational programs. The characteristics of learners are extremely important in selecting unbiased teaching materials and avoiding unequal learning situations (Pollock, 2001). This information shows that students participating in the training possess the manual and other motor skills required as prerequisites for the training, and that the cultural differences of refugee students who do not have language problems are taken into account in the program design phase.

64.3% of students stated that they did not have information about Food Literacy education, while 89.3% stated that Food Literacy education was necessary. In addition, 82.1% of students stated that they could participate in education even during extracurricular times. This also shows that students have the necessary motivation for this training program. Lighting, noise, temperature, seating arrangement, equipment, and transportation conditions of the classroom environment meet the requirements for the implementation of this program. Based on the applied research form, it was revealed that 75% of the students thought that the information they would acquire through Food Literacy training would affect their healthy eating behaviours.

Task analysis

In the Morrison-Ross-Kemp model, task analysis is performed with three techniques. These are topic analysis, which provides the identification of cognitive information, method analysis, which examines tasks that require psychomotor skills and the critical event method, which analyzes interpersonal skills and attitudes. The main purpose of the task analysis is to determine the knowledge and skills necessary to meet the identified teaching needs. In addition to facts and concepts such as "diabetes, obesity, sedentary behavior" to be conveyed to students in the eight main themes determined for the FLP, additional resources will be provided. Analyses of methods that require psychomotor skills, such as "preparing a healthy eating plate," were conducted using document reviews.

Instructional objectives

The goals set in the Goal Analysis phase for the FLP were followed by the process of writing behavioral objectives that align with the goals. Considering the Task Analysis phase, target behaviors for cognitive and affective areas were written, ensuring clarity in the learning objectives. Example behaviors are shown in Table 3.

Table 3

FLP Sample Goal-Behaviors

Theme 1. Healthy Eating
1. Tells the definitions of health, nutrition and healthy eating.
2. Lists common non-communicable chronic diseases in Turkey and in the world.
3. Establishes the relationship between healthy nutrition and non-communicable chronic diseases.
Theme 7. Sustainable and Ethical Food Consumption
2. Selects local and seasonal foods.
3. Regulates food consumption in a way that reduces waste.
4. Prefers to use environmentally friendly and recyclable food packages.

Content sorting

In this section, the objectives identified in the previous section are ranked according to the ranking schemes of Posner and Strike (1976). Three types of sort schemes are proposed by Posner and Strike (1976). In the first scheme related to learning, the characteristics, interests, prerequisite knowledge and mental development of learners are taken into account (Posner and Strike, 1976, as cited in Morrison et al., 2012). Another scheme is the ordering of concepts. In this scheme, it is proposed to teach concepts gradually, follow a path from the concrete to the abstract, and provide logical prerequisites. Considering the needs analysis and the goals set, the ranking charts determined by Posner and Strike (1976) were applied to the FLP. The objectives of the program were revised -as shown in Figure 1- according to the logical order of student characteristics and concepts, as well as the order in which the program will keep student motivation at a high level.

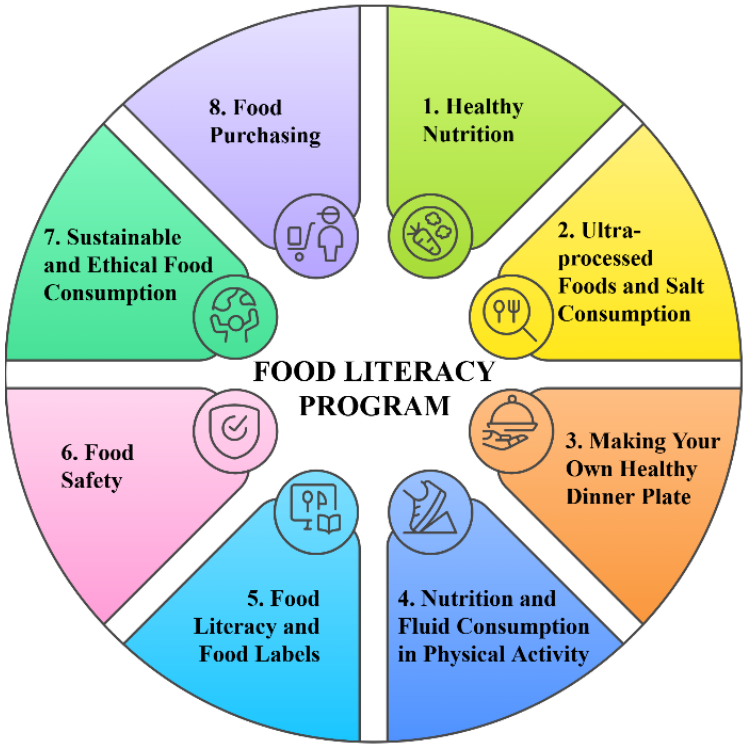


Figure 1. Sorted food literacy program themes

Instructional strategies

The classification of the goals, the characteristics of the learners, and their active participation in the course were considered while determining the teaching strategy to realize permanent learning. As suggested by the model, "Initial Presentation, Productive Strategy and Motivation Strategies" were determined for each goal. Some example strategies are presented in Table 4.

Table 4

Exemplary Teaching Strategies for the FLP

Goal 1. 2. It lists the common non-communicable chronic diseases in Turkey and in the world. *Motivation Strategy: A* video showing the difficulties experienced by an obese person while doing daily tasks such as climbing stairs and wearing clothes and shoes is watched. *First Presentation: Definitions of obesity, diabetes, cancer, and cardiovascular diseases are accompanied by visuals that will illustrate these diseases.* *Generative Strategy: Explains* their own ideas by thinking about the difficulties experienced by people with these diseases in their immediate environment.
Goal 5. 2. Using model foods, it selects the diet and the amount of fluid for different activity states.

First Presentation: The pyramid of healthy eating and physical activity is explained through projecting it on the screen. Then, a healthy dinner plate is prepared by the teacher according to the students' physical activity status.
Generative Strategies: Students in the classroom are asked to prepare new healthy eating plates according to the physical activity status expressed by the teacher.

Instructional message design and developing ınstructional material

At this stage of the design, the teacher's guidebook and the student's book were designed. To make the teaching rich and remarkable, the pre-regulators recommended by the Morrison-Ross-Kemp model were used at the beginning of the chapter. At the beginning of each theme, a short story is presented to draw attention to the theme objectives. The student who will read this story will have preliminary knowledge about the subject and will be curious to learn more about it.

Universe and Sample of the Research

The population of the study comprises primary school students studying in the 4th grade in the 2024-2025 academic year. The sample group consisted of 26 students studying in the fourth-grade in a primary school in Kayseri, 14 girls (54%) and 12 boys (46%), who were selected by typical case sampling technique, which is one of the purposive sampling methods. The typical case sampling method is a non-probability method. The sample selected by this method is expected to represent the universe in the most typical way (Büyüköztürk et al., 2021; Cohen et al., 2021; Gürbüz & Şahin, 2018). Since the curriculum designed for the research is aimed at being applied to students in the 10-12 age group, it was found appropriate to sample the students studying in the 4th grade.

Data Collection Tools and Implementation

An achievement test was prepared for data collection in the study. The achievement test, used as a pre-test and post-test in accordance with the experimental design, is a multiple-choice test prepared by researchers with FLP targets in mind. The test questions cover topics such as food groups, healthy eating habits, food label reading behaviours, and sustainable and ethical food consumption. The test aims to measure not only the knowledge level of food literacy but also comprehension and application skills, as well as objectives related to the affective domain. Here are a few example questions from the achievement test: 'Why is it important to limit the consumption of ultra-processed foods?' 'Which of the following statements is a result of exceeding daily salt intake?' 'What is the fundamental principle underlying sustainable food consumption?'

A pool of 40 questions was created for the achievement test; expert opinions were obtained as part of validity studies; and the test was piloted in a different fourth-grade class at the same school. The questions were revised based on the item difficulty and

discrimination coefficients obtained at the end of the pilot application, and the test was finalized with 31 questions. The Kuder Richardson, (KR-20) reliability coefficient should be preferred because the answers given to a success test are evaluated as correct or incorrect with two options. A KR-20 coefficient above 0.70 is an appropriate value for the reliability of the test (Büyüköztürk et al., 2021). The KR-20 coefficient for the prepared achievement test was calculated as 0.79 for the pre-test and 0.84 for the post-test. Before the application started, the necessary information was given to the students, and a pre-test was conducted. After the pre-test, the FLP, which was designed for 12 hours, was carried out with 26 students, and the post-test took place at the end of the application.

Data Analysis

In the research conducted using a single-group pre-test-post-test design, the pre-test and post-test were applied to the sample group. The success scores obtained from the pre-test and post-test were subjected to normality tests separately. In addition to the skewness and kurtosis coefficients, the Shapiro-Wilk normality test was taken into account because the sample was less than 30 people (Uysal & Kılıç, 2022). As can be seen in Table 5, a paired samples t-test was applied to understand the difference between the pre-test and post-test success scores due to the normal distribution of the data.

Table 5

Pre-Test and Post-Test Normality Test Results

			Shapiro-Wilk		
	Skewness	**Kurtosis**	**Statistics**	**Sd**	**p**
Pre-Test	-,147	-,448	,983	26	,923
Post-Test	-,255	-,448	,940	26	,137

Ethical Considerations

In the course of this research, we paid scrupulous attention to ethical guidelines, ensuring that the integrity and reliability of the study were never compromised. In alignment with the overarching commitment to ethics, this study stringently adhered to all provisions delineated in the "Higher Education Institutions Scientific Research and Publication Ethics Directive." It is imperative to note that there were no activities, which might infringe upon the clauses stated under the "Actions Against Scientific Research and Publication Ethics.

Ethical Review Board: Erciyes University Social Sciences Ethics Committee

Date of Ethics Review Decision: 30/01/2025

Ethics Assessment Document Issue Number: 019

In addition, permission to conduct research at the school was obtained in accordance with the provisions of the "Research Implementation Permits regulation of the Ministry of National Education".

Application Board: Research Application Permits Application and Evaluation System

Date of Application Decision: 18/02/2025

Application Document Number: MEB.TT.2025.019251

FINDINGS

Within the scope of this study, a quantitative, quasi-experimental research model using a single-group pre-test and post-test was designed to examine the effect of a Food Literacy Program developed using the Morrison-Ross-Kemp instructional design model on the food literacy behaviours of primary school students. The study was conducted with 26 fourth-grade students (14 girls and 12 boys) attending an elementary school in Kayseri during the 2024-2025 academic year. Although the gender distribution was reported for descriptive purposes, gender-based analyses were not performed, as this was not the focus of the study. The intervention process lasted 12 class hours over 3 weeks. In the first class hour, the students completed the pre-test; the FLP was applied for 10 class hours, and the post-test was administered in the last class hour. A 31-item achievement test consisting of multiple-choice questions was used as the pre-test and post-test. The data were analysed using the IBM SPSS 25.0 software package. The normality of the data was verified using skewness-kurtosis coefficients and the Shapiro-Wilk normality test. The Levene test was performed to determine whether the pre-test and post-test scores showed homogeneous variance. The results of the Levene test indicated that the pre-test ($F=1.321$; $p>0.05$) and post-test ($F=1.137$; $p>0.05$) scores had homogeneous variance. The results of the analysis of the paired samples t-test are shown in Table 6. The significance level of the test was determined as $p < 0.05$.

Table 6

Pre-Test and Post-Test Scores Paired Samples t-test

	n	$\bar{x}$	ss	t-test		
				t	sd	p
Pre-Test	26	17,31	6,032	-4,866	2,338	,00*
Post-Test	26	19,54	5,602			

*p<0.05

As seen in Table 6, the post-test mean of the students ($\bar{x}=19.54$; $ss=5.602$) is higher than the pre-test mean ($\bar{x}=17.31$; $ss=6.32$). The score obtained for the difference between the two test scores [$t(2.338)=-4.866$; $p<0.05$] shows that this difference is statistically significant. The

effect size calculated using Cohen's d coefficient is 0.38. This indicates that the intervention had a small practical effect on students' food literacy. These findings indicate that the FLP provided a significant increase in student achievement levels, and therefore the programme was effective.

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

In this study, the FLP designed by the researchers based on the Morrison-Ross-Kemp instructional design model was applied, and as a result, it was determined that the FLP was effective in instilling food literacy behaviors in primary school students, including sustainable development goals. In parallel with these results, Ünver and Ünüsan (2005) reported that the nutrition education program applied to preschool students had positive effects on the students. On the other hand, Gümüş Şekerci (2019) observed a significant increase in the nutritional self-efficacy, attitude, and behavior scores of primary school students classified as having low body mass index following nutrition education for the experimental group. In Italy, Scazzocchio et al. (2021) stated that the nutrition program called 'MaestraNatura', which was implemented in schools with 1390 students between the ages of 6-13, received the approval of 94% of the teachers, and that this program provided a n improvement in the students' nutritional habits. In their research on the nutritional habits of adolescents, Ghadirian et al. (2022) stated that supporting adolescents with low literacy levels in critical nutritional literacy with participatory video programs improved food knowledge and food choices. Studies conducted by Begley et al., (2019, 2020) and Meyn et al. (2022) on adults state that well-designed food literacy programs improve adults' long-term food literacy and dietary intake, and that these programs are also effective in areas such as food management, selection, and preparation. In light of all these studies, it can be stated that well-prepared food literacy programs are effective in individuals' healthy interaction with food. Demirci and Çelik (2022), Bahar and Yılmaz (2021) and Arslan et al. (2024) stated that individuals should be given food literacy through educational programs. Kempler et al. (2024) pointed out that individuals should be introduced to food literacy programs at an early age. Ertaş Öztürk et al. (2024) stated that sustainable development awareness gained at an early age will increase sustainable agricultural activities and develop ethical food consumption behaviors, thereby creating a supply-demand balance.

In light of all these studies, it can be said that the Morrison-Ross-Kemp instructional design model provides an appropriate framework for teaching content that includes cognitive and affective goals such as food literacy. The findings reveal that the model supports the achievement of behavioral goals such as sustainable nutrition, reading food labels, and conscious food consumption, thanks to its structured and student-centered approach. It has been demonstrated that this model can provide an appropriate instructional structure for the implementation of food literacy programs. This forms the basis for the following recommendations.

The findings are valid for a small sample group receiving fourth-grade education, and should be carefully evaluated before being generalized to larger sample groups. Similar programs may be beneficial when applied to students in other regions, taking into account local needs and the needs of different socioeconomic levels. Following these applications, the effectiveness of food literacy programs mentioned in the literature when incorporated into the education system as elective courses, may contribute to students making healthy and sustainable food choices.

The effect size of the study is between small and medium according to Cohen's classification. This indicates that the intervention has a positive effect, but its practical power remains limited. Therefore, it is recommended that future interventions be planned for longer periods, the content be intensified, and different measurement tools be used. Additionally, it is believed that the program's impact can be more accurately assessed with larger samples and controlled research designs.

REFERENCES

Aktaş, N., & Özdoğan, Y. (2016). Gıda ve beslenme okuryazarlığı [Food and Nutrition Literacy]. *Harran Tarım ve Gıda Bilimleri Dergisi*, *20*(2), 146–153. https://doi.org/https://doi.org/10.29050/harranziraat.259105

Arslan, N., Ayyıldız, F., & Esin, K. (2024). A mediation model of food literacy: a potential relationship between body ımage dissatisfaction and body mass ındex. *Medicina (Lithuania)*, *60*(8), 1196. https://doi.org/10.3390/medicina60081196

Bahar, M., & Yılmaz, M. (2021). Gıda okuryazarlığı: Bileşenlerin tespiti ve tanımlanması [Food literacy: The determination and the identification of its components]. *International Journal of Social Sciences and Education Research*, *7*(1), 38–62. https://doi.org/10.24289/ijsser.836121

Begley, A., Dhaliwal, S., & Paynter, E. (2018). Evaluation tool development for food literacy programs. *Nutrients*, *10*. https://doi.org/10.3390/nu10111617

Begley, A., Paynter, E., Butcher, L., Bobongie, V., & Dhaliwal, S. (2020). Identifying who ımproves or maintains their food literacy behaviours after completing an adult program. *International Journal of Environmental Research and Public Health*, *17*(12), 4462. https://doi.org/10.3390/ijerph17124462

Begley, A., Paynter, E., Butcher, L., & Dhaliwal, S. (2019). Effectiveness of an adult food literacy program. *Nutrients*, *11*(4), 797. https://doi.org/10.3390/nu11040797

Block, L. G., Grier, S. A., Childers, T. L., Davis, B., Ebert, J. E. J., Kumanyika, S., Laczniak, R. N., Machin, J. E., Motley, C. M., Peracchio, L., Scott, M., & Van Ginkel Bieshaar, M. N. G.

(2011). From nutrients to nurturance: A conceptual introduction to food well-being. *Journal of Public Policy and Marketing*, *30*(1), 5–13. https://doi.org/10.1509/jppm.30.1.5

Bounihi, A., Koceir, E., Saidi, H., & Benbaibeche, H. (2023). Emotional and external eating styles associated with obesity. *Journal of Eating Disorders*, *11*. https://doi.org/10.1186/s40337-023-00797-w

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2021). *Eğitimde bilimsel araştırma yöntemleri* [Scientific research methods in education] (31st ed.). Pegem Akademi Yayıncılık.

Ceyhun Sezgin, A., Eroğlu, F. E., & Şanlıer, N. (2023). Evaluation of sustainable nutrition models. *Turkish Journal of Agriculture-Food Science and Technology*, *11*(3), 603–616. https://doi.org/10.24925/turjaf.v11i3.603-616.5726

Cohen, L., Manion, L., & Morrison, K. (2021). *Eğitimde araştırma yöntemleri* [Research methods in education] (E. Dinç & K. Kıroğlu, Trans.; 8th ed.). Pegem Akademi.

Demirci, Z. A., & Çelik, B. (2022). Gıda okuryazarlığı ve sağlıklı yaşam biçimi davranışları arasındaki ilişki [The Relationship between Food Literacy and Healthy Lifestyle Behaviours]. *Bilecik Şeyh Edebali Üniversitesi Sosyal Bilimler Dergisi*, *7*(1), 104–110. https://doi.org/10.33905/bseusbed.1081438

Dülger, H., & Ayaz-Alkaya, S. (2024). The effect of health literacy-grounded web-based education on nutrition and exercise behaviours in adolescents: A randomized controlled trial. *International Journal of Nursing Practice*, *30*(5), e1325. https://doi.org/10.1111/ijn.13253

Ertaş Öztürk, Y., Kabalı, S., Açar, Y., Ağagündüz, D., & Budán, F. (2024). Adaptation of the food literacy (FOODLIT) tool for Turkish adults: A validity and reliability study. *Nutrients*, *16*(19), 3416. https://doi.org/10.3390/nu16193416

Fanzo, J. (2019). Healthy and sustainable diets and food systems: The key to achieving sustainable development goal 2? *Food Ethics*, *4*, 159–174. https://doi.org/10.1007/s41055-019-00052-6

Food and Agriculture Organization of the United Nations. (2023). *Türkiye gıda okuryazarlığı stratejisi ve eylem planı 2022–2028* [Turkey food literacy strategy and action plan 2022–2028]. Retrieved April 28, 2024, from https://www.tarimorman.gov.tr/GKGM/Belgeler/DB_Gida_Isletmeleri/Gida_Okuryazarligi_Eylem_Plani.pdf

Fer, S. (2015). *Öğretim tasarımı* [Instructional design] (3rd ed.). Anı Yayıncılık.

Ghadirian, M., Marquis, G., Dodoo, N., & Andersson, N. (2022). Participatory video intervention increased critical nutrition literacy of Ghanaian adolescent girls: a cluster

randomized control trial. *Current Developments in Nutrition*, *6*(8), 833. https://doi.org/10.1093/cdn/nzac065.017

Gümüş Şekerci, Y. (2019). Zayıf öğrencilere yönelik uygulanan sağlıklı beslenme programının etkisi: Bir randomize kontrollü çalışma [The effect of a healthy nutrition program applied to underweight students: A randomized controlled trial]. *Van Sağlık Bilimleri Dergisi*, *3*(12), 21–30.

Gürbüz, S., & Şahin, F. (2018). *Sosyal bilimlerde araştırma yöntemleri: Felsefe-yöntem-analiz* [Research methods in social sciences: Philosophy-method-analysis] (5th ed.). Seçkin Yayıncılık.

Honda, T., Ishida, Y., Shibata, M., Sakata, S., Furuta, Y., Kitazono, T., Ninomiya, T., Hirakawa, Y., Yoshida, D., Oishi, E., & Hata, J. (2020). Influence of the accumulation of unhealthy eating habits on obesity in a general japanese population: the hisayama study. *Nutrients*, *12*. https://doi.org/10.3390/nu12103160

Jin, X., Qiu, T., Li, L., Yu, R., Chen, X., Li, C., Proud, C. G., & Jiang, T. (2023). Pathophysiology of obesity and its associated diseases. *Acta Pharmaceutica Sinica. B*, *13*, 2403–2424.

Kempler, J. V., Booth, A., Margerison, C., & Nanayakkara, J. (2024). Food, nutrition and sustainability education in Australian primary schools: a cross-sectional analysis of teacher perspectives and practices. *Archives of Public Health*, *82*(1), 222. https://doi.org/10.1186/s13690-024-01449-4

Kumar, M., Choubey, V. K., Sharma, M., Mangla, S., & Raut, R. (2022). Performance assessment of circular driven sustainable agri-food supply chain towards achieving sustainable consumption and production. *Journal of Cleaner Production*, *372*. https://doi.org/10.1016/j.jclepro.2022.133698

Küçükoğlu, A. (2022). Eğitim programı ve öğretim sürecinin tasarımı [Design of curriculum and instructional process]. In K. Selvi (Ed.), *Öğretim teknolojileri ve materyal tasarımı* [Instructional technologies and material design] (4th ed., pp. 1–41). Anı Yayıncılık.

Lim, H., & Lee, H. (2023). Eating habits and lifestyle factors related to childhood obesity among children aged 5-6 years: Cluster analysis of panel survey data in Korea. *JMIR Public Health and Surveillance*, *10:e51581*. https://doi.org/10.2196/51581

Mathys, A., Chen, C., & Chaudhary, A. (2022). Dietary change and global sustainable development goals. *Frontiers in Sustainable Food Systems*, *6:771041*. https://doi.org/10.3389/fsufs.2022.771041

Mendoza, D., Escuadra, C., Pineda, K., Gonzalez-Suarez, C., Espino, R., Devora, K., & Balid-Attwell, S. (2020). Eating habits of college students in relation to obesity. *Journal of Medicine, University of Santo Tomas*, *4*(2), 500–509. https://doi.org/10.35460/2546-1621.2019-0018

Mensah, K., Rudloff, B., & Wieck, C. (2023). Sustainable food consumption and Sustainable Development Goal 12: Conceptual challenges for monitoring and implementation. *Sustainable Development*, *32*(1), 1109–1119. https://doi.org/10.1002/sd.2718

Meyn, S., Blaschke, S., & Mess, F. (2022). Food literacy and dietary ıntake in German office workers: A longitudinal ıntervention study. *International Journal of Environmental Research and Public Health*, *19*(24), 16534. https://doi.org/10.3390/ijerph192416534

Mızık, E. T., & Avdan, Z. Y. (2020). Sürdürülebilirliğin temel taşı: Ekolojik ayak izi [The Cornerstone of Sustainability: Ecological Footprint]. *Doğal Afetler ve Çevre Dergisi*, *6*(2), 451–467. https://doi.org/10.21324/DACD.630825

Morrison, G. R., Ross, S. M., & Kemp, J. E. (2012). *Etkili öğretim tasarımı* [Effective instructional design] (İ. Varank, Trans.). Bahçeşehir Üniversitesi Yayınları.

Nichifor, B., Zait, L., & Timiras, L. (2025). Drivers, barriers, and ınnovations in sustainable food consumption: A systematic literature review. *Sustainability*, *17*(5), 2233. https://doi.org/10.3390/su17052233

Onofriescu, A., Miler, A., Toader, M., Maxim, M., Ciuntu, B., Trofin, F., Abdulan, I., Vlăsceanu, V., Soroceanu, R.-P., Platon, R., Timofte, D., & Balan, G. (2025). Dietary habits, obesity, and bariatric surgery: A review of ımpact and ınterventions. *Nutrients*, *17*(3), 474. https://doi.org/10.3390/nu17030474

Öztürk, M. (2010). *Çocukların beslenme alışkanlıklarının sağlık davranışı etkileşim modeline göre incelenmesi* [Examination of children's nutritional habits according to the health behavior interaction model] [Doctoral dissertation, İstanbul Üniversitesi]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Philippe, K., De Rosso, S., Varela, P., Nicklaus, S., Mueller, C., Pickard, A., Van Kleef, E., & Ares, G. (2023). Development of food literacy in children and adolescents: implications for the design of strategies to promote healthier and more sustainable diets. *Nutrition Reviews*, *82*(4), 536–552. https://doi.org/10.1093/nutrit/nuad072

Poelman, M., Gillebaart, M., Battjes-Fries, M., Kamphuis, C., Seidell, J., Sponselee, H., & Dijkstra, S. (2018). Towards the measurement of food literacy with respect to healthy eating: the development and validation of the self perceived food literacy scale among an adult sample in the Netherlands. *The International Journal of Behavioral Nutrition and Physical Activity*, *15*(54). https://doi.org/10.1186/s12966-018-0687-z

Pollock, M. (2001). How the question we ask most about race in education is the very question we most suppress. *Educational Researcher*, *30*(9), 2–11. https://doi.org/10.3102/0013189X030009002

Presidency of Strategy and Budget. (2024). Sürdürülebilir kalkınma hakkında temel bilgiler. In *http://www.surdurulebilirkalkinma.gov.tr/temel-tanimlar/*.

Republic of Türkiye Ministry of Health Directorate General of Public Health. (2022). *Türkiye Beslenme Rehberi (TÜBER)*. https://doi.org/https://hsgm.saglik.gov.tr/media/attachments/2025/05/12/turkiye-beslenme-rehberi-2022.pdf

Şahin, M. D. (2024). Sürdürülebilirlik değeri kavramına yönelik bibliyometrik analiz [Bıblıometrıc Analysıs on The Concept of Sustaınabılıty Value]. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, *81*, 321–338. https://doi.org/10.51290/DPUSBE.1487846

Şanlıer, N., & Güler, A. (2005). İlköğretimin ikinci kademesinde eğitim gören öğrencilere verilen beslenme eğitiminin öğrencilerin beslenme bilgi düzeyi ve alışkanlıklarına etkisi [The Effect of the Nutritional Education Given to the Students Attending to the Secondary Stage of the Primary School on Their Nutrition Knoıvledge and Food Habits]. *Beslenme ve Diyet Dergisi*, *33*(2), 31–38.

Scazzocchio, B., Varì, R., d'Amore, A., Chiarotti, F., Del Papa, S., Silenzi, A., Gimigliano, A., Giovannini, C., & Masella, R. (2021). Promoting health and food literacy through nutrition education at schools: The Italian experience with Maestranatura Program. *Nutrients*, *13*(5), 1547. https://doi.org/10.3390/nu13051547

Silva, P., Araújo, R., Lopes, F., & Ray, S. (2023). Nutrition and food literacy: Framing the challenges to health communication. *Nutrients*, *15*(22). https://doi.org/10.3390/nu15224708

Smith, K., Wells, R., & Hawkes, C. (2022). How primary school curriculums in 11 countries around the world deliver food education and address food literacy: A policy analysis. *International Journal of Environmental Research and Public Health*, *19*(4), 2019. https://doi.org/10.3390/ijerph19042019

Republic of Turkey Ministry of Health. (2024). *Sağlık için obezite ile mücadele* [Combating obesity for health]. Retrieved April 28, 2025, from https://www.saglik.gov.tr/TR,11692/obezite.html

United Nations International Children's Emergency Fund Türkiye. (2024). *Krizler 122 milyon kişiyi daha açlığa sürükledi* [Crises have pushed 122 million more people into hunger]. Retrieved April 28, 2024, from https://www.unicefturk.org/yazi/bm-raporu-krizler-122-milyon-kisiyi-daha-acliga-sueruekledi

Uysal, İ., & Kılıç, A. (2022). Normal dağılım ikilemi [Normal Distribution Dilemma]. *Anadolu Journal of Educational Sciences International*, *12*(1), 220–248. https://doi.org/10.18039/ajesi.962653

Ünver, Y., & Ünüsan, N. (2005). Okulöncesinde beslenme eğitimi üzerine bir araştırma [A study on nutrition education in preschool]. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *14*, 529–551. https://dergipark.org.tr/tr/pub/susbed/issue/61791/924103

Vidgen, H. A., & Gallegos, D. (2014). Defining food literacy and its components. *Appetite*, *76*, 50–59. https://doi.org/10.1016/j.appet.2014.01.010

WHO. (2024). *Obesity*. Https://Www.Who.Int/Health-Topics/Obesity#tab=tab_1.

World Wide Fund for Nature. (2014). *Livewell for life*. Retrieved April 28, 2024, from https://livewellforlife.eu/wp-content/uploads/2014/12/LiveWell-for-LIFE_Rec-Report_English_Final.pdf

Yıldırım, M., Kızıltan, G., & Akçil, M. O. (2021). Beslenme okuryazarlığı nedir? [What is Nutritional Literacy?]. *Başkent Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, *6*(BESLENME ÖZEL SAYISI), 1–13.

Yolcuoğlu, İ. Z., & Kızıltan, G. (2021). Beslenme eğitiminin diyet kalitesi, sürdürülebilir beslenme ve yeme davranışları üzerine etkisi [Effect of Nutrition Education on Diet Quality, Sustainable Nutrition and Eating Behaviors]. *Başkent Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, *6*(1), 713–719.

Data Availability Declaration

Data Availability Upon Formal Request:

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

All authors, Mehmet YILDIRIM and Semra DEMİR-BAŞARAN contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. All authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the

content of the paper in case of dispute. The data were collected in the fall semester of 2024-2025.

Statement of interest: We declare no potential conflicts of interest concerning this article's research, authorship, and publication.

Funding: No funding was received to assist with the preparation of this manuscript.

Biographical notes:

Mehmet YILDIRIM[3]*:* Mehmet YILDIRIM completed his BA in Department of Elementary Education and her MA in Department of Educational Administration, Inspection, Planning And Economics. He is currently a PhD student in Curriculum and Instruction. He also works as an Elemantry School teacher in a public school.

Scopus Author Identifier Number: N/A

Web of Science Researcher ID: MVU-7040-2025

Google Scholar Researcher ID:

https://scholar.google.com.tr/citations?hl=tr&user=NR2xpt4AAAAJ

Semra DEMİR-BAŞARAN: Dr. Semra Demir Başaran works as a professor in the department of curriculum and instruction. Her research interests include instructional design, program development, program evaluation, teacher education, and inclusive education.

Scopus Author Identifier Number: 26656532600

Web of Science Researcher ID: AAS-9490-2021

Google Scholar Researcher ID:

https://scholar.google.com.tr/citations?user=TxQpNAEAAAAJ&hl=tr&oi=ao

[3] Corresponding Author

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research Article

Evaluating Mathematical Reasoning Competence: In-Service Teacher Training in Mathematical Literacy Given via Distance Education

Zeynep Özaydın[1] **Çiğdem Arslan**[2]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 454-481
http://www.ijonmes.net

Article Info:

Received 22.11.2024
Revision 08.08.2025
Accepted 30.08.2025

Abstract:

The purpose of this research is to examine the mathematical reasoning competencies of mathematics teachers. As part of the research, mathematics teachers received in-service training in mathematical literacy. Following the training, classroom practices were conducted by these teachers using course modules designed in alignment with the training content. Due to the COVID-19 pandemic, the in-service training and training practices were conducted via online meeting platforms through distance education. In this research, conducted using the case study method, data were collected through open-ended reasoning tests and a basic concept of mathematical reasoning test. The research found that in-service teacher training and training practices delivered through distance education in the field of mathematical literacy had a positive impact on the mathematical reasoning competence of mathematics teachers. While most of the teachers showed a decrease in their scores on the reasoning test administered after in-service training, they achieved their highest score after training practices they implemented in their own classes. After the training practices, it was observed that teachers' perceptions of mathematical reasoning were at a high level.

Keywords:
Distance education, in-service training, mathematical literacy, mathematical reasoning, mathematics teachers.

Citation:
Özaydın, Z., Arslan, Ç. (2025). Evaluating Mathematical Reasoning Competence: In-Service Teacher Training in Mathematical Literacy Given via Distance Education. *International Journal of Modern Education Studies, 9*(2), 454-481. https://doi.org/10.51383/ijonmes.2025.392

[*] This research was produced from the master's thesis completed by the first author under the supervision of the second author.

[1] Ph.D. Student, Bursa Uludağ University, Bursa, Türkiye, zeynepozaydin@uludag.edu.tr
https://orcid.org/0000-0003-1768-3963
[2] Prof. Dr., Bursa Uludağ University, Bursa, Türkiye, arslanc@uludag.edu.tr
https://orcid.org/0000-0001-7354-8155

INTRODUCTION

Mathematics education provides individuals with a broad range of knowledge and skills that will help them understand the physical world and social roles. It also provides a language analyze, explain, predict, and solve problems from a variety of experiences (Ministry of National Education [MoNE], 2005). The understanding of "mathematical literacy" is adopted as the main purpose of mathematics education (Özgen & Kutluca, 2013; Widjaja, 2011), and this concept is discussed in the context of innovations in mathematics education (Özgen & Kutluca, 2013). Mathematical literacy is the ability to formulate, use, and interpret mathematics in a variety of contexts and to recognize the role mathematics plays in the world (Organisation for Economic Co-operation and Development [OECD], 2013; 2017; 2019). According to Wijayanti & Waluya (2018), mathematical literacy is an ability that enables students to use their mathematical knowledge to solve problems they encounter in daily life.

An essential aspect of mathematical literacy is the notion of "mathematical competence" (Maracci, 2021). Mathematical competencies encompass a comprehensive mastery of mathematics, which includes the ability to solve both mathematical and non-mathematical problems (Niss & Jablonka, 2014). The mathematics frameworks of the Programme for International Student Assessment (PISA), an international student assessment program that extensively covers mathematical literacy, deal with mathematical competencies under seven headings (OECD, 2003; 2013; 2017; 2019). These are "mathematical modeling, problem posing and solving, mathematical reasoning, representation, communication, using symbolic, formal and technical language and operations, using mathematical tools.". Mathematical reasoning is one of the three competencies that are at the top of mathematical competencies (Niss & Højgaard, 2019).

Mathematical reasoning is applied across various stages and activities involved in mathematical literacy (OECD, 2013). Mathematical reasoning is clearly included in the most accepted definition of mathematical literacy in the literature and made by the OECD as "Mathematical literacy includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena" (OECD, 2013, p.25). Similarly, Colwell & Enderson (2016) argue that mathematical literacy is a higher order thinking skill, such as analytical thinking and reasoning skills, while De Lange (2003) states that mathematical literacy requires a concentration on reasoning, thinking, and interpretation. The definitions of mathematical literacy in the literature highlight that mathematical reasoning is a key competence critical for it.

In addition to being one of the primary mathematical competencies (Altun, 2020b), mathematical reasoning, a key skill in the field of mathematics (MoNE, 2024), is an essential requirement across all areas of education (Umay & Kaf, 2005). Mathematical reasoning is a cognitive process that involves people reaching conclusions by producing their own knowledge (Kurtz et al., 1999) and is closely related to understanding mathematics (Ev-

Çimen, 2008). It is a natural part of learning levels, from a more general perspective, it is a natural part of all human activities (Venkat et al., 2009).

Given the importance of mathematical reasoning for both mathematics education and mathematical literacy, it is necessary to prepare environments for the development of this skill (MoNE, 2009; Öz & Işık, 2017). Ensuring the development of mathematical reasoning, which is inherent in education, is a common goal in every field (Altıparmak & Öziş, 2005). It is considered essential to raise awareness among students about the value of mathematical reasoning skills, which ease life (MoNE, 2009). Teachers play a crucial role in fostering the development of mathematical reasoning in students by creating supportive environments and raising awareness about its importance.

Considering the great influence of teachers on students' performance (Jahangir et al., 2012), mathematics teachers need to support reasoning and proof skills to achieve high levels of mathematical knowledge and comprehension in students (Yackel & Hanna, 2003). For this reason, teachers should make mathematical reasoning the focus of their classrooms to enhance students' reasoning skills (Ayele, 2017). However, research on teachers' knowledge and understanding of mathematical reasoning indicates that teachers require support to foster and assess various aspects of this competence (Blanton & Kaput, 2005; Bozkuş & Ayvaz, 2018; Jazby & Widjaja, 2019; Loong et al., 2013; Loong et al., 2018). It is possible to provide this support to teachers through professional development programs, distance education, in-service, and pre-service training. Considering the role of teachers in student achievement, researchers are constantly investigating which components constitute quality teaching to make teacher education and professional development programs, along with education policies, more effective and efficient (OECD, 2016). Teachers develop a positive attitude towards such training, but there is a need for studies to test the effectiveness of such training (Karasolak et al., 2012).

This research focuses on the impact of distance in-service training and related practices in mathematical literacy on mathematics teachers, specifically enhancing their skills in mathematical reasoning. The significant role of mathematical reasoning in mathematics education and its importance in mathematical literacy make it a proficiency demanded by various mathematics education curricula worldwide (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2017; MoNE, 2013; New Jersey Mathematics Curriculum Framework [NJMCF], 1996). This research prioritizes examining the level of reasoning competence in teachers who are curriculum practitioners.

Significance of the Study

In Turkey, mathematics curricula vary in their emphasis on the pivotal role of teachers. For example, the "Ministry of National Education Primary School Mathematics Curriculum and Guide for Grades 6-8" published in 2009, explains the role of teachers in the classroom in detail (MoNE, 2009). Other programs published since then (MoNE, 2013; MoNE, 2018) do not address the specifics of teachers' roles in the learning environment.

Indeed, in the Turkey Century Maarif Model, shaped by a holistic approach to education in line with contemporary trends in the 21st century, the duties of teachers have been reconsidered in detail (MoNE, 2024). The shift in emphasis on teacher roles in mathematics curricula over time demonstrates the need for continuous support for teachers to adapt to changing expectations. Considering the multifaceted roles assigned to teachers in the 21st-century educational approach—not only as knowledge transmitters, but also as student guides, technologically equipped, problem posers, problem solvers, critical and creative thinkers, values education supporters, classroom leaders, researchers, and lifelong learners—, it is crucial that teacher training be regularly updated and provided to reflect current developments. This should occur not only before but also throughout their service.

At the same time, in today's changing and developing world, raising mathematically literate students has become a necessity. Given this need, there is a high expectation for teachers to have an adequate understanding of how to integrate the concept of mathematical literacy into their teaching practice whenever and wherever it is required (Doyle, 2007). These expectations, along with the centralization of mathematical literacy in teaching, have necessitated in-service training for mathematics teachers. In many countries, decreasing school budgets have made it difficult for teachers to participate in professional development activities (OECD, 2016). Within the scope of the relevant research, in-service teacher training in mathematical literacy, which was carried out on a voluntary basis by both educators and participants, responds to this challenge.

On the other hand, Bansilal et al. (2015) expressed the importance of planning and implementing educational content so that education systems, through in-service teacher training, can benefit students. In the relevant research, course modules prepared in accordance with the content of in-service teacher training were used in the classes of teachers who participated in the training. Therefore, the information obtained from teacher training being reflected in the education and training process makes the research important.

This research examines teacher training and training practices in the field of mathematical literacy in the context of "mathematical reasoning". For this reason, it is necessary to mention the importance of "mathematical reasoning" for mathematical literacy. "Mathematical reasoning", which is one of the mathematical literacy competencies, clearly takes its place in the definition of mathematical literacy in PISA sources (OECD, 2013, p.25). In the PISA 2022 Mathematics Framework, mathematical reasoning has been focused on as a fundamental aspect of mathematical literacy (OECD, 2023). Moreover, being mathematically literate depends on the ability to apply mathematical reasoning (Santoso & Sari, 2025). From an educational perspective, it has been determined that students who engage in tasks requiring mathematical reasoning have a higher tendency to develop mathematical literacy skills (Lestari et al., 2021). When it comes to engaging students in tasks that require reasoning, the concept of the "teacher", who is undoubtedly the implementing element of education, comes to the fore.

The National Council of Teachers of Mathematics states that when teachers focus on reasoning, students' learning of mathematics will reach a high level (NCTM, 2000); it also mentions the active role of the teacher factor in making reasoning competence functional. Despite reasoning being a competence included in mathematics curricula around the world, research has revealed that teachers struggle to understand, teach, and evaluate mathematical reasoning (Loong et al., 2013; Loong et al., 2018; Clarke et al., 2012; Davidson vd., 2019). When teachers understand how to create opportunities for their students to reason and how to evaluate these reasoning processes, they will be more likely to incorporate reasoning into their mathematics lessons (Sullivan & Davidson, 2014). It is necessary to gain a better understanding of how teachers perceive the role of reasoning in mathematics teaching and assessment practices (OECD, 2023). In the relevant research, teacher training and training practices in the field of mathematical literacy were deemed important because they made positive contributions to teachers' efforts to understand, teach, and evaluate mathematical reasoning.

Another factor that makes the research important is the low number of studies with teachers compared to the studies conducted with students in the literature on mathematical literacy, both articles (Ülger et al., 2020; Erdoğan & Arslan, 2023) and graduate theses (Arslan et al., 2021; Coşkun-Şimşek et al., 2023). Therefore, it is thought that the research will contribute to the literature on mathematical literacy through the use of its sample type.

Purpose and Problems of the Study

The aim of the research is to reveal the effect of in-service teacher training provided through distance education in the field of mathematical literacy and the use of course modules prepared in accordance with the content of the education on the mathematical reasoning competence of mathematics teachers. The problem statement of the research was determined as *"What impact does distance in-service training in mathematical literacy have on the mathematical reasoning competence of mathematics teachers?"*. The sub-problems of the research are as follows: (i) How do teachers perform on reasoning tests? (ii) What are the perceptions of mathematics teachers who have participated in training and training practices about mathematical reasoning?

METHOD

Research Model

This research was conducted using a case study design, one of the qualitative research methods. Qualitative research is a process in which events are observed in real life and presented realistically and holistically (Yin, 2014; Yıldırım & Şimşek, 2018). In qualitative research, data are generally collected from the participants' own environments and interpreted by the researcher through an analysis that derives generalizations from specific cases (Creswell, 2017). Case studies, one of the qualitative research methods, allow us to investigate the effectiveness of an educational process and examine the reasons this process

may or may not be effective (Leymun et al., 2017). The information contained in educational research is process-dependent; it includes information about how the research group is affected in the process. Furthermore, case studies are used when the research problems are related to the process (Rose et al., 2015). This research is suitable for the case study design, which is one of the qualitative research methods, because it presents the data collected in the participants' living spaces in a holistic manner by analyzing them to generalize from specific situations; and reveals the effectiveness of teacher training and practices in the field of mathematical literacy in the context of reasoning through process-oriented research problems.

Participants

The study group of this research consists of six middle school (5th, 6th, 7th and 8th grade level) mathematics teachers who have regularly participated in teacher training and training practices in the field of mathematical literacy. The selection of the study group was carried out according to the criterion sampling method. In the criterion sampling method, all cases that meet the criteria determined by the researcher are included in the study group (Marshall & Rossman, 2014). In the current this research, the criterion for selecting teachers for the study group was determined as "having participated in both mathematical literacy training and training practices and continuing their participation consistently". Teachers work in five state schools in four districts of Bursa in Turkey. Detailed information about the teachers who constitute the study group is provided in Figure 1.

Code: T1 Gender: Female	**Code: T2 Gender: Female**	**Code: T3 Gender: Female**
She has 19 years of professional experience. The middle school offers classes at all grade levels. She has not received any training in mathematical literacy before. She stated that to improve her mathematical literacy. She included the solution of vital problems in her class, the questions she used in her lesson were generally test-type, and she always started her lessons with activities.	She has 8 years of professional experience. The middle school offers classes at all grade levels. She took part in the 6th grade mathematical literacy question writing workshop at the Bursa Measurement and Evaluation Center. She stated that she included real-life problems in her classroom to improve mathematical literacy, and that she paid attention to the use of real data by her students in problem-solving studies.	She has 15 years of professional experience. The middle school offers classes at all grade levels. She has not received any training in mathematical literacy before. To improve mathematical literacy, she stated that she had brainstorming activities in her classroom before starting the subjects.
Code: T4 Gender: Male	**Code: T5 Gender: Female**	**Code: T6 Gender: Female**
He has 17 years of professional experience. The middle school offers classes at all grade levels. He has not received any training in mathematical literacy before. He stated that he made problem-solving practices that measured skills in his classroom to improve mathematical literacy.	She has 6 years of professional experience. The middle school teaches at the 5th, 7th and 8th grade levels. She has not received any training in mathematical literacy before. She stated that to improve mathematical literacy, she carried out studies for students to read and understand Turkish texts in her classroom and carried out mathematical problem-solving studies.	She has 10 years of professional experience. The secondary school teaches at the 5th, 7th and 8th grade levels. She has not received any training in mathematical literacy before. She stated that she used materials, contextual explanations and dynamic software in her lesson to improve mathematical literacy.

Figure 1. Detailed Information about the Teachers in the Working Group

Data Collection Tools

The tools used to collect data in the research are "Reasoning Tests (RT1, RT2, RT3)" and "Basic Concept of Mathematical Reasoning Test". The questions in the "Reasoning Tests (RT1, RT2, RT3)" were selected and compiled by the researchers from various sources

(Altun, 2020a; Altun, 2021a; Altun, 2021b; Altun, 2021c; Consortium for Mathematics and Its Applications [COMAP], 2008 pp.129,138) and were applied before teacher training, after teacher training and after the training practices. Each test consists of four open-ended questions. A sample question from each test is provided in Appendix 1. The questions were presented for the opinion of six experts in the project team. One of the experts who works in the field of mathematical literacy and competencies is a professor, two are associate professors, and three are doctors. Opinions were gathered from experts about whether the questions allow the observation of the reasoning competence of the individual, and whether the tests are equivalent to each other. At the same time, they were asked to make suggestions for making the questions more insightful. Considering the suggestions of the experts, the questions have been revised and deepened.

The "Basic Concept of Mathematical Reasoning Test", which is applied at the end of the training practices, was prepared by the researchers to reveal the mathematical reasoning perceptions of the teachers after the training and training practices. The prepared questions were examined by the field expert in terms of whether they were relevant to the field of reasoning or not. It was decided that all the questions of the open-ended test were aimed at the concept of mathematical reasoning. The questions in the test are "(i) What is mathematical reasoning? (ii) How do you know that your students are reasoning? (iii) What are the indicators of reasoning?"

Data Collection Process

This research was carried out during the 14-session in-service teacher training and practices of the project titled "Increasing the Level of Mathematical Literacy with Dual Focus Teaching Model (Cift Odaklı Öğretim Modeli – COM). In-service teacher training, consisting of five main parts (i. what is mathematical literacy, ii. choosing and writing a mathematical literacy question, iii. adapting the teaching content to mathematical literacy, iv. introducing the COM and v. module development, planning, and implementation suitable for COM), was organized and carried out in a structure that would deepen the understanding of mathematical literacy (Altun et al., 2024). In-service teacher training and practices were carried out in the form of distance education on online meeting platforms due to the COVID-19 pandemic.

Data were collected in stages. After determining the teachers who would participate in the training, "RT1" was administered to teachers before the training and "RT2" afterward. Teachers who participated in the teacher training and wanted to join the training practices were selected on a voluntary basis. The practice teachers used the COM course modules (prepared by the project team) that matched the training content in an online classroom environment for an educational training period. At the end of this period, "RT3" and "Basic Concept of Mathematical Reasoning Test" were administered to practice teachers. The data collection process is shown in Figure 2.

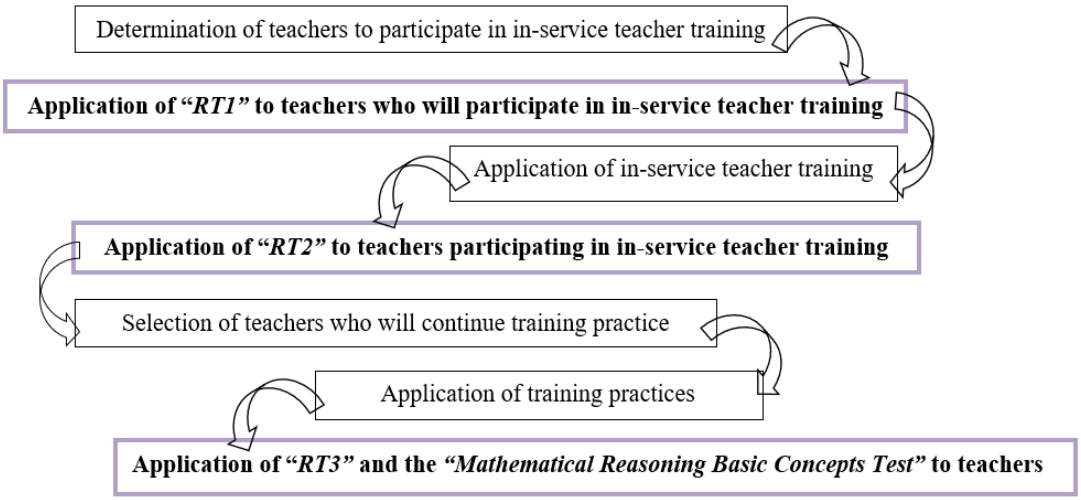


Figure 2. Data Collection Process

The Role of the Researcher

The researchers are in the team of the project in which the research is produced. They took an active role in every stage of in-service teacher training in the field of mathematical literacy carried out within the scope of the project. In line with the content prepared by the project coordinator, the materials and documents were made ready for implementation over 14 sessions of the teacher training. The organization of the online sessions, the sharing of participation information with teachers, and conducting the training sessions were carried out by the researchers.

In qualitative research, a researcher is a person who spends time in the field of data collection, communicates directly with the study group, witnesses the experiences of the study group, and reflects the perspective gained in the field of data collection to the analysis of the data (Yıldırım, 1999). In this research, the participating teachers were able to communicate with the researchers whenever they needed and were able to find solutions and answers to their problems. As a result of this situation, the researchers became acquainted with the participating teachers closely.

After the teacher training, the researchers took an active role in preparing the COM course modules aligning with the training content and delivering them to the participating teachers. The researchers applied the "Reasoning Tests (RT1, RT2, RT3)" and the "Basic Concept of Mathematical Reasoning Test" and collected the data. The data collected were analyzed by the researchers.

Data Analysis

For the first research problem, RT1, RT2, and RT3 were applied. The obtained data were analyzed and scored using the "Reasoning Competence Rubric (RCR)" developed by Özaydın & Arslan (2022). To apply RCR in data analysis, the criteria within RCR that could be observed through the test questions were first identified. The criteria established by the expert were kept numerically consistent across all tests, ensuring that the maximum

obtainable score was equal for each test (Figure 3). Appendix 2 includes justifications for the criteria in a sample problem, and the rubric indicating how many points will be received from each criterion in different situations. In determining the criteria, the percentage of agreement between the researchers was calculated using the reliability formula proposed by Miles & Huberman (1994). By determining the criteria, the percentage of agreement between the researchers was calculated to be 90.2%, and this rate is sufficient for the evaluation results to be considered reliable (Miles & Huberman, 1994; Şencan, 2005).

	RT1				RT2				RT3			
	Question 1	Question 2	Question 3	Question 4	Question 1	Question 2	Question 3	Question 4	Question 1	Question 2	Question 3	Question 4
K1							+	+	+			
K2	+	+		+	+	+		+	+	+	+	+
K3			+					+				
K4	+	+	+	+		+	+			+		+
K5			+		+	+	+		+			
K6	+	+	+	+	+	+	+	+	+	+	+	+
K7							+					+
K8	+	+			+		+		+	+	+	+
K9	+	+	+	+	+	+		+	+		+	+
K10	+	+			+	+			+	+	+	
K11		+	+	+		+					+	
K12												
Max Score	12	14	12	10	12	14	12	10	14	10	12	12
Min Score	0	0	0	0	0	0	0	0	0	0	0	0
Sum Max Score	48				48				48			
Sum Min Score	0				0				0			

Figure 3. Scores that can be Obtained for the Criteria in the Tests

For the second research problem, "Basic Concept of Mathematical Reasoning Test" was applied. The data obtained were analyzed using the mathematical reasoning perceptions framework (Figure 4) defined by Herbert et al. (2015) to reveal the perceptions of mathematical reasoning of mathematics teachers who participated in training and training practices. The framework consists of hierarchical categories. Loong (2014) states that this framework can be a tool for assessing teachers' awareness of different aspects of reasoning over time and comparing their perceptions. This framework facilitates the monitoring of perceptions to assess the effectiveness of learning opportunities (Herbert et al., 2015).

Category	Perception of mathematical reasoning
Category A	Reasoning is perceived to be thinking
Category B	Reasoning is perceived to be communicating thinking
Category C	Reasoning is perceived to be problem solving
Category D	Reasoning is perceived to be validating thinking
Category E	Reasoning is perceived to be forming conjectures
Category F	Reasoning is perceived to be using logical arguments for validating conjectures
Category G	Reasoning is perceived to be connecting aspects of mathematics

Figure 4. Teachers' Perceptions of Mathematical Reasoning (Herbert et al., 2015)

The Role of the Researcher Validity and Reliability of Data

Validity is related to the accuracy of research results (Baltacı, 2019). The researcher's presentation of the data to expert review contributes positively to the validity (Denzin & Lincoln, 2008; Merriam, 1998). Expert opinions were consulted at every stage of the relevant research, such as the preparation of data collection tools, the preparation and selection of tools in data analysis, and the interpretation and confirmation of the findings. Miles and Huberman (1994) emphasized that to ensure validity in qualitative research, the researcher must be consistent in the analysis and interpretation of data. Clearly expressing the scoring analyses (Appendix 2-3) for the rubric used in the study and sharing these with the reader provide evidence of the researcher's consistency in data analysis and interpretation. Merriam (1998) stated that long-term observations in case studies enhance validity. In this case, it can be said that the validity is ensured by collecting the data of the relevant research in three stages (pre-training, post-training, post-training practices) over a period of approximately nine months.

Reliability is related to the reproducibility of research results. Because human behavior is highly variable, measuring reliability poses challenges in social science research (Miles & Huberman, 1994). LeCompte & Goetz (1982) stated that clearly expressing the position of the researcher in the research increases reliability. Yin (2014) indicated that supporting the research with documents enhances its reliability. Additionally, Miles & Huberman (1994) noted that explaining in detail the data collection tools, the data collection process, and how the data was analyzed further increases reliability In this research, reliability was ensured by clearly stating the role of the researcher, supporting the findings with photographs of teacher responses, and providing a detailed explanation of the data collection tools, the data collection process, and how the data were analyzed.

Ethical considerations

Ethical Review Board: Bursa Uludağ University Research and Publication Ethics Committees, Social and Human Sciences Research and Publication Ethics Committee

Date of Ethics Review Decision: 25.10.2018

Ethics Assessment Document Issue Number: 2018-09

RESULTS

The first sub-problem of the research is "How do teachers perform on reasoning tests?". It is possible to observe the findings related to this problem through the scores of the teachers with the codes T1, T2, T3, T4, T5, and T6 on the "Reasoning Tests (RT1, RT2, RT3)". After the teachers' answers to the reasoning tests were interpreted according to the criteria in the RCR, they were scored accordingly. Details of the process analyzing two sample teacher responses and their scores, against the criteria, are included in Appendix 3. The scores were reflected in the graph, thus revealing the trend in the teachers' scores from the reasoning tests. Teachers' scores on reasoning tests are presented in detail in tables, along with the test questions. Subsequently, graphs of the scores were organized to illustrate the progression of the results. The scores of the teachers from the questions in the tests are given in Table 1.

Table 1

Teachers' scores on RT1, RT2, and RT3

	RT1					RT2					RT3				
Tecaher Code	Question 1	Question 2	Question 3	Question 4	**Sum**	Question 1	Question 2	Question 3	Question 4	**Sum**	Question 1	Question 2	Question 3	Question 4	**Sum**
T1	6	9	7	7	**29**	9	1	10	0	**20**	10	8	5	7	**30**
T2	10	8	6	8	**32**	9	12	8	9	**38**	13	10	10	12	**45**
T3	10	13	4	9	**36**	8	12	8	7	**35**	11	10	11	12	**44**
T4	4	14	12	6	**36**	12	7	6	8	**33**	14	8	11	8	**41**
T5	10	9	9	9	**37**	12	8	6	7	**33**	13	10	9	11	**43**
T6	8	7	10	10	**35**	12	8	8	6	**34**	12	10	9	12	**43**

Figure 5, prepared to show the progression of the test scores of all teachers, is given below.

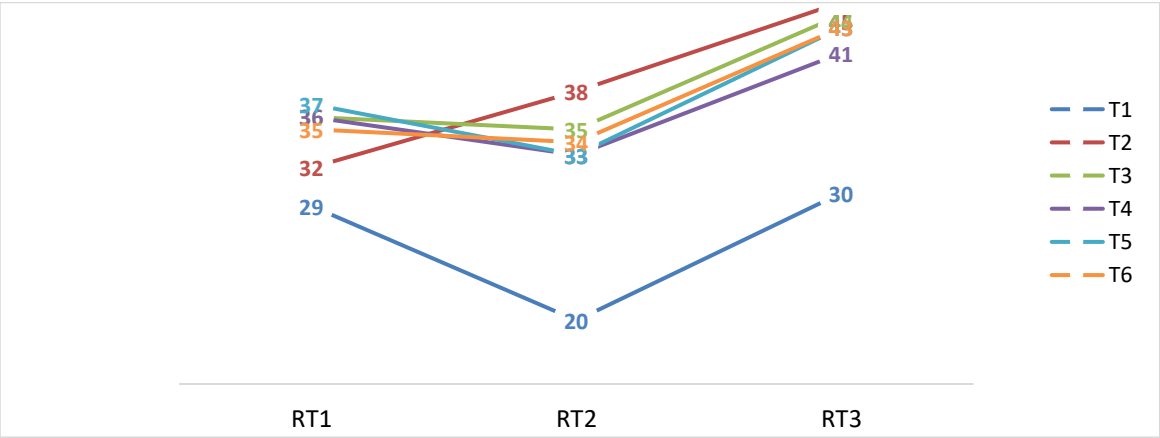


Figure 5. The Course of Teachers' Scores from RT1, RT2 and RT3

Figure 5 shows that most teachers experienced a score decrease from RT1 to RT2, and all teachers achieved the highest score on RT3. T2 is the only teacher who has continuously increased her score without experiencing a decline. At the same time, T1 scored lower than the other teachers on all the tests, falling below the area of pile-up on the graph.

The second sub-problem of the research is "What are the perceptions of mathematics teachers who have participated in training and training practices about mathematical reasoning?". The findings related to this problem were obtained from the "Basic Concept of Mathematical Reasoning Test". The data were analyzed using the mathematical reasoning perceptions framework put forward by Herbert et al. (2015). Table 2 shows the perceptions of reasoning that emerged from the teachers' answers to the questions "What is mathematical reasoning? How do you know that your students are reasoning? What are the indicators of reasoning?"

Table 2

Teachers' Perceptions of Mathematical Reasoning

Category	"Perception of mathematical reasoning"	f	%
A	"Reasoning is perceived to be thinking"	6	24
B	"Reasoning is perceived to be communicating thinking"	1	4
C	"Reasoning is perceived to be problem solving"	5	20
D	"Reasoning is perceived to be validating thinking"	2	8
E	"Reasoning is perceived to be forming conjectures"	1	4
F	"Reasoning is perceived to be using logical arguments for validating conjectures"	6	24
G	"Reasoning is perceived to be connecting aspects of mathematics"	4	16
	Sum	25	100

As shown in Table 2, perceptions in categories A and F were observed most frequently, appearing in 24% of responses. This indicates that all six teachers in the study group demonstrated perceptions associated with categories A and F. Category C was the second most observed, present in 20% of responses, while category G was observed in 16% of responses, ranking third. Category D appeared in 8% of responses, placing it fourth. Finally, categories B and E were the least observed, identified in the views of two teachers, with perceptions in these categories comprising 4% of responses.

Some of the teachers' opinions are given below. In addition, it was explained which perception category included the teachers' opinions. The teacher's opinion in Figure 6 is included in category A because it mentions the act of thinking, and in category F because it mentions the act of argumentation.

Figure 6. Teacher's Opinion Included in Categories "A" and "F"

The teacher's opinion in Figure 7 was included in category F for mentioning mathematical relationships, D for mentioning verifying an idea by justifying it, E for mentioning generalizations, A for mentioning thinking, and B for mentioning the necessity of hearing one's thoughts out loud.

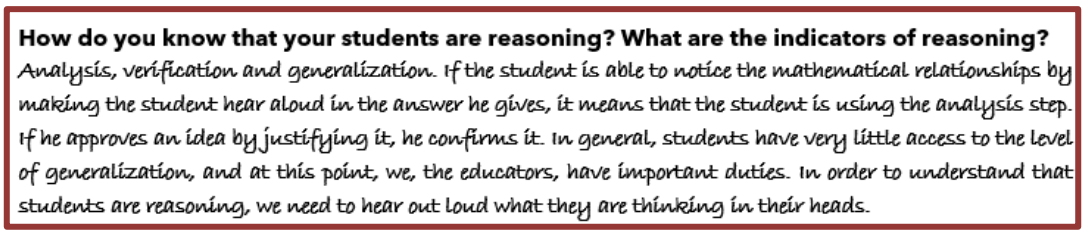

How do you know that your students are reasoning? What are the indicators of reasoning?
Analysis, verification and generalization. If the student is able to notice the mathematical relationships by making the student hear aloud in the answer he gives, it means that the student is using the analysis step. If he approves an idea by justifying it, he confirms it. In general, students have very little access to the level of generalization, and at this point, we, the educators, have important duties. In order to understand that students are reasoning, we need to hear out loud what they are thinking in their heads.

Figure 7. Teacher's Opinion Included in Categories "A", "B", "D", "E" and "F"

The teacher's view in Figure 8 is included in category C because it mentions problem-solving. On the other hand, the expression "blending new information in the mind" is viewed as a situation related to the restructuring of knowledge (category G).

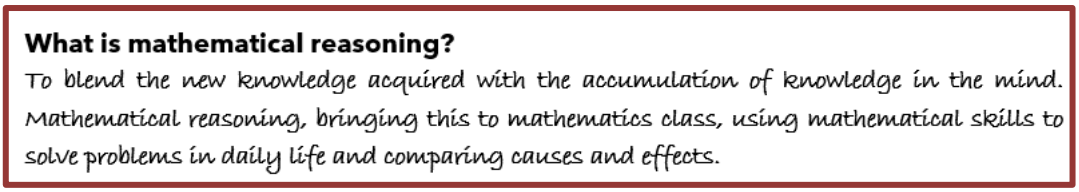

What is mathematical reasoning?
To blend the new knowledge acquired with the accumulation of knowledge in the mind. Mathematical reasoning, bringing this to mathematics class, using mathematical skills to solve problems in daily life and comparing causes and effects.

Figure 8. Teacher's Opinion Included in Categories "C" and "G"

The teacher's opinion in Figure 9 was included in category C because it mentioned different solution methods and in category F because it mentioned connections.

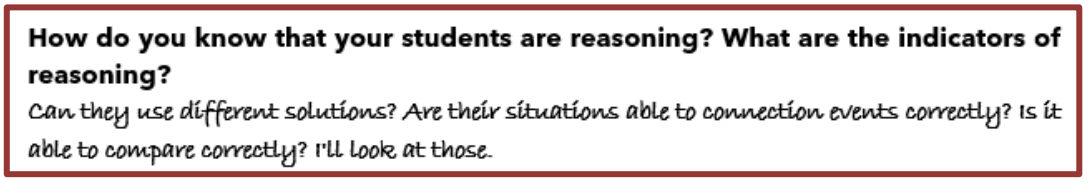

How do you know that your students are reasoning? What are the indicators of reasoning?
Can they use different solutions? Are their situations able to connection events correctly? Is it able to compare correctly? I'll look at those.

Figure 9. Teacher's Opinion Included in Categories "C" and "F"

The teacher's opinion in Figure 10 was included in category A because it mentioned thinking, and in category C because it mentioned problem solving.

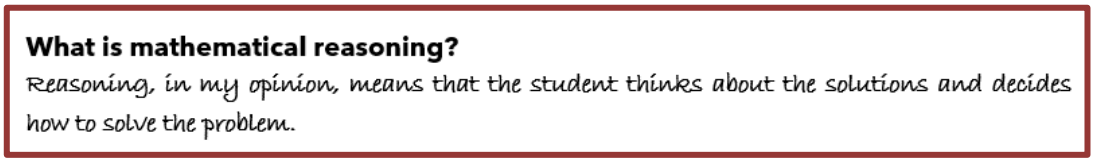

What is mathematical reasoning?
Reasoning, in my opinion, means that the student thinks about the solutions and decides how to solve the problem.

Figure 10. Teacher's Opinion Included in Categories "A" and "C"

The teacher's view in Figure 11 was included in category C because it mentioned problem solving and in category D because it mentioned mathematical bases. On the other hand, the expression "mathematical processes" was included in category F because it was thought to evoke the use of step-by-step logical arguments.

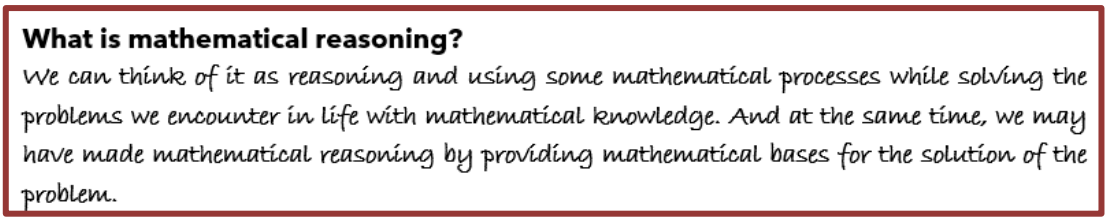


Figure 11. Teacher's Opinion Included in Categories "C", "D" and "F"

Considering the hierarchical structure of the categories, the fact that teachers' perceptions have the highest frequency in category F as well as category A is a positive finding in terms of teachers' reasoning perceptions. That is, all teachers expressed an opinion that can be included in category F.

DISCUSSION AND CONCLUSION

The purpose of this research is to reveal the effects of in-service teacher training and training practices provided through distance education in the field of mathematical literacy on the mathematical reasoning competence of mathematics teachers. At the same time, an examination was conducted on the mathematical reasoning perceptions of teachers who participated in training and training practices. Before discussing the results obtained from this research, it is essential to note that reasoning is an individual process and may vary depending on the perspective of the evaluator (Umay, 2003). In addition, the research limitations should be mentioned. Interpreting the discussion, results, and suggestions in this way would be a more accurate approach. The findings of this research are limited to the data obtained from six middle school (5th, 6th, 7th and 8th grade level) mathematics teachers who participated in the project titled "Increasing the Level of Mathematical Literacy with Dual Focus Teaching Model", attended a 14-session teacher training program, and implemented the course modules—prepared in line with the content of the training—in their classrooms over the course of one academic semester. In addition, the long-term retention of teachers' learning was not evaluated, which can also be considered a limitation of the research.

Considering the progression of the scores obtained from the reasoning tests, most teachers exhibited a decrease in their scores on the reasoning test administered after the in-service teacher training. The reason for this situation may be that teacher education is provided through distance education. Karaevli & Levent (2022) concluded that teachers have limited opportunities for interactive and lasting learning in remote education, due to the inability of online training to facilitate immediate practical applications compared to face-to-face instruction. At this point, continuous evaluation of distance education applications and designing new training in line with these evaluations will benefit the quality of the training to be given (Taşlıbeyaz et al., 2014). However, it should be considered that the beliefs of the participants regarding distance education are also an important factor in achieving its desired quality (Horzum & Canan Güngören, 2012).

At the same time, designing professional learning processes that will improve teachers' understanding of reasoning is reportedly extremely complex (Rasmussen & Marrongelle, 2006). Teaching reasoning is difficult because it requires identifying complex thought processes (Rogers & Steele, 2016). In this case, it will take time for teachers' reasoning scores to improve, as this was also observed in the present research. Teachers reached the highest score in the reasoning test applied at the end of the training sessions. Frith & Prince (2006) state that it would be useful to design the content of education as a social practice when planning in-service teacher training in the field of mathematical literacy. The literature suggests that in-service training should encompass not only theoretical instruction but also practical applications to effectively transfer this training into the classroom environment (Bansilal et al., 2015; Bozkurt, 2019; Loong et al., 2017; Ülger, 2021). Loong et al. (2017) observed improvement in both teachers' and students' perceptions and understanding of mathematical reasoning because the teachers participated in a professional learning program and efficiently implemented the learning program in their classrooms.

It was observed that the teacher who scored lower than the other teachers in all the reasoning tests and was below the region with the accumulation in the graph, was the teacher with the most professional experience. Botha et al. (2013) found that teachers with more teaching experience performed mathematics literacy practices more efficiently. However, it should be considered that the in-service training and training practices within the scope of this research were carried out through distance education. Horzum et al. (2012) state that as teachers' professional experience increases, their belief in distance in-service training decreases and the difficulties they experience increase.

If the general research question is answered with the results discussed thus far, the impact of in-service teacher training and training practices provided through distance learning in the field of mathematical literacy on mathematics teachers' mathematical reasoning competence is positive. This positive result revealed by the current study is both desired and expected. Herbert et al. (2022) found that teachers who participated in a professional learning program designed to help integrate reasoning into mathematics lessons increased their awareness of various aspects of mathematical reasoning. Similarly, Herbert and Bragg (2021) report that teachers who participated with their peers in a professional learning program designed to identify reasoning and develop strategies for applying reasoning to mathematics lessons reported experiencing positive effects. Based on the results obtained from the current study and those in the literature, it can be argued that teachers' processes of recognizing, interpreting, and integrating reasoning skills into the classroom can be improved through planned professional learning experiences.

On the other hand, Esendemir et al. (2015) reported that preservice elementary mathematics teachers perceived themselves as well-equipped in mathematical reasoning, while Güler and Arslan (2019) found that preservice mathematics teachers lacked awareness of these competencies. Similarly, even though mathematics teachers' conceptualization of

mathematical reasoning aligns with the international curriculum (Jeannotte et al., 2020), teachers have a limited understanding of mathematical reasoning (Herbert et al., 2022). Therefore, even if mathematics teachers feel equipped or demonstrate certain success in mathematical reasoning both before and in service, their awareness of the underlying reasoning process is limited. Accordingly, their understanding of mathematical reasoning remains superficial. Given that developing and supporting teachers in mathematical literacy is seen as important and beneficial (Özgen, 2019; Frith & Prince, 2006), the same can be said for reasoning, one of the mathematical literacy competencies. Studies suggesting that teachers need training to develop a deeper understanding of mathematical reasoning (Ayele, 2017; Bozkuş & Ayvaz, 2018; Loong et al., 2013; Öz & Işık, 2020) support this idea.

It has been determined that mathematics teachers' perceptions of mathematical reasoning after following the training practices are at a high level. However, Bozkuş and Ayvaz (2018) indicate that mathematics teachers often lack comprehensive and sufficient knowledge regarding mathematical reasoning, highlighting the need for additional training to enhance their understanding. Therefore, it is expected that the teachers in the study group of the current research, who have received mathematical literacy training and implemented its content through practical classroom applications, exhibit high levels of perceptions of mathematical reasoning. Similarly, Park and Magiera (2020) assert that pre-service mathematics teachers who receive education in mathematical reasoning are better equipped to interpret it broadly, encompassing aspects such as thinking, validating ideas, problem-solving, and synthesizing or making sense of concepts.

When the results obtained within the scope of the study are evaluated from a general perspective in line with the research problems, it is clear that in-service teacher training and training practices in the field of mathematical literacy have positively impacted mathematics teachers' skills and perceptions of mathematical reasoning competence. Mathematical reasoning is an important skill for every individual in every classroom environment in today's century. Therefore, even if teachers are sufficiently knowledgeable about reasoning, they must always receive support to deepen this knowledge to keep pace with the developments of the age and to reach more students in our changing world. For example, it may become necessary to integrate artificial intelligence applications, which have gained popularity in recent years, with reasoning in learning environments. This research has revealed that mathematical literacy is an effective context for teachers to develop and deepen their mathematical reasoning competencies.

REFERENCES

Altıparmak, K. & Öziş, T. (2005). Matematiksel ispat ve matematiksel muhakemenin gelişimi üzerine bir inceleme [An investigation upon mathematical proof and development of mathematical reasoning]. *Ege Eğitim Dergisi*, *6*(1), 25-37. https://dergipark.org.tr/en/download/article-file/57090

Altun, M. (2020a). *EFEMAT LGS: Yeni nesil matematik soruları [EFEMAT LGS: New generation mathematics questions].* Alfa Aktüel Akademi Yayıncılık.

Altun, M. (2020b). *Matematik okuryazarlığı el kitabı [Mathematical literacy handbook]*. Alfa Aktüel Akademi Yayıncılık.

Altun, M. (2021a). *EFEMAT 5: Yeni nesil matematik soruları ve öğretim uygulamaları [EFEMAT 5: New generation mathematics questions and teaching practices].* Dora Basım-Yayın.

Altun, M. (2021b). *EFEMAT 6: Yeni nesil matematik soruları ve öğretim uygulamaları [EFEMAT 6: New generation mathematics questions and teaching practices].* Dora Basım-Yayın.

Altun, M. (2021c). *EFEMAT 7: Yeni nesil matematik soruları ve öğretim uygulamaları [EFEMAT 7: New generation mathematics questions and teaching practices].* Dora Basım-Yayın.

Altun, M., Akkaya, R., Kozaklı Ülger, T., Bozkurt, I., Arslan, Ç. & Demir, F. (2024). A model suggestion for in-service teacher training to develop mathematical literacy. *Bartın University Journal of Faculty of Education, 13*(4), 955-971. https://doi.org/10.14686/buefad.1341165

Arslan, Ç., Karaduman, B. & Özaydın, Z. (2021). Thematic analysis of postgraduate theses on mathematics literacy in the field of mathematics education in Turkey. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi*, *15* (2), 317-340. https://doi.org/10.17522/balikesirnef.1025977

Australian Curriculum, Assessment and Reporting Authority [ACARA]. (2017). *Australian Curriculum, Assessment and Reporting Authority.* https://www.australiancurriculum.edu.au/f-10-curriculum/mathematics/rationale/

Ayele, M. A. (2017). Mathematics teachers' perceptions on enhancing students' reasoning skills in mathematics. *British Journal of Education, Society & Behaviorual Science*, *19*(2), 1-12. https://doi.org/10.9734/BJESBS/2017/30866

Baltacı, A. (2019). Nitel araştırma süreci: Nitel bir araştırma nasıl yapılır? [The qualitative research process: How to conduct a qualitative research?]. *Ahi Evran Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *5*(2), 368-388. https://doi.org/10.31592/aeusbed.598299

Bansilal, S., James, A. & Webb, L. (2015). Teacher training for mathematical literacy: A case study taking the past into the future. *South African Journal of Education*, *35*(1), 1-10. https://hdl.handle.net/10520/EJC167028

Blanton, M. L. & Kaput, J. J. (2005). Characterizing a classroom practice that promotes algebraic reasoning. *Journal for Research in Mathematics Education*, *36*(5), 412-446. http://dx.doi.org/10.2307/30034944

Botha, H., Maree, J. & Stols, G. (2013). Mathematical literacy teachers: Can anyone be one?. *Perspectives in Education*, *31*(4), 180-194. https://hdl.handle.net/10520/EJC151335

Bozkurt, I. (2019). *Matematik okuryazarlığı konusunda yetiştirilen öğretmenlerin öğrencilerinde matematik okuryazarlığının gelişiminin incelenmesi [The investigation of the development of students' mathematical literacy who are educated by mathematic teachers trained about mathematical literacy]*. [Doctoral Thesis]. Bursa Uludag University, Bursa. https://tez.yok.gov.tr/

Bozkuş, F. & Ayvaz, Ü. (2018). Middle school mathematıcs teachers'knowledge of mathematical reasoning. *European Journal of Education Studies*, *4*(9), 16-34. https://doi.org/10.5281/zenodo.1287947

Clarke, D. M., Clarke, D. J. & Sullivan, P. (2012). Reasoning in the Australian Curriculum: Understanding its meaning and using the relevant language. *Australian Primary Mathematics Classroom, 17*(3), 28-32. https://search.informit.org/doi/10.3316/informit.895247978810826

Colwell, J. & Enderson, M. C. (2016). "When I hear literacy": Using pre-service teachers' perceptions of mathematical literacy to inform program changes in teacher education. *Teaching and Teacher Education*, *53*, 63-74. https://doi.org/10.1016/j.tate.2015.11.001

Consortium for Mathematics and Its Applications [COMAP] (2008). *For all practical purposes: Mathematical literacy in today's world*. Wh Freeman.

Coşkun-Şimşek, M., Dumlu, B. Ö. & Turanlı, N. (2023). Türkiye'de matematik okuryazarlığı üzerine yapılmış çalışmaların betimsel içerik analizi [A descriptive content analysis of the studies concerning mathematical literacy in Türkiye]. *TEBD, 21*(3), 1204-1225. https://doi.org/10.37217/tebd.1195319

Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.

Davidson, A., Herbert, S. & Bragg, L. A. (2019). Supporting elementary teachers' planning and assessing of mathematical reasoning. *International Journal of Science and Mathematics Education, 17*(6), 1151-1171. https://doi.org/10.1007/s10763-018-9904-0

De Lange, J. (2003). Mathematics for literacy. *Quantitative literacy: Why numeracy matters for schools and colleges*, *80*, 75-89.

Denzin, N. K. & Lincoln, Y. S. (2008). Introduction: The discipline and practice of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Strategies of qualitative inquiry* (pp. 1–43). SAGE Publications. https://api.semanticscholar.org/CorpusID:149701443

Doyle, K. (2007). The teacher, the tasks: Their role in students? Mathematical literacy. In J. Watson & K. Beswick, (Eds.). *Proceedings 30th annual conference of the mathematics education research group of Australasia-mathematics: Essential research, essential practice* (pp. 246–254). Mathematics Education Research Group of Australasia. https://www2.merga.net.au/documents/RP192007.pdf

Erdoğan, E. & Arslan, Ç. (2023). Matematik eğitimi alanında matematik okuryazarlığı üzerine yapılan çalışmaların tematik içerik analizi [Thematic content analysis of studies on mathematical literacy in the field of mathematics education]. *Dokuz Eylül Üniversitesi Buca Eğitim Fakültesi Dergisi*, (57), 1669-1693. https://doi.org/10.53444/deubefd.1281997

Esendemir, Ö., Çırak, S. & Samancıoğlu, M. (2015). Pre-service elementary math teachers' opinions about mathematics teaching competencies. *Gaziantep University Journal of Social Sciences*, *14*(1), 217-239. https://doi.org/10.21547/jss.256787

Ev-Çimen E. (2008). *Matematik öğretiminde, bireye "matematiksel güç" kazandırmaya yönelik ortam tasarımı ve buna uygun öğretmen etkinlikleri geliştirilmesi [A design of learning environment and related teacher activities to foster mathematical power of individuals in mathematics education].* [Doctoral Thesis]. Dokuz Eylül University, İzmir. https://tez.yok.gov.tr/

Frith, V. & Prince, R. (2006). Reflections on the role of a research task for teacher education in data handling in a mathematical literacy education course. *Pythagoras*, *12*(1), 52-61. https://doi.org/10.4102/pythagoras.v0i64.99

Güler H. K. & Arslan C. (2019). Mathematical competencies required by mathematical literacy problems. *MOJES: Malaysian Online Journal of Educational Sciences*, *7*(2), 57-70.

Herbert, S. & Bragg, L. A. (2021). Elementary teachers' planning for mathematical reasoning through peer learning teams. *International Journal for Mathematics Teaching and Learning*, *22*(1), 24-43. https://doi.org/10.4256/ijmtl.v22i1.291

Herbert, S., Vale, C., Bragg, L. A., Loong, E. & Widjaja, W. (2015). A framework for primary teachers' perceptions of mathematical reasoning. *International Journal of Educational Research*, *74*, 26-37. https://doi.org/10.1016/j.ijer.2015.09.005

Herbert, S., Vale, C., White, P. & Bragg, L. A. (2022). Engagement with a formative assessment rubric: A case of mathematical reasoning. *International Journal of Educational Research*, *111*, 101899. https://doi.org/10.1016/j.ijer.2021.101899

Horzum, M. B. & Canan Güngören, Ö. (2012). A model for beliefs, tool acceptance levels and web pedagogical content knowledge of science and technology preservice teachers towards web based instruction. *Turkish Online Journal of Distance Education-TOJDE*, *13*(3), 50-69. https://dergipark.org.tr/en/download/article-file/155938

Horzum, M. B., Albayrak, E. & Ayvaz, A. (2012). Sınıf öğretmenlerinin hizmet içi eğitimde uzaktan eğitime yönelik inançları [Elementary classroom teachers' beliefs on ın-service training via distance education]. *Ege Eğitim Dergisi*, *13*(1), 55-72. https://dergipark.org.tr/en/download/article-file/57008

Jahangir, S. F., Saheen, N. & Kazmi, S. F. (2012). In-service training: A contributory factor influencing teachers' performance. *International Journal of Academic Research in Progressive Education and Development*, *1*(1), 31-38.

Jazby, D. & Widjaja, W. (2019). Teacher noticing of primary students' mathematical reasoning in a problem-solving task. *Proceedings of the 42nd Annual Conference of the Mathematics Education Research Group of Australasia*, 380–387. https://files.eric.ed.gov/fulltext/ED604495.pdf

Jeannotte, D., Sampson, S. & Dufour, S. (2020). Elementary teachers'discourse about mathematical reasoning. In Sacristán, A.I., Cortés-Zavala, J.C. & Ruiz-Arias, P.M. (Eds.). (2020). *Mathematics Education Across Cultures: Proceedings of the 42nd Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 845-849). https://doi.org/10.51272/pmena.42.2020-126

Karaevli, Ö. & Levent, F. (2022). Salgın sürecinde yapılan uzaktan eğitimlerin öğretmenlerin profesyonel gelişimlerine etkisine ilişkin görüşler [Opinions on effect of distance education practices on professional development of teachers during the COVID-19 pandemic]. *Milli Eğitim Dergisi*, *51*(233), 303-325. https://doi.org/10.37669/milliegitim.786842

Karasolak, K., Tanriseven, I. & Konokman, G. Y. (2012). Öğretmenlerin hizmetiçi eğitim etkinliklerine ilişkin tutumlarinin belirlenmesi [Determining teachers' attitudes towards inservice education activities]. *Kastamonu Eğitim Dergisi*, *21*(3), 997-1010.

Kurtz, K. J., Gentner, D. & Gunn, V. (1999). Reasoning. In D. E. Rumelhart & B. M. Bly (Eds.), *Cognitive science: Handbook of perception and cognition* (pp. 145-200). Academic Press. https://pages.ucsd.edu/~scoulson/203/KurtzGentnerGunn 201999.pdf

LeCompte, M. D. & Goetz, J. P. (1982). Problems of reliability and validity in ethnographic research. *Review of Educational Research*, *52*(1), 31-60. https://www.jstor.org/stable/1170272

Lestari, Y., As'ari, A. R. & Muksar, M. (2021). Analysis of students' mathematical literacy skills in solving PISA mathematical problems. *MaPan: Jurnal Matematika dan Pembelajaran*, *9*(1), 102-118. https://doi.org/10.24252/mapan.2021v9n1a7

Leymun, Ş. O., Odabaşı, F. & Yurdakul, İ. K. (2017). Eğitim ortamlarında durum çalışmasının önemi [The importance of case study research in educational settings]. *Eğitimde Nitel Araştırmalar Dergisi*, *5*(3), 367-385. https://doi.org/10.14689/issn.2148-2624.1.5c3s16m

Loong, E. (2014). A primary teacher's developing understanding of mathematical reasoning. Retrieved on July 20, 2024 from https://hdl.handle.net/10536/DRO/DU:30064935

Loong, E., Vale, C., Bragg, L. & Herbert, S. (2013). Primary school teachers' perceptions of mathematical reasoning. Retrieved on August 15, 2024 from https://files.eric.ed.gov/fulltext/ED572932.pdf

Loong, E., Vale, C., Herbert, S., Bragg, L. A. & Widjaja, W. (2017). Tracking change in primary teachers' understanding of mathematical reasoning through demonstration lessons. *Mathematics Teacher Education and Development*, *19*(1), 5-29. https://mted.merga.net.au/index.php/mted/article/view/329/284

Loong, E., Vale, C., Widjaja, W., Herbert, S., Bragg, L. A. & Davidson, A. (2018). Developing a rubric for assessing mathematical reasoning: a design-based research study in primary classrooms. Retrieved on August 20, 2024 from https://files.eric.ed.gov/fulltext/ED592421.pdf

Maracci, M. (2021). On the notion of mathematical competence. Retrieved on August, 2024 from https://www.mathunion.org/fileadmin/ICMI/Conferences/ICME/ICME%2014/Proceedings/Invited%20Lecturers/IL%20%23Mirko%20Maracci.pdf

Marshall, C. & Rossman, G. B. (2014). *Designing qualitative research*. SAGE Publications.

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. Jossey-Bass Publishers.

Miles, M. B. & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. SAGE Publications.

Ministry of National Education [MoNE]. (2005). *İlköğretim matematik programı [Primary school mathematics program]*. MEB Talim Terbiye Başkanlığı Yayınları.

Ministry of National Education [MoNE]. (2009). *İlköğretim matematik dersi 6-8.sınıflar öğretim programı ve kılavuzu [Primary school mathematics course curriculum and guide for 6-8th grades].* MEB Talim Terbiye Başkanlığı Yayınları.

Ministry of National Education [MoNE]. (2013). *Ortaokul matematik dersi 5-8. sınıflar öğretim programı [Middle school mathematics course curriculum for grades 5-8].* MEB Talim Terbiye Başkanlığı Yayınları.

Ministry of National Education [MoNE]. (2018). *Matematik dersi öğretim programı (İlkokul ve ortaokul 1, 2, 3, 4, 5, 6, 7 ve 8. sınıflar) [Mathematics course curriculum (Primary and secondary school 1st, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th grades)].* MEB Talim Terbiye Başkanlığı Yayınları.

Ministry of National Education [MoNE]. (2024). *Türkiye yüzyılı maarif modeli öğretim programları ortak metni [Common text of Türkiye's century education model curriculum].* https://tymm.meb.gov.tr/

National Council of Teachers of Mathematics [NCTM]. (2000). *Principles and standards for school mathematics*. National Council of Mathematics Teachers.

New Jersey Mathematics Coalition and the New Jersey Department of Education [NJMCF]. (1996). *New Jersey Mathematics Curriculum Framework: The first four standards, standard 4-reasoning, K-12 overview.* State of New Jersey Department of Education.

Niss, M. & Højgaard, T. (2019). Mathematical competencies revisited. *Educational Studies in Mathematics, 102*(1), 9–28. https://doi.org/10.1007/s10649-019-09903-9

Niss, M. & Jablonka, E. (2014). Mathematical literacy. In: Lerman, S.(ed.) *Encyclopedia of Mathematics Education*. https://doi.org/10.1007/978-94-007-4978-8_100

Organisation for Economic Co-operation and Development [OECD]. (2003). *The PISA 2003 assesment framework – mathematics, reading, science and problem solving knowledge and skills.* OECD Publishing. https://doi.org/10.1787/9789264101739-en

Organisation for Economic Co-operation and Development [OECD]. (2023). *PISA 2022 assessment and analytical framework*, PISA, OECD Publishing. https://doi.org/10.1787/dfe0bf9c-en

Organisation for Economic Co-operation and Development [OECD]. (2013). *PISA 2012 assessment and analytical framework. Mathematics, reading, science, problem solving and financial literacy*. OECD Publishing. https://doi.org/10.1787/9789264190511-en

Organisation for Economic Co-operation and Development [OECD]. (2016). *Ten questions for mathematics teachers and how pısa can help answer them*, PISA, OECD Publishing. https://doi.org/10.1787/9789264265387-en

Organisation for Economic Co-operation and Development [OECD]. (2017). *PISA 2015 assessment and analytical framework: science, reading, mathematic, financial literacy and collaborative problem solving, revised edition*, PISA, OECD Publishing. http://dx.doi.org/10.1787/9789264281820-en

Organisation for Economic Co-operation and Development [OECD]. (2019). *PISA 2018 assessment and analytical framework*, PISA, OECD Publishing. *https://doi.org/10.1787/b25efab8-en*

Öz, T. & Işık, A. (2017). İlköğretim matematik öğretmeni adaylarının matematiksel akıl yürütme becerisi üzerine görüşleri [Pre-service elementary mathematics teachers' views on "mathematical reasoning" skills]. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi*, *19*(2), 228-249. https://doi.org/10.17556/erziefd.292622

Öz, T. & Işık, A. (2020). Investigation of the possibilities for mathematical reasoning skills candidate mathematics teachers offer their students. *Online Journal of Mathematics, Science and Technology Education (OJOMSTE), 1*(1), 87– 100. https://ojomste.com/index.php/1/article/view/6

Özaydın, Z. & Arslan, Ç. (2022). Assessment of mathematical reasoning competence in accordance with PISA 2021 mathematics framework. *Kuramsal Eğitimbilim Dergisi [Journal of Theoretical Educational Science], 15*(3), 453-474. https://doi.org/10.30831/akukeg.1027601

Özgen, K. & Kutluca T. (2013). İlköğretim matematik öğretmen adaylarının matematik okuryazarlığına yönelik görüşlerinin incelenmesi [An investigation of primary mathematics pre-service teachers' views towards mathematical literacy]. *Dicle Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (10), 1-22. https://dergipark.org.tr/en/download/article-file/1716186

Özgen, K. (2019). Problem-posing skills for mathematical literacy: The sample of teachers and pre-service teachers. *Eurasian Journal of Educational Research*, *84*, 177-212. https://doi.org/10.14689/ejer.2019.84.9

Park, H. & Magiera, M. T. (2020). Prospective teachers' interpretations of mathematical reasoning. *Mathematical and Statistical Science Faculty Research and Publications*. 107. https://epublications.marquette.edu/math_fac/107

Rasmussen, C. & Marrongelle, K. (2006). Pedagogical content tools: Integrating student reasoning and mathematics in instruction. *Journal for Research in Mathematics Education, 37*(5), 388–420. https://pubs.nctm.org/view/journals/jrme/37/5/article-p388.xml

Rogers, K. C. & Steele, M. D. (2016). Graduate teaching assistants' enactment of reasoning-and-proving tasks in a content course for elementary teachers. *Journal for Research in Mathematics Education, 47*(4), 372–419. https://doi.org/10.5951/jresematheduc.47.4.0372

Rose, S., Spinks, N. & Canhoto, A.I. (2015). *Manegement research: applying the principles.* Routledge.

Santoso, F. G. I. & Sari, A. E. R. M. (2025). Mathematical literacy of prospective mathematics teacher based on cognitive style. *Jurnal Elemen, 11*(2), 427-446. https://doi.org/10.29408/jel.v11i2.28494

Sullivan, P. & Davidson, A. (2014). The role of challenging mathematical tasks in creating opportunities for student reasoning. *Mathematics Education Research Group of Australasia.* https://files.eric.ed.gov/fulltext/ED572597.pdf

Şencan, H. (2005). *Sosyal ve davranışsal ölçümlerde güvenilirlik ve geçerlilik [Reliability and validity in social and behavioral measures].* Seçkin Yayıncılık.

Taşlıbeyaz, E., Karaman, S. & Göktaş, Y. (2014). Öğretmenlerin uzaktan hizmet içi eğitim deneyimlerinin incelenmesi [Examining the experiences of teachers received in service training through distance education]. *Ege Eğitim Dergisi*, *15*(1), 139-160. https://dergipark.org.tr/en/download/article-file/57171

Umay, A. & Kaf, Y. (2005). Matematikte kusurlu akıl yürütme üzerine bir çalışma [A study on flawed reasoning in mathematic]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *28*(28), 188-195. https://dergipark.org.tr/en/download/article-file/87727

Umay, A. (2003). Matematiksel muhakeme yeteneği [Mathematical reasoning ability]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *2003*(24), 234-243. https://dergipark.org.tr/en/download/article-file/87843

Ülger, T. K. (2021). *Matematik okuryazarlık yeterliklerinin gelişimine dayalı bir modüler programın tasarlanması, uygulanması ve değerlendirilmesi [Design, implementation and evaluation of a modular program based on the development of mathematical literacy competencies].* [Doctoral Thesis]. Bursa Uludag University, Bursa. https://tez.yok.gov.tr/

Ülger, T. K., Bozkurt, I. & Altun, M. (2020). Thematic analysis of articles focusing on mathematical literacy in mathematics teaching-learning process. *Egitim ve Bilim*, *45*(201), 1-37. http://dx.doi.org/10.15390/EB.2020.8028

Venkat, H., Graven, M., Lampen, E., Nalube, P. & Chitera, N. (2009). Reasoning and reflecting in mathematical literacy. *Learning and Teaching Mathematics, 7*, 47-53. https://hdl.handle.net/10520/EJC20795

Widjaja, W. (2011). Towards mathematical literacy in the 21st century: Perspectives from Indonesia. *Southeast Asian Mathematics Education Journal, 1*(1), 75-84. https://doi.org/10.46517/seamej.v1i1.12

Wijayanti, R. & Waluya, S. B. (2018). Analysis of mathematical literacy ability based on goal orientation in model eliciting activities learning with murder strategy. In *Journal of Physics: Conference Series*. IOP Publishing. https://doi.org/10.1088/1742-6596/983/1/012141

Yackel, E. & Hanna, G. (2003). Reasoning and proof. In J. Kilpatrick, W. G. Martin & D. Schifter (Eds.), *A research companion to NCTMs principles and standards* (pp.227-236). National Council of Teachers of Mathematics.

Yıldırım, A. & Şimşek, H. (2018). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in social sciences].* Seçkin Yayıncılık.

Yıldırım, A. (1999). Nitel araştırma yöntemlerinin temel özellikleri ve eğitim araştırmalarındaki yeri ve önemi [Basic characteristics of qualitative research methods and their place and importance in educational research]. *Eğitim ve Bilim*, *23*(112), 7-17. https://educationandscience.ted.org.tr/article/view/385/370

Yin, R.K. (2014). *Case study methods: design and methods*. SAGE Publication.

Appendix 1- Sample Questions From Reasoning Tests (RT1, RT2, RT3)

Reasoning Test (RT1) **- Question 1 (Altun, 2021c)**

To determine the order of transactions at the counters, a bank gives a two-digit sequence number to those who queue with an ID number, and a four-digit sequence number to those who queue with a bank card. To give priority to those who queue with cards for transactions at the box office, an ordinary period of "card, card, identity" is followed in calling customers. The numbers in the hands of ten customers waiting in line to be processed in the waiting room are 5324, 78, 5321, 77, 5322, 5323, 79, 80, 81,5325.

a) Since the customer who receives sequence number 77 is called to make a transaction in the first row at the box office, what will be the turn of the transaction for 80? Justify it.

b) Does a customer with a card who enters the bank at that moment change the order in which the customer with the sequence number 80 makes a transaction? Explain.

c) Would you suggest a quadruple period that would accept the customer with the number 78 in the 6th row, provided that the first person called was the card? Support your suggestion mathematically.

Reasoning Test (RT2) **- Question 2 (COMAP, 2008, p.129-138)**

A toy manufacturer produces skateboards and dolls. The production of skateboards requires 5 units of plastic and can be sold for a profit of 1 TL. The production of dolls requires 2 units of plastic and can be sold for a profit of 0.55 TL. The toy manufacturer has 60 units of plastic available.

a) How much skateboard/doll should the toy manufacturer produce to maximize its profits in the presence of so many materials? Justify your solution.

b) It takes 15 minutes to skateboard and 18 minutes to make dolls. The toy manufacturer has 360 minutes available. How much skateboard/doll should the toy manufacturer produce to maximize its profits in the presence of so much time and material (60 units of plastic)? Demonstrate your solution.

c) How do you decide on the accuracy of your solutions? Show me.

Reasoning Test (RT3) **- Question 3 (Altun, 2020)**

Standard paper sizes, commonly used in printing and correspondence, are designated as A0, A1, A2, ..., in descending order of size. Each paper size is a similar rectangle to the others. A4 is also known as letter paper, with dimensions of 21 x 29.7 cm. To obtain a larger one, it is necessary to place two sheets of the same size side by side along the long side.

a) According to this information, what kind of relationship should there be between m and n for a paper with dimensions' m and n to be standard paper size? Show me. How can you make ensure the validity of this relationship?

b) Stained glass (glass painting) will be made on an A3 size glass panel. On the paint tube to be used for the painting process, it is written that it can paint a maximum area of 1092cm². Is this tube of paint enough to paint this glass panel? Your idea should be based on a mathematical solution process.

Appendix 2- Criteria and Rubric for a Sample Problem (RT1-Question 1)

Reasoning Test (RT1) - Question 1

Reasons for selecting the criteria in the problem

a) Determining the order in which customer number 80 will perform a transaction depends on the mathematical solution process (K4).
b) Whether the order of transactions of the cardholder currently at the bank will affect customer number 80 is a contextual problem. The contextual problem should be interpreted in a real-world context (K8), along with explanations supporting the solution (K10).
c) A representation in the four-period format that assumes customer number 78 is considered the sixth in line should be presented (K2). Relationships between contextual and mathematical language should be established during the representation (K9).
During the solution process, the rules provided in the question text should be used correctly (K6).

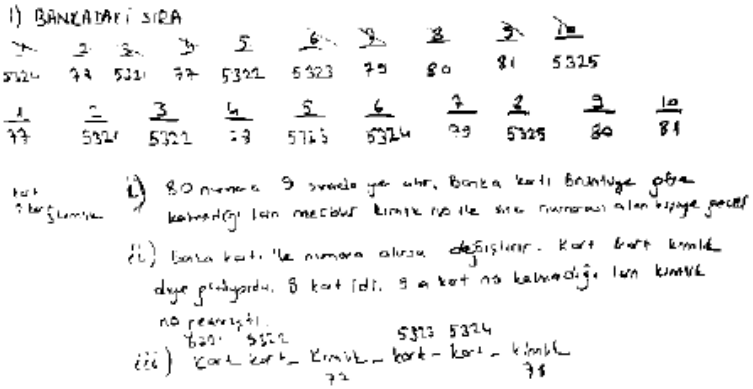
Rubric for the problem

RT1-Q1	0	1	2
K2	There is no representation.	There is a representation that accepts customer number 78 as the 6th row. However, its period is not quadruple.	The quadruple period that assumes accepting customer number 78 as the 6th row is "card-ID-card-card."
K4	There is no resolution process./There is a resolution process, but it is incorrect.	*"77-5321-5322-78-5323-5424-79-5325-(No more cardholders)80"* It was determined that customer number 80 would be the 9th to process the issue, but no justification was provided.	The justification for the resolution process was given as *"because there are no more cardholders."*
K6	The rules provided in the question text were not considered.	The rules provided in the question text were used incorrectly/incompletely.	During the solution process, the rules provided in the question text were used correctly/completely.
K8	There is no contextual interpretation.	Interpretations such as "the order of operations does not change" are incorrect.	*"the order of operations change"* is a correct contextual interpretation based on the mathematical result.
K9	There is no representation.	The relationships between languages in the representations proposed outside the quadruple period are flawed.	The relationships between contextual language and symbolic language in the proposed representation of *"card-ID-card-card"* are correct.
K10	The solution to the problem has not been considered.	The presence of a contextual comment (K8) indicates that a solution has been considered, but there is no explanation.	The following explanation supports the solution to the problem: *"The card-holding customer will queue after 5325, so they will be ahead of person number 80."*

Appendix 3- Sample Analyses (RT1-Question 1)

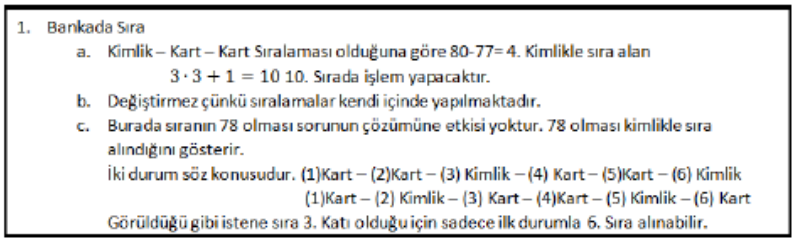
RT1-Q1	K2	K4	K6	K8	K9	K10	Sum
T2	1	2	2	2	1	2	10
T4	1	0	1	1	1	0	4

T2's answer to Question 1 in RT1



As seen in the photo, the teacher's incorporating the bank order rule into his solutions, without ignoring it throughout the question, demonstrates his understanding of the rules and definitions (K6). She answered correctly in the first item of the question by saying, "Number 80 is in 9th place." She gave a justification for the solution process she carried out as "since there are no customers with bank cards, the queue goes to the person who takes the queue with their ID number" (K4). The answer in the second question, "If the bank takes the number with the card, it changes", indicates that the teacher can interpret in a real-world context (K8). After the teacher decided to change the order, she provided a statement supporting this decision: "The cards were going as card IDs. There were 8 cards. Since there were no card numbers left for 9, the ID number was used" (K10). When we reached the last item of the problem, the teacher proposed a new period - representation - that would accept customer number 78 as the 6th row, but since this period was a terminal rather than a quadruple period, the necessary assumptions were not made (K2). This shows that the relationship between contextual language and the mathematical language in which the problem is conveyed has not been fully established (K9).

T4's answer to Question 1 in RT1



1. Bankada Sıra
   a. Kimlik – Kart – Kart Sıralaması olduğuna göre 80-77= 4. Kimlikle sıra alan
      $3 \cdot 3 + 1 = 10$ 10. Sırada işlem yapacaktır.
   b. Değiştirmez çünkü sıralamalar kendi içinde yapılmaktadır.
   c. Burada sıranın 78 olması sorunun çözümüne etkisi yoktur. 78 olması kimlikle sıra alındığını gösterir.
      İki durum söz konusudur. (1)Kart – (2)Kart – (3) Kimlik – (4) Kart – (5)Kart – (6) Kimlik
      (1)Kart – (2) Kimlik – (3) Kart – (4)Kart – (5) Kimlik – (6) Kart
      Görüldüğü gibi istene sıra 3. Katı olduğu için sadece ilk durumla 6. Sıra alınabilir.

As seen in Photograph, T4 ignored the fact that the number of customers with debit cards was 5 on the first item of the question and stated that customer number 80 would be the 10th to process. The solution process exists, but it is incorrect (K4). The answer "doesn't change" in the second item of the question is an interpretation in the real-world context, but the interpretation is incorrect and does not depend on the mathematical result (K8). Because there is no mathematical solution, the criterion coded K10 cannot be observed. The examples in which the teacher represented the problem in different ways in the last item of the question are those for which the necessary assumptions were not made – examples with a threefold. The language used in the contextual and mathematical representations does not fully align (K9). Looking at the answers given throughout the question, it appears that the teacher does not fully understand the rules provided in the main text of the question (K6).

Data Availability Declaration

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

Zeynep Özaydın and Çiğdem Arslan spearheaded the conceptualization, designed the research methodology, and supervised the entire article. Zeynep Özaydın was responsible for the data collection, analysis, and interpretation, bringing analytical rigor to the study. Zeynep Özaydın and Çiğdem Arslan took the lead in drafting the manuscript, ensuring its alignment with scholarly standards, and revising it for intellectual depth. All authors collaboratively discussed the results, provided critical insights, and contributed to the final manuscript. They have read, approved, and take joint accountability for the presented work's accuracy and integrity.

Authors' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Acknowledgements: This research was carried out of the project titled "Increasing the Level of Mathematical Literacy with Dual Focus Teaching Model (Cift Odaklı Öğretim Modeli-COM)" numbered TÜBİTAK 1003-218K515. I would like to thank TÜBİTAK (The Scientific and Technological Research Council of Turkey) for the financial support it provided.

Biographical notes:

Zeynep Özaydın 1[3]*:* Zeynep Özaydın is currently pursuing her doctorate. She has published articles and ongoing research on mathematical reasoning, mathematical literacy, mathematical thinking skills, and higher-order thinking skills.

Scopus Author Identifier Number: 58739226400

Web of Science Researcher ID: MCJ-3328-2025

Google Scholar Researcher ID: B4iel5EAAAAJ

Çiğdem Arslan 2: Çiğdem Arslan has published numerous articles in international journals and has also taken part in various projects in different roles, all focusing on problem solving-posing, geometry teaching, mathematical thinking, mathematical anxiety, mathematical reasoning and mathematical literacy.

Scopus Author Identifier Number: 26656549500

Web of Science Researcher ID: C-9729-2019

Google Scholar Researcher ID: 98ckc60AAAAJ

[3] Corresponding Author

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

The Effect of Socratic Questioning on Secondary School Students' Higher-Order Thinking[1]

Elif Nur Bozer Özsaraç[2] İsa Korkmaz[3]

Article Type
Original Research
International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 482-501
http://www.ijonmes.net

Article Info:

Received 11.07.2025
Revision 30.08.2025
Accepted 18.09.2025

Abstract:

In today's information-driven world, the capacity to analyze, assess, and think critically about information has emerged as a core objective of education. As traditional content-based instruction shifts toward skill-based learning, fostering higher-order thinking skills among students is increasingly prioritized in education. This study aims to examine the effect of the Socratic questioning method on the higher-order thinking skills of 6th-grade middle school students within the context of the Turkish language course. A quasi-experimental design with pre-test and post-test control groups was employed. The experimental group received instruction based on Socratic questioning, while the control group followed traditional teaching methods. The study focused on three core cognitive skills: critical thinking, critical reading, and creative thinking. Data were collected quantitatively through valid and reliable instruments: the Cornell Critical Thinking Test, a Critical Reading Scale, and the Torrance Tests of Creative Thinking (verbal form). Statistical analyses revealed that the Socratic questioning method significantly improved students' performance in all three areas. The findings indicated that structured classroom discussions, guided by philosophical inquiry and critical reflection, fostered students' reasoning, idea generation, and textual interpretation skills. The research contributes to the field by combining these three higher-order skills in a single experimental framework and by highlighting the potential of Socratic dialogue in language-based learning. Implications for educational practice and future research are discussed considering the results.

Keywords: Socratic questioning, higher-order thinking skills, critical thinking, critical reading, creative thinking

[1] This article is based on the doctoral dissertation conducted by the first author under the supervision of the second author.

[2] Assistant Professor, Selcuk University, Education Faculty, Konya, Türkiye. elifnur.ozsarac@selcuk.edu.tr, https://orcid.org/0000-0002-2320-3199

[3] Professor, Necmettin Erbakan University, Ahmet Kelesoglu Education Faculty, Konya, Türkiye. ikorkmaz@erbakan.edu.tr, https://orcid.org/0000-0002-6647-1812

Bozer Saraç, E., N. & Kormaz, İ. (2025). The Effect of Socratic Questioning on Secondary School Students' Higher-Order Thinking. *International Journal of Modern Education Studies, 9*(2), 482-501. https://doi.org/10.51383/ijonmes.2025.424

INTRODUCTION

In today's world, where access to information has become easier and the flow of information takes place at a dizzying pace, individuals' abilities to interpret, evaluate, and distinguish between accurate and inaccurate information have gained unprecedented importance. Rather than accepting information as it is, questioning it and discussing its meaning and value are among the fundamental cognitive competencies that enable individuals to become more effective not only in their academic lives but also in society. Therefore, it is evident that education systems should not merely aim to transmit information, but should also focus on nurturing individuals who are capable of thinking, questioning, and producing.

Thinking constitutes the foundation of processes such as making sense of the environment, generating solutions to encountered problems, and forming judgments based on knowledge. According to Dewey (1910), thinking is a mental effort that arises from confusion and doubt and aims at producing solutions. While Nickerson (1987; akt. Ellis & Hunt, 1993) defines thinking in terms of qualities such as evaluating multiple perspectives, analyzing with impartiality, and making logical inferences, De Bono (1976) regards thinking as a skill that can be learned and developed. From this point of view, it becomes necessary to support individuals' thinking skills not through random exposure but through planned, systematic, and structured instructional processes.

In the literature, thinking skills are addressed in two dimensions: general and higher-order thinking skills. Doğanay (2015) defines higher-order thinking as a process of reconstructing and producing knowledge based on existing information. Bloom's Taxonomy of the Cognitive Domain associates the levels of analysis, synthesis, and evaluation with these skills (Krathwohl, 2002). In this context, Resnick (1987) links higher-order thinking to processes such as logical reasoning, critical evaluation, metacognitive control, and problem-solving. In Saifer's (2018) "Taxonomy of Thinking Skills (TOTS)" model, thinking is classified into three levels—lower, middle, and higher—and both critical and creative thinking are considered as higher-order skills.

The focus on three higher-order thinking skills—critical thinking, creative thinking, and critical reading—in this study is grounded in both theoretical and practical justifications. These three skills are language-based cognitive processes and are directly related to reading, writing, speaking, and listening activities conducted particularly in Turkish lessons. With its structure based on meaning-making and meaning construction, the Turkish course provides a favorable learning environment for the development of higher-order thinking skills. While critical thinking encompasses the processes of questioning information, analyzing it, and making logical inferences, creative thinking includes the abilities to develop original ideas, think flexibly and productively, and generate alternative solutions. Critical reading, on the other hand, stands out as a skill that

operationalizes both modes of thinking through written texts and involves multilayered processes of questioning and interpretation. These three skills form an integrated and complementary structure, both at the theoretical level and in classroom practices.

The Socratic questioning method draws attention as an effective instructional strategy aimed at activating students' thinking processes. Paul and Elder (2007) state that this method allows students to determine their level of knowledge, question concepts, and conduct in-depth analyses. Socratic questioning, which serves as a core component of the "Philosophy for Children (P4C)" approach developed by Lipman (2003), aims to foster both critical and creative thinking processes simultaneously. This approach offers a multilayered thinking practice that supports not only the transmission of knowledge but also intellectual and social inquiry. This approach offers a multilayered thinking practice that promotes not only the transmission of knowledge but also intellectual and social inquiry.

Chesters (2012) states that Socratic questioning is not merely a "maieutic" process, but a holistic one in which creative and critical thinking function complementarily, encompassing both intellectual and social dimensions. According to Chesters, this process consists of two stages: the creative stage (problem identification, question generation, hypothesis formation) and the critical stage (analyzing ideas, drawing inferences, and making judgments). He describes this structure as consisting of six fundamental steps: encountering a problem, setting an agenda, collecting information, reasoning and analysis, making judgments, and drawing conclusions. Although these steps are not sharply separated from one another, they are significant in illustrating how creative and critical thinking are intertwined. This structure enables students to use multidimensional thinking skills simultaneously in the processes of generating and evaluating ideas.

The Turkish Language Curriculum (MEB, 2015) presents a holistic structure that aims to develop not only students' basic language skills but also their higher-order cognitive abilities such as thinking, understanding, questioning, establishing connections, conducting analysis and synthesis, critiquing, and evaluating. The outcomes organized under the categories of "oral communication," "reading," and "writing" aim at the development of higher-order mental skills such as justifying, making inferences, expressing opinions, and questioning. Especially at the 6th grade level, there are outcomes that directly address critical thinking, creative thinking, and critical reading skills, which provides a suitable context for instructional practices structured through the Socratic questioning method. For example, in the domain of oral communication, learning outcomes such as "recognizing different perspectives in speech" (T6.1.2), "distinguishing which of the speaker's opinions are supported by reasoning" (T6.1.7), and "questioning consistency" (T6.1.9) are directly related to critical thinking skills. Similarly, in the reading domain, objectives such as "making inferences from texts" (T6.2.5), "identifying the author's purpose" (T6.2.13), and "determining whether opinions are supported by reasoning" (T6.2.14) are also aligned with critical thinking. In the writing domain, outcomes like "gathering reasons and evidence and

presenting them in a logical order" (T6.3.4.5–6) and "concluding opinions effectively" (T6.3.4.8) aim to support students' abilities to generate and structure their thinking.

In this respect, the Turkish language course offers a pedagogically appropriate context for the instruction of higher-order thinking skills, owing to its structure that facilitates the simultaneous development of both linguistic and cognitive competencies. Activities that involve text analysis, oral discussion, the cultivation of multiple perspectives, and the justification of ideas are closely aligned with the principles of Socratic questioning. Socratic questioning is a systematic instructional method that enables students to construct their thinking through open-ended questions, articulate and defend their views, and critically evaluate the ideas of others (Paul & Elder, 2010). Accordingly, the Turkish course—both in terms of content and skill dimensions—constitutes a fertile ground for the effective implementation of Socratic questioning, and provides a robust foundation for fostering higher-order thinking skills, particularly critical and creative thinking.

A review of the literature reveals that the number of experimental studies conducted within this context is limited. Most studies on higher-order thinking skills remain at a descriptive level (Tümay, 2014; Çakır, 2013; Yavaş, 2013; Altın, 2011; Aydın & Yılmaz, 2010) or focus on different subject areas (Saygılı, 2010; Çınar, 2007; Uysal, 2005). In line with this gap, the current study presents a holistic approach aiming to reveal the effect of the Socratic questioning method on three core higher-order thinking skills within the context of the Turkish course. The fact that experimental studies addressing higher-order thinking skills through the Socratic questioning method at the secondary school level and within the context of Turkish lessons are quite limited is thought to increase the theoretical originality and the potential practical contribution of the present research.

Purpose and Research Problem

The primary aim of this study is to reveal the effect of the Socratic questioning method implemented in 6th grade Turkish lessons on students' higher-order thinking skills. The study focuses on three core skills: critical thinking, critical reading, and creative thinking. Pre-test and post-test scores related to these skills will be compared to statistically evaluate the impact of the method. In doing so, the study aims to provide evidence-based data to inform teachers' pedagogical decision-making processes and to contribute to the restructuring of instructional methods. Accordingly, the main research problem is formulated as follows:

Does the use of the Socratic questioning method in 6th grade Turkish lessons create a significant difference in students' higher-order thinking skills?

In line with this main problem, the following sub-research questions will be addressed:

1. Is the Socratic questioning method effective in developing students' critical thinking skills?

2. Does the Socratic questioning method lead to differences in students' critical reading skills?
3. Is the Socratic questioning method effective in enhancing creative thinking skills?

METHOD

This section provides detailed information regarding the research design, study group, data collection tools, implementation process, and data analysis procedures. The study utilized only quantitative data.

Research Model

This research employed a quasi-experimental pretest-posttest control group design to examine the effect of the Socratic questioning method on students' higher-order thinking skills (critical thinking, critical reading, and creative thinking). This design is a quantitative model suitable for testing cause-effect relationships by comparing experimental and control groups (Büyüköztürk et al., 2012; Karasar, 2011). It was preferred because it enables a controlled comparison of instructional methods within real classroom settings, ensuring both methodological soundness and practical relevance in educational research. While the experimental group received Socratic-questioning-based instructional activities developed by the researcher, the control group was taught using traditional teaching methods.

Participants

The study group consisted of 23 sixth-grade students attending a private school in the city center of Konya. Using purposive sampling, one of the sixth-grade classes was assigned as the experimental group and the other as the control group. The experimental group included 6 female and 6 male students (n=12), while the control group consisted of 3 female and 8 male students (n=11). No students requiring inclusive education were included in the study.

Findings Regarding Group Equivalence: Group equivalence was assessed by comparing the pretest scores of students' critical thinking, critical reading, and creative thinking skills. Whether the data were normally distributed was examined through skewness and kurtosis values. These values ranged between-1.655 and 0.551 for all variables, indicating that the assumption of normal distribution was met (Tabachnick & Fidell, 2013).

Additionally, independent samples t-tests were conducted to determine whether there were significant differences between the groups in terms of the pretest scores of the three instruments. The results were as follows:

- Cornell Critical Thinking Test: $p = .15$
- Torrance Test of Creative Thinking: $p = .86$
- Critical Reading Scale: $p = .26$

Since all p-values were above the significance threshold of .05, it was concluded that the experimental and control groups were statistically equivalent prior to the intervention.

Data Collection Tools

To assess students' higher-order thinking skills, three different measurement instruments were employed. These tools were administered to both experimental and control groups before and after the intervention.

Cornell Critical Thinking Test – Level X: The Cornell Critical Thinking Test, developed by Ennis, Millman, and Tomko (1985), is a widely used and highly valid instrument designed to comprehensively measure critical thinking skills. The Level X version used in this study is appropriate for individuals from Grade 4 to university level.

The test consists of four sub-sections and includes 76 items (5 of which are sample questions):

- Judging whether a fact supports a hypothesis (Items 1–25)
- Evaluating the credibility of observational reports (Items 26–50)
- Estimating probability in sequences of events (Items 51–66)
- Identifying assumptions (Items 67–76)

Rather than being scored separately by sub-skill, evaluation was based on the total score. The total duration of the test was structured to be 64 minutes, suitable for the students' age group.

Critical Reading Scale: This scale was developed by Ünal (2006) and aims to determine students' critical reading behaviors through self-assessment. The scale has a unidimensional structure and consists of 22 items formatted as a 5-point Likert scale. The reported Cronbach's alpha reliability coefficient is .88.

Torrance Test of Creative Thinking (Verbal Form): Developed in 1966, the Torrance Test of Creative Thinking is one of the rare tools in the literature capable of directly measuring creative thinking. The test consists of two main sections: figural and verbal. Since this study focused on verbal skills, the verbal form was used.

The verbal form includes the following subtests:

- Asking questions
- Predicting causes and effects
- Product improvement
- Generating unusual uses/questions
- "Suppose that…" activities

Creativity is assessed through the dimensions of fluency, originality, and flexibility. The average duration of administration is 35–40 minutes. The Turkish version of the test

was adapted by Aslan (2001). Reliability coefficients ranged from .92 for fluency, .94 for originality, and between .62–.86 for flexibility. Since administering and scoring the test requires expertise, the researcher received formal training from Prof. Dr. Esra Aslan to ensure competence.

Implementation Process

The experimental process of the study lasted a total of nine weeks. After pretests were administered, the experimental and control groups were determined, no further interaction occurred with the control group until the posttest phase. The experimental group underwent a systematically planned intervention.

Before the experimentation, in the first week, the objectives, process, methodology, and expectations of the study were explained to the experimental group through a detailed presentation. To concretize the process, students watched a sample video of a Socratic circle and were provided with a list of guiding questions and phrases to use during discussions.

For each session, students reorganized the classroom seating to form an inner and outer circle as required by the Socratic discussion format. The layout was pre-arranged, and the researcher acted as an observer and facilitator when necessary. The seating arrangement was planned with the students beforehand and was restored after each session. Students in the inner circle began discussions by rereading the assigned text. In the early weeks, the researcher modeled questioning techniques with initial prompts; in later sessions, students independently guided the discussions. The question lists distributed in the first week were used actively during discussions. The researcher only intervened when students struggled or deviated from the topic.

Approximately 30 minutes of each session was dedicated to the inner circle discussions, while the remaining 10 minutes were allocated to written feedback by the outer circle. Although the outer circle initially provided superficial feedback, more in-depth and critical reflections emerged in later weeks through modeling and guidance from the researcher. Roles alternated weekly. Students who were in the inner circle one week moved to the outer circle the next, ensuring all students experienced both discussion and evaluation roles. Group dynamics were reshuffled weekly to avoid fixed groupings.

Most of the texts used in the experimental group were selected from Ron Shaw's Philosophy in the Classroom and translated into Turkish by the researcher. Additional materials included selections from Kalila and Dimna and Philosophy for Kids by David A. White, along with one video and one game. The table below presents the materials:

Table 1

Instructional Materials Utilized During The Implementation Process

Material	Resource
Father and His Two Daughters	Philosophy in the Classroom, Ron Shaw
Lioness, Hunter, and Jackal	Kalila and Dimna, Beydeba
Wild Rabbit and Frogs	Philosophy in the Classroom, Ron Shaw
What Makes Me Me? (Video)	https://www.bbc.co.uk/teach/school-radio/articles/zpyyhcw
Cause and Effect	Philosophy for Kids, David A. White
The Camel and the Monkey	Philosophy in the Classroom, Ron Shaw
The Wind and the Sun	Philosophy in the Classroom, Ron Shaw
Space Odeyssea	www.p4c.com (Accessed: 23.11.2016)
The Lion and the Mouse	Philosophy in the Classroom, Ron Shaw

Data Analysis

Quantitative data obtained from the study were analyzed using IBM SPSS 21. To determine the appropriate type of analysis, the normal distribution of posttest data was first examined. Skewness and kurtosis values were calculated for posttest scores from the Cornell Critical Thinking Test, Critical Reading Scale, and Torrance Test of Creative Thinking.

Table 2

Normality Statistics Of The Post-Test Scores Obtained From The Assessment Instruments

Scales	Group	N	Mean	SD	Skewness	Kurtosis
Cornell Critical Thinking	Experimental	12	42.83	5.17	-0.531	-0.523
	Control	11	35.55	8.41	-0.264	-0.823
Critical Reading Scale	Experimental	12	3.54	0.33	0.158	0.551
	Control	11	3.24	0.21	0.831	0.353
Torrance Test (Verbal)	Experimental	12	0.387	0.96	1.065	1.923
	Control	11	-0.375	0.74	-0.422	0.305

As shown in the table, skewness values ranged between -0.531 and 1.065, while kurtosis values ranged from -0.823 to 1.923. According to Cohen and Swerdlik (2013), the

assumption of normality is met when these values fall within the range of -3 to +3. Tabachnick and Fidell (2013) further suggest that values close to zero indicate normal distribution. Based on both criteria, it can be concluded that the data are normally distributed. Accordingly, parametric tests were used to analyze the posttest data. Independent samples t-tests were employed to compare groups, while paired samples t-tests were used to examine within-group changes. The significance level was set at $p < .05$.

Ethical Considerations

In the course of this research, we paid scrupulous attention to ethical guidelines, ensuring that the integrity and reliability of the study were never compromised.

This research was conducted **in 2017**, during a period when formal ethical committee approval was not compulsory in Türkiye for school-based educational studies carried out within the scope of regular instructional activities. Despite this, all procedures strictly adhered to the core principles of research ethics, including voluntary participation, respect for individuals, and the protection of participants' rights and data.

RESULTS

This section presents the findings related to the sub-problems derived from the quantitative data of the study. The results of the posttests administered to the experimental and control groups were analyzed using independent samples t-tests. The findings were discussed in terms of three higher-order thinking skills (critical thinking, critical reading, and creative thinking) in order to evaluate the effectiveness of the Socratic questioning method.

Findings Related to the First Sub-Problem

The first sub-problem was formulated as follows:

"Does the use of the Socratic questioning method in 6th grade Turkish lessons lead to a significant difference in students' posttest scores of critical thinking?"

The arithmetic means, standard deviations, and independent samples t-test results for the posttest scores of the Cornell Critical Thinking Test Level X are presented in Table 3.

Table 3

Descriptive Statistics and t-Test Results for the Posttest Scores of the Cornell Critical Thinking Test

Group	N	M	SD	df	t	p
Control	11	35.55	8.41	21	2.530	.019*
Experimental	12	42.83	5.17			

*$p < .05$

The results of the independent samples t-test indicated a statistically significant difference between the experimental and control groups (t(21) = 2.530, p = .019). The mean score of the experimental group (M = 42.83, SD = 5.17) was higher than that of the control group (M = 35.55, SD = 8.41). This finding suggests that the Socratic questioning method significantly improved students' critical thinking skills.

Findings Related to the Second Sub-Problem

The second sub-problem was formulated as follows:

"Does the use of the Socratic questioning method in 6th grade Turkish lessons lead to a significant difference in students' posttest scores of critical reading?"

The analysis results for this sub-problem are presented in Table 4.

Table 4

Descriptive Statistics and t-Test Results for the Posttest Scores of the Critical Reading Scale

Group	N	M	SD	df	t	p
Control	11	3.24	0.21	21	2.528	.020*
Experimental	12	3.54	0.33			

*p < .05

The findings demonstrate that the experimental group (M = 3.54, SD = 0.33) achieved a higher mean score compared to the control group (M = 3.24, SD = 0.21). The difference was statistically significant (t(21) = 2.528, p = .020). This result indicates that instruction based on the Socratic questioning method had a positive and significant effect on students' critical reading skills.

Findings Related to the Third Sub-Problem

The third sub-problem was formulated as follows:

"Does the use of the Socratic questioning method in 6th grade Turkish lessons lead to a significant difference in students' posttest scores of creative thinking?"

The posttest scores of the Torrance Test of Creative Thinking administered to both the experimental and control groups were analyzed, and the results are presented in Table 5.

Table 5

Descriptive Statistics and t-Test Results for the Posttest Scores of the Torrance Test of Creative Thinking

Group	N	M	SD	df	t	p
Control	11	-0.375	0.74	21	2.125	.046*
Experimental	12	0.387	0.96			

*p < .05

According to the results of the independent samples t-test, the creative thinking scores of the experimental group (M = 0.387, SD = 0.96) were significantly higher than those of the control group (M = -0.375, SD = 0.74) (t(21) = 2.125, p = .046). This finding reveals that the Socratic questioning method was also effective in enhancing students' creative thinking skills.

DISCUSSION

This study aimed to examine the effects of Socratic questioning method on higher-order thinking skills among 6th grade middle school students. Quantitative analysis results revealed that the method significantly improved students' critical thinking, critical reading, and creative thinking skills. When these findings are evaluated in comparison with the literature on the pedagogical strength of Socratic questioning and the contribution of the Philosophy for Children (P4C) approach to thinking skills, it becomes evident that the study offers original contributions to the field.

Discussion in Terms of Critical Thinking and Critical Reading Skills

The study found that Socratic questioning made a statistically significant contribution to students' level of critical thinking. Similarly, in the study conducted by Bülbül- Hüner (2018), it was observed that Socratic questioning enhanced students' capacities for both critical and independent thinking. The researcher employed the structured questioning templates developed by Paul and Elder for critical thinking and reported that those entellectual standarts support students in developing conceptual clarity and intellectual responsibility.

Comparable effects have also been observed in studies conducted with adult learners. Jackson (2024), for example, found that Socratic questioning improved clinical reasoning skills among nursing students. This suggests that the method supports abstraction and justification skills regardless of age group. In line with this, Yang, Newby, and Bill (2005) also demonstrated that Socratic questioning significantly enhanced college students' critical thinking performance in online discussions, emphasizing its broad applicability. Similarly, King (1995) reported that guided Socratic questioning strategies promoted critical thinking

among university students by encouraging elaboration and deeper processing of information.

Various studies have demonstrated that P4C-based practices particularly support the development of critical thinking skills in early childhood education. Research conducted by Karadağ and Demirtaş (2018) has shown that philosophical inquiry activities at the preschool level improved children's abilities to explain ideas, establish cause-effect relationships, and justify their thoughts. In a study by Işıklar (2019) focusing on early childhood, although the experimental group scored higher in critical thinking, the difference was not statistically significant. The researcher suggests that the absence of a significant difference in critical thinking outcomes may be due not only to factors such as intervention duration and sample size, but also to the Preschool Education Curriculum's existing emphasis on critical and inquiry-based thinking, which may have reduced the program's additional impact in experimental group.

Türksoy (2020), who conducted P4C-based practices at the middle school level, reported significant improvements in students' critical thinking scores. This implies that such methods may be effective indifferent age groups—such as middle school—where cognitive flexibility begins to develop more prominently. This is consistent with findings by Reznitskaya et al. (2001), who showed that dialogic, inquiry-based discussions improved students' reasoning and critical argumentation skills.

Additionally, studies utilizing other structured discussion techniques have reported similar results. Göçmez (2016), in a debate-based study with 4th grade students, found significant improvements in critical thinking scores. Although debate is not a form of Socratic questioning per se, it involves similar cognitive processes such as listening to opposing viewpoints, defending ideas, and forming logical judgments. Therefore, it can be stated that structured discussion environments in general contribute positively to the development of critical thinking.

One of the significant contributions of the present study is its direct investigation of critical reading skill development alongside critical thinking. The significant improvement in the experimental group's critical reading scores demonstrates that Socratic discussions guided by purposeful questioning during the reading process effectively activated students' abilities to analyze texts, make inferences, and justify interpretations. This finding is consistent with the meta-analysis by Murphy et al. (2009), which demonstrated that classroom discussion approaches substantially improved students' text comprehension and, in some cases, their critical-thinking and reasoning skills. Although the literature suggests that P4C practices contribute indirectly to critical reading skills, this study provides a unique contribution to the field by directly measuring critical reading as an outcome.

Discussion in Terms of Creative Thinking Skills

In terms of creative thinking, the Socratic questioning method also yielded statistically significant and positive effects. The results of the Torrance Test of Creative Thinking

indicated significant differences in favor of the experimental group, particularly in the dimensions of fluency, flexibility, and originality. Similar findings were reported by Akan (2022) in a P4C-based study conducted with 4th grade students, where improvements were observed in students' abilities to think innovatively and generate creative solutions. This supports the idea that structured discussion environments can stimulate creative thinking.

Likewise, the study by Jones- Teuben (2013), which was structured around "communities of inquiry," demonstrated progress in students' abilities to generate ideas, form connections, and adopt different perspectives. In another study conducted by Kaplan and Parsa (2016) with 8th grade students, inquiry-based instruction led to statistically significant improvements in creative thinking skills. This finding aligns with the age group of the current study and further supports the effectiveness of the method.

A quasi-experimental study conducted by Belen-Uluçay (2025) at the preschool level found that P4C-based practices led to significant improvements in both critical and creative thinking skills among children. This finding reinforces existing literature suggesting that the P4C approach can effectively support the development of thinking skills regardless of age level.

However, there are also studies in the literature reporting non-significant results for P4C-based interventions. In a year-long study conducted by Ventista (2019), no significant improvements were observed in either critical or creative thinking scores. Such results suggest that factors like implementation quality, teacher expertise, and consistency of the instructional process may play a more decisive role than the method itself. Within this context, it can be argued that the positive outcomes observed in the present study are related to the systematic, structured, and pedagogically aligned implementation of the process.

General Evaluation

Overall, the Socratic questioning method stands out as an effective strategy for developing higher-order thinking skills, owing to both its theoretical grounding and pedagogical potential. The approach not only encouraged students to evaluate existing knowledge but also supported them in generating new ideas and recognizing cognitive dissonance. In this respect, the method shifted students from passive recipients to active agents in productive thinking processes. Compared to other P4C-based and structured discussion approaches in the literature, this study offers a unique and valuable contribution through its methodological integrity and multidimensional assessment framework. While the findings of this study provide promising evidence, they should be viewed with a degree of caution. The relatively small sample size and the purposive, non-random sampling may place some limits on generalizability. Further research with larger and more diverse groups would help to consolidate and broaden the applicability of these results. Additionally, possible influences such as teacher effects, classroom dynamics, or students' previous experience with inquiry-based methods should be taken into account in future studies.

CONCLUSION AND RECOMONDATIONS

Conclusion

This study investigated the effect of Socratic-questioning-based instruction on sixth-grade middle school students' higher-order thinking skills. The findings revealed that students in the experimental group showed statistically significant improvements in critical thinking, critical reading, and creative thinking skills. These results point to the potential of structured inquiry environments in enhancing students' cognitive depth, evaluative capacities, and ability to generate alternative ideas.

Socratic questioning in particular was found to foster students' abilities in logical reasoning, justification, seeking coherence, and constructing thought. The active engagement of students in thinking processes during the intervention—such as generating ideas from texts and confronting opposing viewpoints—was effective in developing both critical and creative thinking skills.

Another notable contribution of this study is the demonstration that critical reading skills can be developed through Socratic inquiry. While this relationship is mostly discussed indirectly in the literature, it was directly measured in this research, and the experimental group showed a statistically significant improvement. This finding indicates that the method contributes multidimensionally to higher-order thinking skills.

The overall results of the study suggest that Socratic questioning has a strong theoretical foundation and can serve as an effective pedagogical tool in classroom practices. Furthermore, the method offers a holistic approach that simultaneously supports multiple higher-order thinking skills and contributes to deep learning processes among students.

Recommendations

Recommendations for Educational Practice

1. The Socratic questioning method can be used regularly in Turkish language courses, particularly in reading comprehension and writing activities. This method supports students in approaching texts critically, justifying their ideas, and developing alternative perspectives.
2. Classroom discussion environments should be redesigned not only to transmit knowledge but also to center on generating thought. Teaching students how to ask questions, provide justifications, and evaluate each other's ideas constructively is essential for the development of 21st-century skills.
3. In-service training programs with practical components should be provided to teachers on the use of Socratic questioning. As this method requires not only theoretical knowledge but also interactive, classroom-based competence, teacher qualification is a key factor.
4. Extracurricular activities that promote philosophical thinking (e.g., philosophy clubs, discussion workshops) can be expanded in schools. These activities provide

opportunities for students to apply their thinking skills in natural and engaging environments.

Recommendations for Future Research

1. This study was conducted only at the 6th-grade level. Future research could explore the effects of similar interventions across different age groups, particularly in early childhood and high school settings.
2. Other variables that may influence the development of critical reading skills (e.g., self-efficacy, motivation) could be examined, and conceptual models could be developed accordingly.
3. Most studies on creative thinking are directly based on the P4C approach. Experimental and descriptive studies that explore the relationship between Socratic questioning and creative thinking in greater depth would make valuable contributions to the field.
4. Comparative studies involving different discussion-based instructional strategies (e.g., debate, Six Thinking Hats) could be conducted to examine the relative effectiveness of Socratic questioning.

REFERENCES

Akan, R. (2022). *Hayat bilgisi öğretiminde çocuklar için felsefe (P4C) yaratıcı düşünme becerisi etkinliklerinin öğrencilerin yaratıcı düşünme becerisine etkisi* [The effect of philosophy for children (P4C) creative thinking activities in life studies education on students' creative thinking skills] (Publication No. 757448) [Doctoral dissertation, Bursa Uludağ University, Turkey]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Altın, Ş. (2011). *Fen ve teknoloji öğretmenleri ve öğretmen adaylarının üst düzey düşünme becerilerinin incelenmesi: Konya örneği* [The survey of the higher order thinking skills of science and technology teachers and prospective teachers: Example of Konya] (Publication No. 386742) [Master's thesis, Selçuk University, Turkey]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/

Aslan, E. (2001). Torrance yaratıcı düşünce testi'nin Türkçe versiyonu. [Torrance test of creative thinking's Turkish version] *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi*, 14(14), 19-40.

Aydın, N., & Yılmaz, A. (2010). Yapılandırıcı yaklaşımın öğrencilerin üst düzey bilişsel becerilerine etkisi [The effect of constructivist approach in chemistry education on students' higher order cognitive skills]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 39*(39), 57-68.

Belen-Uluçay, H. (2025). *Çocuklarda felsefe uygulamalarının okul öncesi dönem çocukların yaratıcılıklarına ve eleştirel düşünme becerilerine etkisinin incelenmesi* [Examining the effects of philosophy practices with children on preschool children's creativity and critical thinking

skills] (Publication No. 913573) [Master's thesis, Selçuk University, Turkey]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/

Bülbül-Hüner, S. (2018*). Sokratik sorgulama temelli etkinliklerin hayat bilgisi dersinde başarı ve kalıcılığa etkisinin incelenmesi: bir eylem araştirmasi* [Investigation of the effect of socratic questioning based activities on achievement and retention in life studies course: action research] (Publication No. 530667) [Doctoral dissertation, İstanbul University-Cerrahpaşa]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/

Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2012). *Bilimsel araştırma yöntemleri* [Scientific research methods] (18. baskı). Pegem Akademi Yayımcılık.

Chesters, S. D. (2012). *The socratic classroom*. Sense Publishers. **https://doi.org/10.1007/978-94-6091-855-1**

Cohen, R., & Swerdlik, M. (2013). *Psikolojik test ve değerlendirme - testler ve ölçmeye giriş* [Psychological testing and assessment - introduction to tests and measurement] (E. Tavşancıl, Trans.). Nobel Yayıncılık.

Çakır, N. (2013). *Üniversite eğitiminin üst düzey düşünme becerilerinin gelişimine etkisi*. [The effect of university education on the development of higher order thinking skills] (Publication No. 363194) [Doctoral dissertation, Hacettepe University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Çınar, D. (2007). *İlköğretim fen eğitiminde probleme dayalı öğrenme yaklaşımının üst düzey düşünme becerilerine ve akademik risk alma düzeyine etkisi*. [The effect of problem based learning approach in elementary science education on higher order thinking skills and academic risk-taking level] (Publication No. 212439) [Master's thesis, Selçuk University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

De Bono, E. (1976). *Teaching thinking*. Penguin.

Dewey, J. (1910). *How We Think*. DC Heath. https://doi.org/10.1037/10903-000

Doğanay, A. (2015). Düşünme becerileri ve öğretimi. [Thinking skills and instruction] A. Doğanay (Ed.), *Öğretim ilke ve yöntemleri* içinde [within Principles and methods of instruction] (s. 307–330). Pegem Akademi.

Ellis, H., & Hunt, R. (1993). *Fundamentals of cognitive psychology*. Mc Graw Hill.

Ennis, R., Millman, J., & Tomko, T. (1985). *Cornell critical thinking tests level x & level z manual* (3 ed.). Critical Thinking Books & Software

Göçmez, B. (2016). *İlkokul 4. Sınıf sosyal bilgiler dersinde münazara tekniğinin ders başarısı ve eleştirel düşünmeye etkisi.* [The effect of debate technique on course achievement and critical thinking in 4th grade social studies course] (Publication No. 443529) [Master's thesis, Çanakkale Onsekiz Mart University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Işıklar, S. (2019). *Çocuklar için felsefe eğitim programinin 5-6 yaş çocuklarda felsefi sorgulama yoluyla eleştirel düşünme ve problem çözme becerilerine etkisi*. [The effect of philosophy for children education program on critical thinking and problem solving skills through philosophical inquiry in 5-6 year old children] (Publication No. 594869) [Master's thesis, Çanakkale Onsekiz Mart University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Jackson, J. A. (2024). *Impact of socratic questioning as a teaching strategy to develop clinical judgment skills of 1st-year student nurses* (Publication No. 30995305). [Doctoral dissertation, William Carey University]. https://www.proquest.com/index

Jones-Teuben, H. M. (2013). *'I disagree with myself!': creative thinking ın a key stage 1 community of enquiry.* (Publication No. 10048835). [Doctoral dissertation, Newcastle University]. https://www.proquest.com/index

Kaplan-Parsa, M. (2016). *İşbirlikli sorgulamaya dayalı öğrenme ortamının yaratıcı düşünmeye, sorgulayıcı öğrenme becerilerine, fen ve teknoloji dersine yönelik tutuma etkisi.* [The effect of collaborative inquiry based learning environment on creative thinking, inquiry learning skills, and attitude towards science and technology course] (Publication No. 437085) [Doctoral dissertation, Marmara University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Karadağ, A., & Demirtaş, A. (2018). Çocuklarla felsefe öğretim programı'nın okul öncesi dönemdeki çocukların eleştirel düşünme becerileri üzerindeki etkililiği. [The effectiveness of philosophy with children curriculum on critical thinking skills of preschool children] *Eğitim ve Bilim Dergisi*, 43(195), 19–40. https://doi.org/10.15390/EB.2018.7268

Karasar, N. (2011). *Bilimsel araştırma yöntemi* [Scientific research methods] (22. baskı). Nobel Yayıncılık.

King, A. (1995). Designing the instructional process to enhance critical thinking across the curriculum: Inquiring minds really do want to know. *Teaching of Psychology*, 22(1), 13–17. https://doi.org/10.1207/s15328023top2201_5

Krathwohl, D. R. (2002). A revision of bloom's taxonomy: an overview. *Theory into Practice*, 41(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Lipman, M. (2003). *Thinking in education*. Cambridge University Press https://doi.org/10.1017/CBO9780511840272

MEB. (2015). Türkçe dersi öğretim programı (1-8. sınıflar). [Turkish course curriculum (grades 1-8)] Millî Eğitim Bakanlığı.

Murphy, P. K., Wilkinson, I. A., Soter, A. O., Hennessey, M. N., & Alexander, J. F. (2009). Examining the effects of classroom discussion on students' comprehension of text: A meta-analysis. *Journal of Educational Psychology*, 101(3), 740–764. https://doi.org/10.1037/a0015576

Paul, R., & Elder, L. (2007). *The thinker's guide to the art of socratic questioning.* Foundation for Critical Thinking Press.

Paul, R., & Elder, L. (2010). *The thinker's guide to the art of asking essential questions* (5th ed.). Foundation for Critical Thinking Press.

Resnick, L. B. (1987). *Education and learning to think*: National Academies.

Reznitskaya, A., Anderson, R. C., McNurlen, B., Nguyen-Jahiel, K., Archodidou, A., & Kim, S.-y. (2001). Influence of oral discussion on written argument. *Discourse Processes*, 32(2-3), 155-175. https://doi.org/10.1207/S15326950DP3202&3_04

Saifer, S. (2018). *Hot skills: developing higher-order thinking in young learners*. Redleaf Press. https://doi.org/10.4324/9781032683423-7

Saygılı, G. (2010). *Öğretim teknolojilerinin fen ve teknoloji dersinde kullanımının ilköğretim öğrencilerinin problem çözme becerilerine öğrenme ve ders çalışma stratejilerine üst düzey düşünme becerilerine fen ve teknoloji dersine yönelik tutumlarına ve ders başarısına etkisinin incelenmesi.* (The investigation of the effect of using instructional technologies in science and technology course on elementary students' problem solving skills, learning and study strategies, higher order thinking skills, attitudes towards science and technology course, and course achievemen) (Publication No. 278481) [Doctoral dissertation, Dokuz Eylül University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

Tümay, F. B. (2014). *Examining the relationship between the higher-order thinking processes ın the native language and reading comprehension skills ın english ın the secondary education*. (Publication No. 368557) [Doctoral dissertation, Mersin University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Türksoy, N. (2020). *Çocuklar için felsefe (p4c) eğitiminin ortaokul öğrencilerinin bilimsel sorgulamaya yönelik görüşlerine ve eleştirel düşünme becerilerinin gelişimine katkisi: bir karma yöntem araştirmasi* [The contribution of philosophy for children (P4C) education to middle school students' views on scientific inquiry and the development of their critical thinking skills: mixed methods research] (Publication No. 640120) [Master's thesis, Alanya Alaaddin Keykubat University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Ünal, E. (2006). *İlköğretim öğrencilerinin eleştirel okuma becerileri ile okuduğunu anlama ve okumaya ilişkin tutumları arasındaki ilişki.* [The relationship between elementary students' critical reading skills, reading comprehension, and attitudes towards reading] (Publication No. 188864) [Master's thesis, Eskişehir Osmangazi University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Uysal, Ö. (2005). *Bilgisayar destekli bilişsel çıraklık yönteminin öğrencilerin üst düzey düşünme becerilerine etkisi.* [The effect of computer assisted cognitive apprenticeship method on students' higher order thinking skills] (Publication No. 160103) [Master's thesis, Ankara University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Ventista, O. M. (2019). *An evaluation of the `philosophy for children' programme: the impact on cognitive and non-cognitive skills*. [Doctoral dissertation, Durham University]. Durham E-Theses Online: http://etheses.dur.ac.uk/13121/

Yang, Y. T. C., Newby, T. J., & Bill, R. L. (2005). Using Socratic questioning to promote critical thinking skills through asynchronous discussion forums in distance learning environments. *The American Journal of Distance Education*, 19(3), 163–181. https://doi.org/10.1207/s15389286ajde1903_4

Yavaş, S. (2013). *İlköğretim 4. Ve 5. Sınıf öğrencilerinin kitap okuma alışkanlıkları ile üst düzey düşünme becerileri arasındaki ilişkinin değerlendirilmesi.* [The evaluation of the relationship between 4th and 5th grade elementary students' reading habits and higher order thinking skills] (Publication No. 328693) [Master's thesis, Necmettin Erbakan University] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr

Data Availability Declaration

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

Elif Nur Bozer Özsaraç and İsa Korkmaz contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. All authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements: The authors would like to thank the children and their families who voluntarily participated in this study

Biographical notes:

Elif Nur BOZER ÖZSARAÇ [1]*:* She completed both her master's and doctoral degrees in the field of Curriculum and Instruction at Necmettin Erbakan University. She is currently serving as an Assistant Professor in the field of Early Childhood Education at Selçuk University.

Google Scholar Researcher ID: https://scholar.google.com.tr/citations?user=4wuWuP8AAAAJ&hl=tr

İsa KORKMAZ: He is currently a Professor in the Department of Primary Education at Necmettin Erbakan University. He received his master's and doctoral degrees in Curriculum and Instruction department from Ohio University.

Scopus Author Identifier Number: 57189640370

Web of Science Researcher ID: CZT-9513-2022

Google Scholar Researcher ID: https://scholar.google.com.tr/citations?hl=tr&user=dkep4nEAAAAJ

[1] Corresponding Author

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Investigation of Digital Competencies and Artificial Intelligence Literacy of Special Education Students

Mehrossâdat Vosough Matin[1]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 501- 525
http://www.ijonmes.net

Article Info:

Received 12.08.2025
Revision 06.09.2025
Accepted 18.09.2025

Abstract:

This study investigated the digital competence and artificial intelligence (AI) literacy levels of special education students at various universities, examining differences by gender and grade level. A quantitative, descriptive, and correlational design was employed with a sample of 234 voluntary participants studying in special education departments. Data were collected using the "Digital Competence Perception Scale for Pre-service Teachers" and the "Artificial Intelligence Literacy Scale." Results indicated that students exhibited high levels of both digital competence and AI literacy. Male students scored significantly higher in overall digital competence, whereas gender differences in AI literacy were minimal. Regarding grade level, notable differences emerged in the sub-dimensions of digital competence, and higher-grade students demonstrated greater AI literacy and self-efficacy. Regression analysis showed that digital competence significantly predicted AI literacy, explaining 39% of its variance. These findings highlight the interconnection between digital skills and AI literacy among future special education teachers. Therefore, it is recommended that teacher education programs integrate digital competence and AI literacy modules into their curricula. Future studies should adopt mixed or qualitative methods to explore participants' experiences more deeply and validate the quantitative outcomes.

Keywords: Special education, Pre-service teachers, Artificial intelligence literacy, Digital competence

Citation:
Vosoughmatin, M.(2025) Investigation of Digital Competencies and Artificial Intelligence Literacy of Special Education Students. *International Journal of Modern Education Studies, 9*(2), 501-525. https://doi.org/10.51383/ijonmes.2025.430

[1] Asst. Prof. Dr., Hasan Kalyoncu University, Faculty of Education, Gaziantep, Türkiye.
mehrossadat.vosoughmatin@hku.edu.tr , https://0000-0001-7082-1275

INTRODUCTION

With the spread of digitalization across all sectors of society, radical transformations are occurring in the educational ecosystem. Information and communication technologies, which are central to these transformations, profoundly affect and reshape not only teaching processes but also the characteristics of learners. The opportunities offered by technology-oriented innovations contribute to the construction of inclusive, accessible and participatory learning environments that support the cognitive, sensory and motor skills of individuals with learning disabilities, especially in connection with special education (Bozkurt, 2017; Drigas & Ioannidou, 2012; Shettar et al., 2021).

Digital competencies is a multidimensional concept that encompasses individuals' ability to use digital technologies effectively, safely, critically, and responsibly. The Digital Competence Framework (DigComp) developed by the European Commission classifies these competencies into five main areas: information and data literacy, communication and collaboration, digital content production, security, and problem solving. Digital competence is not only limited to technical knowledge but also includes social and cognitive skills such as ethical behavior in digital environments, critical thinking, and digital citizenship (Carretero et al., 2017; Essuman et al., 2025). In the context of education, digital competencies enable prospective teachers and students to use technology effectively in learning and teaching processes. Today, the digitalization of learning environments requires individuals to be able to use digital tools effectively in education (Tondeur et al., 2017). For the students of the Department of Special Education, digital competencies have special importance in terms of both developing their professional competencies and providing effective support to the learning processes of individuals with special needs. These students are expected to have the skills to use digital technologies effectively related to special education, develop adaptive digital materials, work with assistive technologies, and integrate digital solutions into individualized instructional practices (Al-Awidi & Aldhafeeri, 2017).

With the rapid introduction of artificial intelligence-based technologies to the education agenda, the concept of “artificial intelligence literacy” has been included in the discussions on digital transformation in education. This concept is defined as a broad area of competence that includes individuals' ability to recognize algorithmic systems, critically evaluate these systems, and use productive technologies with ethical responsibility (Chiu et al., 2024). The acquisition of these competencies by students and teachers is seen as a prerequisite for the safe and effective implementation of data-driven and individualized teaching practices (Stolpe & Hallström, 2024). According to the findings of a study conducted by Uğraş and colleagues (2025) on teachers, ChatGPT plays important roles in providing instant feedback, including personalized content recommendations, encouraging creativity, fostering real-world connections, and increasing student motivation. Furthermore, ChatGPT's features have accelerated the educational process and provided teachers with greater flexibility in planning and promoting student equity. When used

correctly, AI applications can not only improve learning experiences but also lead to more creative, rich, and flexible teaching methods, helping to achieve the ambitious sustainability goals of education (Ipek et al., 2023; Uğraş et al., 2024). Despite the high potential benefits of using artificial intelligence-based applications in special education, there are limited concrete examples in practice (Hopcan et al., 2023). In addition, ethical concerns in data-based decision-making processes and the inadequate management of data security and privacy issues lead stakeholders to develop reservations towards these technologies (Kharbat et al., 2021). This study aims to examine the digital competencies and artificial intelligence literacy of special education students studying at different universities across various factors.

Digital competence is no longer limited to computer use but encompasses comprehensive areas such as data security, digital ethics, and productivity (Long & Magerko, 2020). Competence in the use of artificial intelligence is an important extension of digital competence today. Education systems should integrate these two competence areas into the curriculum, supported by teacher training, digital infrastructure investments, and awareness campaigns (Sector, 2021; Vuorikari et al., 2016).

Digital Literacy in Special Education

In today's information age, digital literacy is defined as the ability of individuals not only to use technological tools, but also to critically evaluate, produce, and safely share digital content (Marín & Castaneda, 2023). Gilster (1997) defined digital literacy as the ability to "access, evaluate and use information effectively in a digital environment,". The acceptance of digital literacy as a basic competency in the educational context makes it necessary to reconsider this concept in terms of teacher training processes and especially in the field of special education (Forsling, 2023). Special education is a field that focuses on individual differences and includes customized teaching processes according to different learning needs. In this context, effective and creative use of digital technologies makes significant contributions to the learning processes of individuals with special needs. However, making effective use of the opportunities offered by technology requires not only technical skills but also the ability to criticize digital content and use it in a pedagogical context. At this point, digital literacy stands out as one of the basic competencies that special education teachers and candidates should acquire (Ng, 2012).

Research shows that digital literacy in special education provides cognitive, social and communicative gains in the learning processes of individuals with special needs. In particular, digital technologies such as augmented reality (AR), virtual reality (VR), speech recognition systems, and audio-visual aided materials make learning accessible and motivating for students with different disabilities such as autism spectrum disorder, learning disabilities, and intellectual disabilities (Bourgonjon et al., 2014; Alper & Raharinirina, 2006). This makes it imperative for teachers not only to be familiar with the tools, but also to be competent in individualizing, adapting, and using digital content

according to the pedagogical context. However, research has revealed that pre-service special education teachers' digital literacy levels are not sufficient, and that they have difficulty in using digital tools effectively in pedagogical contexts. A study conducted in Turkey stated that pre-service special education teachers have positive attitudes towards digital technologies, but their competence in using these technologies for effective and individualized instruction, is low (Kurt & Ayas, 2021). This situation reveals that digital literacy skills should be emphasized more in teacher training programs in harmony with special education.

When it comes to special education, digital literacy should include not only the use of information and communication technologies, but also awareness of digital citizenship, security, respect for copyright, and digital ethics. Acting with ethical responsibility in digital environments is an essential part of effective digital literacy for pre-service teachers. This includes respecting the privacy rights of students with special needs and guaranteeing their emotional safety when using technology. These ethical considerations are not optional; they are a fundamental component of a teacher's digital competence, as noted by Ribble (2011). In addition to theoretical knowledge, practical training is of great importance in developing digital literacy skills. In particular, pre-service teachers' gaining experience in preparing digital learning materials, developing digital content suitable for individualized education programs (IEPs), and applying technological tools in the field supports these competencies in becoming permanent. International studies emphasize that pre-service teachers' opportunities to directly experience technology are decisive for their digital competencies and literacy levels (Tondeur et al., 2012).

The factors affecting the acquisition of digital competence in special education students exhibit a multidimensional structure consisting of cognitive, motor, and socio-emotional factors. Woodward and Cuban (2001) state that limited professional development delays the utilization of technology in teacher practice. Cagıltay et al. (2019) report that lack of infrastructure and internet connectivity problems complicate integration efforts. In their analysis of the teacher technology acceptance model, Nam et al. (2013) reveal that perceived ease of use plays a critical role in developing positive attitudes. Drigas and Ioannidou (2012) state that teachers' lack of technological pedagogical content knowledge hinders the integration process. Bozdağ (2017) emphasizes that intercultural differences constitute important variables in technology acceptance. Ünal (2013) shows that integration initiatives become unsustainable if teacher self-efficacy perception is low. Gülnar (2025) states that the complexity of user interfaces increases the cognitive load, and this negatively affects student motivation. Alnahdi (2014) argues that adopting universal design principles reduces barriers by increasing accessibility. In this context, when barriers and facilitators are considered together, the development of digital competence requires coordinated technological, pedagogical, and institutional strategies.

Artificial Intelligence Literacy and Its Importance for Special Education

The concept of artificial intelligence literacy is defined as a holistic competence area that includes the capacity of individuals to comprehend the basic principles of artificial intelligence systems, to make critical evaluations on the outputs of these systems, and to assume ethical responsibility during their use (Chiu et al., 2024). It can be said that the cognitive, technical, social, and ethical sub-dimensions of AI literacy complement each other (Stolpe & Hallström, 2024). The cognitive dimension of the concept explains the level of users' comprehension of algorithmic processes. The technical dimension describes their ability to understand model architectures and use tools effectively. The social dimension covers the ability to interpret the social impacts of artificial intelligence. The ethical dimension requires responsible usage behaviors in line with the principles of privacy, bias and accountability (Yao & Wang, 2024).

Educational research lays emphasis on the significance of embedding AI literacy into interdisciplinary learning designs (Yim, 2024). In terms of general education, AI is widely applied through adaptive learning systems that provide customized feedback, analytics dashboards that offer data-driven guidance, and assessment tools based on natural language processing (Chen et al., 2022; Takona, 2024). These applications create individualized learning paths by adapting content according to students' learning speed. In the field of special education, artificial intelligence offers interventions tailored to the individual needs of students through interactive learning environments, eye-tracking-based attention monitoring systems, and alternative communication solutions supported by natural language processing (Hopcan et al., 2023; Kara, 2025). For example, audio and visual parameters are dynamically adjusted for students with sensory sensitivity. These adaptations organize the learning materials in a way that reduces the student's cognitive load. Research shows that AI-supported applications increase students' academic achievement and motivation (Barua et al., 2022). However, in relation to special education, systems need to be designed in accordance with accessibility standards. User interfaces are required to take into account cognitive and motor skill differences. Teachers need technical support in the process of selecting and implementing AI-based tools (Waterfield et al., 2024).

The theoretical foundations of AI literacy include students' competencies to understand, critically evaluate, and responsibly use AI systems; and these competencies take on even more complex dimensions in the field of special education. The literacy framework proposed by Chiu et al. (2024) addresses technical, moral, legal, and sociocultural dimensions as a whole. Stolpe and Hallström (2024) identify six structural components of AI literacy in technology education in relation to pedagogical goals and discuss their transferability to special education settings. AI literacy in special education is critical for students' participation in the future workforce and their right to be included in social life. In their research, Garg and Sharma (2020) reveal that AI-based interactions increase peer interaction. Barua et al (2022) state that personalized artificial intelligence tools

improve autonomous learning behaviors in children with neurodevelopmental disorders. Alkan (2024) argues that professional development programs should be redesigned by examining the factors determining the intention of special education teachers to use artificial intelligence tools. Johnson et al. (2023) explain that generative artificial intelligence expands students' creative expression areas by providing autonomous content production in special education classrooms. Yao and Wang (2024) show that digital literacy, self-efficacy, and perceived ease of use significantly determine attitudes towards artificial intelligence in their study on pre-service special education teachers. These studies reveal that special education students are more likely to take part as active citizens in the digital world thanks to their AI literacy. As a result, it is emphasized that literacy plays a key role in sustainable economic participation and social justice.

Integrating Digital and Artificial Intelligence Literacy into Teacher Education Programs

Training programs play a crucial role in developing AI literacy. Wallace and Georgina (2014) highlight that technology training modules for special education teachers increase pedagogical innovation when they include literacy components. Nazik Akcayir et al. (2020) in their research examining teacher attitudes, stated that the frequency of professional development programs directly affects the use of digital tools. Şen and Akbay (2023) reported that artificial intelligence workshops facilitated the experience sharing of pre-service teachers. Anderson (2019) states that applied AR/VR workshops trigger active learning approaches in teachers. Pinski (2024) states that in-house mentor systems ensure continuity and accelerate teacher adaptation. The findings in the related literature show that the structural revision of teacher training programs, along with other branches, is important for the institutional sustainability of artificial intelligence literacy in special education.

Within the framework of technology integration of pre-service teachers, the SAMR Model stands out in planning of teaching activities with the steps of Substitution, Augmentation, Modification, and Redefinition of technology. TPACK, on the other hand, defines Technological, Pedagogical, and Content Knowledge as three intersecting dimensions and is a model revealing that teachers can provide technology integration with the balance between these components (Aubakirova et al., 2024; Ay, Karadağ & Acat, 2015). Ünal (2013) shows that pre-service teachers' TPACK efficacy levels are significantly related to their technology integration self-efficacy. Kaya and Yılayaz (2013) state that teacher education programs are enriched with application-based courses that include TPACK components. Bozdağ (2017) points out that the adaptation of different frameworks in the international context varies due to cultural and institutional variables. Therefore, models such as SAMR and TPACK provide a systematic lens on technology integration in special education and make it possible to develop sustainable innovation strategies.

Statement of the Problem

Today, digital technologies are radically transforming educational environments and reshaping many areas from teaching processes to assessment methods. Especially in the field of special education, the use of digital tools plays a critical role in developing individualized teaching practices and ensuring the effective participation of individuals with special needs in learning processes (Drigas & Rodi, 2013). This transformation requires not only the technical use of digital tools but also the development of pre-service teachers' competencies to use these technologies effectively, ethically, and critically for pedagogical purposes. Thus, the level of digital competencies of prospective special education teachers directly affects their future teaching quality (Yenmez & Gökçe, 2019). Artificial intelligence technologies are becoming increasingly visible in education. Adaptive learning systems, applications that provide automatic feedback, artificial intelligence-based communication tools, and diagnostic assessment software developed for individuals with special needs require teachers to have both technological knowledge and AI literacy (Chiu et al., 2024).

Special education is one of the disciplines that can benefit the most from technology in terms of individualization, flexibility, and differentiated instruction (Alkan, 2024). However, the transformation of this potential into practice depends on pre-service teachers' strong digital competencies and artificial intelligence literacy. It is of great importance not only to use digital tools and artificial intelligence-based systems but also to evaluate them critically, use them within the framework of ethical principles, and apply them by considering the rights of individuals with special needs. Therefore, examining the competencies of special education students in these areas is a serious necessity both academically and practically.

Current research on the use of AI-based applications in special education reveals that although the potential benefits are high, there is limited research in practice (Hopcan et al., 2023). Although, scales and assessment tools for measuring AI literacy have started to be developed, the validity-reliability evidence of these tools in connection with special education is not sufficiently reported (Wang et al., 2023). The need for tools that can validly and reliably measure the level of AI literacy of special education students continues. This problem area necessitates an in-depth investigation of the relationship between technology integration skills and artificial intelligence literacy, which clarifies the problem of this study. This study aims to reveal the extent to which pre-service special education teachers have the knowledge and skills required by the digital age. The findings will contribute to the development of concrete recommendations for the restructuring of teacher training programs. At the same time, this study aims to fill an important gap by realizing digital transformation in special education effectively and increasing pedagogical adaptation to technological developments.

The aim of this study is to examine the digital competencies and artificial intelligence literacy of special education students studying at different universities in relation to various variables. In this respect, the following questions were addressed in the study.

H1: What is the level of digital competencies and artificial intelligence literacy of special education students?

H2: Do the digital competencies and artificial intelligence literacies of special education students differ in relation to the gender variable?

H3: Do the digital competencies and artificial intelligence literacies of special education students differ in relation to grade level?

H4: Do special education students' digital competencies significantly predict their AI literacy?

METHOD

Research Design

This research is a descriptive and correlational study designed to examine the relationship between digital competencies, and artificial intelligence literacy of students studying in the special education department at the university. In this study, which is based on quantitative research methods, data were collected using a questionnaire technique, and these data were evaluated through descriptive and correlational analyses.

Sample

The sample of the study includes all students studying in special education departments of universities in Turkey. It consists of 234 university students who agreed to share their data through an online survey studying in the special education departments of several universities. Maximum variation sampling was used in sample selection. Creating a maximum diversity sample involves making a sample that is directly related to the research purpose and reflecting the diversity of individuals who may be parties to the problem being studied to the maximum extent (Miestamo et al., 2016). Of the participating students, 135 (57.3%) were female and 96 (42.7%) were male. Forty-eight (20.51%) of the participants were in the first grade, 64 (27.35%) in the second grade, 87 (37.18%) in the third grade, and 35 (14.96%) in the fourth grade.

Data Collection Tools and Data Collection

In this study, different measurement tools and a sociodemographic information form were used to analyze the connection between digital competence and artificial intelligence literacy of university students studying in the special education department. The study was conducted using an online survey form that included all these measurement tools and questions. The personal information form, which was created to determine the

sociodemographic characteristics of the participants, was designed to collect basic information such as age, gender, class, and department. This data make it possible to determine the general demographic profiles of the participants and analyze the results of the study according to these demographic variables.

The data collection process was meticulously planned and implemented. In the first stage, the data collection tools to be used for the research were prepared and a pilot application was carried out. Necessary corrections were made to the surveys in line with the feedback received as a result of the pilot application. When selecting the sample, it was ensured that the students were distributed across all departments of the special education faculties in universities. It was decided to implement the data collection tools online, and the survey links were sent to the participants via WhatsApp and e-mail. In addition, QR codes were created and distributed in university areas to provide quick access to the surveys. Participants were given a certain amount of time to complete the survey, and the surveys were completed entirely on a voluntary basis. Participants' responses were collected anonymously and their identities were kept confidential. The collected data were securely recorded in a digital environment and protected against unauthorized access. The security of the data is of critical importance for the validity and reliability of the research.

Artificial Intelligence Literacy Scale (AILS)

The artificial intelligence literacy scale is a psychometric tool that aims to measure the knowledge, skills, attitudes, and awareness levels of individuals about artificial intelligence (AI) technologies. Such scales have been developed especially for use in the fields of education, psychology and informatics. Studies conducted in this field in Turkey aim to evaluate individuals' awareness, knowledge levels, and usage competencies regarding artificial intelligence. The "Artificial Intelligence Literacy Scale" developed by Çelebi et al. (2023) is one of the important contributions in this field. The researchers conducted validity-reliability analyses to develop the scale and grouped it into four dimensions. These are (i) Awareness, (ii) Usage, (iii) Evaluation, and (iv) Ethics. In a study conducted by Eniş-Erdoğan & Ekşioğlu (2024), the construct validity of the AI Literacy Scale was tested. The Kaiser-Meyer-Olkin value was found to be 0.780, and the Bartlett test was significant. Exploratory factor analysis results showed that the scale had four dimensions and explained 82.87% of the total variance. The scale's goodness-of-fit values were calculated as RMSEA=0.078, NFI=0.944, TLI=0.952, CFI=0.967, IFI=0.967, and GFI=0.931. These values demonstrate that the Turkish version of the AI Literacy Scale is a valid and reliable tool for measuring participants' perceptions of AI literacy. In this research sample, the Cronbach's Alpha coefficient of artificial intelligence literacy and its subscales was calculated. As a result of the analyses conducted for this purpose, the reliability coefficients of the whole scale and its subscales ranged between 0.76 and 0.89.

Prospective Teacher Digital Competence Perception Scale

The Prospective Teacher Digital Competence Perception Scale is a valid and reliable measurement tool developed by Karakuş, Sünbül, and Kılıç (2022) to measure the digital competence perceptions of prospective teachers. In this study published in the Bayburt Faculty of Education Journal, 347 prospective teachers studying at a state university in the 2020-2021 academic year were selected as participants. The scale, designed as a five-point Likert-type scale, consists of 26 items and three main dimensions: media-communication competencies, competencies in designing teaching in digital environments, and informatics competencies. As a result of exploratory and confirmatory factor analyses, it was found that the three-factor structure of the scale was statistically significant. While the total variance of the scale was represented as 56.798%, the Cronbach alpha reliability coefficients obtained for the sub-dimensions were 0.90, 0.90, and 0.88, respectively. These high reliability values show that the internal consistency and construct validity of the scale are strong. This scale, effective instrument for measuring the digital competence levels of prospective teachers, is valuable for use in educational research and digital pedagogical development processes.

Data Analysis

After the data collection phase of the study was completed, the data were processed and analyzed using the SPSS 27.0 program. The data analysis included applying various statistical methods to conduct the objectives of the study and test the hypotheses. First, the demographic characteristics and scale scores of the participants were summarized using descriptive statistics. Frequency and percentage values were calculated for categorical variables, and mean, standard deviation, minimum, and maximum values were calculated for numerical variables.

The internal consistency of the scales used was evaluated with Cronbach's Alpha coefficients. This analysis aims to determine the reliability and consistency of the scales. Skewness and kurtosis coefficients were calculated to check whether the data were normally distributed. The skewness and kurtosis values of the digital competence and artificial intelligence literacy scores, of the special education department students showed that the data had a normal distribution. In this context, Pearson correlation analysis was used to determine the relationship between digital competence and artificial intelligence literacy. This analysis helped to evaluate the linear relationship between two quantitative variables, as well as the direction (positive or negative) and strength of this relationship.

Regression analysis was applied to determine the effect of digital competencies on AI literacy. This analysis helped to determine the effect of independent variables (digital competence) on the dependent variable (AI literacy) and the magnitude of this effect. ANOVA and independent sample t-tests were used to determine whether there was a significant difference in dark personality traits, and burnout levels between demographic groups. The one-way ANOVA test was used to compare three or more groups in terms of a numerical variable. In case of significant ANOVA results, post hoc tests (e.g., Scheffe Test)

were applied to identify the groups between which differences existed. An independent sample t-test was used to compare two independent groups in terms of a numerical variable.

Compliance with Ethical Rules

Throughout the research process, the researcher adhered to all principles of scientific research and publication ethics. Participating students were informed of the data collection process through a consent form. Citations in the study were made in accordance with scientific rules and are included in the bibliography in accordance with APA style. Ethics committee approval was required for this study. Therefore, approval was obtained from the Scientific Research Ethics Committee of Hasan Kalyoncu University.

RESULTS

Descriptive findings regarding the scores obtained by special education department students from the digital competence and artificial intelligence literacy scale are presented in Table 1.

Table 1.

Descriptive Statistics on the Scores Obtained by Special Education Students from the Digital Competence and Artificial Intelligence Literacy Scale

	-n-	Min.	Max.	$\overline{X}$	*Sd*
Media Communication Competencies	234	1,00	5,00	4,48	0,69
Competencies for Designing Instruction in Digital Environments	234	1,00	5,00	4,23	0,77
Competences in Information Technology	234	1,00	5,00	4,13	0,86
General Digital Competence	234	1,00	5,00	4,28	0,71
Awareness	234	1,67	5,00	3,63	0,51
Use	234	1,00	5,00	3,62	0,61
Evaluation	234	1,00	5,00	4,21	0,79
Ethics	234	1,33	5,00	3,72	0,64
Artificial Intelligence Literacy	234	1,58	5,00	3,79	0,50

Table 1 shows descriptive statistics regarding the scores obtained by special education students from the digital competence and artificial intelligence literacy scale. According to the findings, it was determined that the scores of the digital competence scale and its subscales varied between 1.00 and 5.00. The mean scores were calculated as 4.48±0.69 in the Media Communication Competence subscale, 4.23±0.77 in the Digital Environments Instructional Design Competencies subscale, 4.13±0.86 in the Informatics Competencies subscale, and 4.28±0.71 in the entire scale, respectively. According to the mean values

obtained, the data indicate that the digital competences of special education students are at a very high level.

The study found that special education students have a high level of artificial intelligence literacy. The scores on the artificial intelligence literacy scale and its subscales ranged from 1.00 to 5.00, with average scores falling between 3.62 and 4.21. These high mean scores indicate a strong command of AI literacy among the students.

Table 2.

T-test Results of Digital Competence Scores of Special Education Teachers According to Gender Variable

	Gender	-n-	$\overline{X}$	*Sd*	t	P
Media Communication Competencies	Male	135	4,42	0,72	-1,62	0,11
	Female	96	4,57	0,64		
Competences in Designing Instruction in Digital Environments	Female	135	4,14	0,81	-2,22	0,03*
	Male	96	4,36	0,69		
Competences in Information Technology	Female	135	3,99	0,95	-3,04	0,00*
	Male	96	4,33	0,68		
General Digital Competence	Female	135	4,18	0,74	-2,58	0,01*
	Male	96	4,42	0,62		

*p<0.05

An analysis of digital competency scores among special education teachers revealed a significant relationship between gender and most aspects of digital competence, with one key exception. According to Table 2 ($p < .05$), there was a significant difference in scores for all digital competency subscales and the overall total score based on gender. However, for the media communication subscale, no significant difference was found ($p > .05$). This suggests that while gender may be a factor in other areas of digital skill, it does not appear to influence a teacher's proficiency in media communication. When the mean scores of the groups were examined, it was found that the digital competencies of male students were higher than their female peers.

Table 3.

T-test Results of Digital Competence Scores of Special Education Teachers According to Gender Variable

	Gender	-n-	$\overline{X}$	*Sd*	t	P
Awareness	Female	135	3,64	0,54	0,28	0,78
	Male	96	3,62	0,48		
Use	Female	135	3,58	0,66	-1,10	0,27
	Male	96	3,67	0,55		
Evaluation	Female	135	4,12	0,82	-2,11	0,04*

	Male	96	4,34	0,74		
Ethics	Female	135	3,73	0,66	0,46	0,65
	Male	96	3,69	0,61		
AI Literacy	Female	135	3,77	0,55	-0,94	0,35
	Male	96	3,83	0,43		

*p<0.05

According to Table 3, there was a significant relationship between gender and the scores on the evaluation subscale of the artificial intelligence literacy scale for special education teachers. This means that male and female teachers differed in their ability to critically evaluate AI systems. However, gender was not a significant factor for other aspects of AI literacy. On the other hand, there was no significant difference in the other subscales and total scores (p>0.05). When the mean scores of the groups were examined, it was seen that although the artificial intelligence literacy of male students appeared higher than their female peers, no significant difference was found between the scores of this sample in terms of gender.

Table 4.

ANOVA Test Results of Digital Competence Scores of Special Education Teachers According to Grade Level

	Grade	-n-	$\overline{X}$	*Sd*	F	P
Media Communication Competencies	1	48	4,45	0,46	1,10	0,35
	2	64	4,37	0,79		
	3	87	4,57	0,68		
	4	35	4,50	0,78		
Competences in Designing Instruction in Digital Environments	1	48	4,07	0,66	1,93	0,13
	2	64	4,16	0,78		
	3	87	4,37	0,70		
	4	35	4,24	0,99		
Competences in Information Technology	1	48	3,92	0,89	2,28	0,08
	2	64	4,04	0,88		
	3	87	4,29	0,74		
	4	35	4,22	1,02		
Digital Competencies General	1	48	4,14	0,62	1,97	0,12
	2	64	4,19	0,77		
	3	87	4,41	0,66		
	4	35	4,32	0,80		

In Table 4, the relationship between the scores obtained from the scale, used to determine the digital competencies of the special education teachers included in the study, and the class level was examined using an F test. The analysis revealed that the F values

calculated according to the class variable in the entire scale and its sub-scales of the digital competencies scale did not differ significantly (p>.05).

Table 5.

ANOVA Test Results of Artificial İntelligence Literacy Scores of Special Education Teachers According to Grade Level

	Grade	N	Mean	Std. Deviation	F	P
Awareness	1	48	3,47	0,44	2,67	0,05*
	2	64	3,59	0,46		
	3	87	3,70	0,55		
	4	35	3,73	0,55		
Use	1	48	3,44	0,44	2,36	0,07
	2	64	3,57	0,56		
	3	87	3,70	0,62		
	4	35	3,72	0,84		
Evaluation	1	48	3,94	0,65	2,91	0,04*
	2	64	4,17	0,85		
	3	87	4,32	0,78		
	4	35	4,36	0,83		
Ethics	1	48	3,57	0,45	3,35	0,02*
	2	64	3,67	0,64		
	3	87	3,73	0,62		
	4	35	4,00	0,82		
AI Literacy	1	48	3,61	0,37	4,24	0,01*
	2	64	3,75	0,51		
	3	87	3,86	0,48		
	4	35	3,95	0,61		

*p<0.05

Scores from the artificial intelligence literacy scale, when analyzed in relation to the grade level of the special education teachers, showed no significant difference on the usage subscale. This indicates that a teacher's grade level did not have a measurable effect on their ability to use AI tools, as shown in Table 5 (p > .05). On the other hand, there was a significant difference according to the grade level in the other subscales and total scores (p<0.05). According to the advanced analyses carried out with the Scheffe test, it was seen that the participants studying in the second, third and fourth grades had significantly higher artificial intelligence literacy compared to the students studying in the first grades.

Table 6.

Results of Simple Regression Analysis between Participants' Digital Competence and Artificial İntelligence Literacy

	β	-t-	P	R	R2	F	P
Regression	1,88	11,94	0,000	0,0117	0,39	150,67	P<0,05
Artificial Intelligence Literacy	0,45	12,28	0,000				

According to Table 6, digital competence is the independent variable and artificial intelligence literacy is the dependent variable. The digital competences of the participants explain the change in the dependent variable of artificial intelligence literacy significantly (F= 150.67, p<0.05). There is a significant and high-level relationship between digital competences and artificial intelligence literacy (β=0.45; p<0.05). In addition, digital competences account for 39% of artificial intelligence literacy. In this respect, if digital competences are at a high level, artificial intelligence literacy shows a positive trend.

DISCUSSION

This study describes the relationship between the digital competence levels and artificial intelligence literacy levels of students studying in the special education department, and reveals how these variables differ in terms of gender, grade level, and interaction factors. First, the digital competence levels and artificial intelligence literacy of special education students were examined in the study. The findings show that the digital competence levels of the students are quite high. The data reveal that the students exhibit strong performance in basic media communication competencies. This result indicates that the students' perceptions of their skills in designing instruction in digital environments are positive. The level of teacher candidates' use of information and communication technologies appears to be high in the field of informatics competencies. The performance in the field of data evaluation reflects the students' competencies in making inferences and providing feedback. The level of perception in the ethical dimension shows that there is a sense of responsibility in the use of artificial intelligence. These findings reveal that the students exhibit a positive profile in both digital competence and artificial intelligence literacy. The high averages in the study suggest that the students can quickly adapt to technology-integrated learning environments. This result is parallel to Ünal's (2013) study, which revealed the effect of technology integration self-efficacy perception on learning outcomes. Similarly, research by Spasopoulos and colleagues (2025) found that preservice teachers effectively use AI tools primarily for conceptual clarification, hypothesis generation, and self-regulated learning. Furthermore, these tools serve as cognitive partners in designing lesson plans, differentiating instruction, and simulating classroom scenarios. Teacher candidates' high levels of digital competence demonstrate their ability to effectively integrate technology into classroom practices in the future. This is particularly

important in fields where personalized learning environments are prominent, such as special education. Ferrari (2013) and Vuorikari et al. (2016) emphasize that digital competence is a fundamental prerequisite for the teaching profession. Krumsvik (2014) states that digital competence in special education is critical for personalized learning, communication supports (e.g., augmented and alternative communication), and adaptations for different disability groups.

The study examined the differences in digital competence and artificial intelligence literacy levels of special education department students according to gender and class variables. The findings show that there are significant differences in terms of gender in the general scores of digital competences. It was revealed that male students showed higher performance in digital competence scores compared to female students. This situation became evident in all sub-dimensions except for the media communication sub-dimension. It was determined that male students had an advantage especially in the sub-dimensions of designing instruction in digital environments and informatics competence. On the other hand, gender differences in artificial intelligence literacy levels were limited. It was determined that male students scored significantly higher than female students only in the evaluation sub-dimension. This finding supports the studies in the literature that reveal that the effect of gender on digital competence perception has a limited structure (Nam et al., 2013). Indeed, in a study conducted in Norway, Hatlevik et al. (2015) suggested that male students may have higher overall digital proficiency levels because they have greater exposure to and experience with digital tools. Similarly, Moreno-Guerrero et al. (2020) and Özkan (2024) noted that male students' higher self-confidence in technical skills positively impacts their digital proficiency levels. Similarly, studies show that while women possess sufficient knowledge in using technology and digital tools, they often have lower self-efficacy perceptions than men. This may stem from society's perception of technology as a male-dominated field (Cooper, 2006). Furthermore, access to technology, usage habits, and learning opportunities also create gender differences (Volman & van Eck, 2001). Therefore, the findings of this study support the existence of a gender-based dimension, not just a socioeconomic one. To address these disparities, it is crucial for education faculties to provide supportive learning environments and access to artificial intelligence applications, particularly for female students, to develop their digital competencies.

According to the class level analyses, no significant differences were observed in the sub-dimensions of digital competencies. This result suggests that the development of digital competencies based on class level progresses homogeneously. In terms of artificial intelligence literacy, the class level effect was observed to be more pronounced. The effect of the class variable was not found to be statistically significant in the awareness and usage sub-dimensions. Differences depending on the class level variable emerged in the evaluation and ethics dimensions and total artificial intelligence literacy. When further analyses were found, it was determined that students studying in lower grades received low scores, while these scores gradually increased in upper grades. This finding shows that

students' artificial intelligence perception and skills mature in the advancing grade levels. It points to the importance of supporting the development based on class level with the continuity of pedagogical practices and blended learning scenarios.

The findings regarding the effect of special education students' digital competencies on their AI literacy show that digital competencies significantly explain AI literacy. As a result of the regression analysis, it was determined that digital competencies are an important predictor of AI literacy. Digital competencies explain 39% of AI literacy. This result reveals that students' technology use competencies are decisive on their ability to use AI tools interactively and critically. This finding supports the view of Chiu et al. (2024) that digital literacy is a fundamental building block within the framework of AI literacy. In addition, Çelebi et al. (2023) state that digital competencies are related to AI literacy indicators. These findings show that AI applications in education should be based on a digital competency infrastructure.

This study supports the TPACK theory's prediction that digital and pedagogical competencies play an important role in the development of AI literacy. This finding reveals that the integration of TPACK, SAMR, and TIM models into the context of special education strengthens the relationship between digital competencies and AI literacy. These findings expand Kaya and Yılayaz's (2013) studies on technology integration models in teacher education with the dimension of AI literacy. The findings expand Dönmez's (2022) proposal for an integration management model in Turkey on the axis of digital competence and AI literacy. In terms of application, this study emphasizes the need to enrich teacher candidates' professional development programs with AI-focused strategies. The results predict that digital competence training contents will have positive effects on learning outcomes when developed in parallel with AI literacy. In this context, it is recommended that SAMR and TPACK models be used together in the design of digital literacy programs in special education. Moreover, it becomes clear that education policies need to produce policies that integrate digital skills and artificial intelligence literacy.

In line with all these findings, the study also has some limitations. First of all, the fact that the sample was selected only from special education departments of certain universities in Turkey limits the general validity level. This situation indicates that the findings should be approached cautiously in generalizing them to different regional and cultural contexts. In addition, the fact that the data collection tool was self-reported questionnaires may have caused the emergence of a social desirability effect. This effect raises concerns that the participants may have overstated their actual competence levels. The fact that qualitative data collection methods were not used in the study causes the students' experiential perspectives to be lost. In conclusion, the findings should be interpreted with caution and these limitations should be eliminated in future studies.

LIMITATIONS AND RECOMONDATIONS

This study supports the TPACK theory's prediction that digital and pedagogical competencies play an important role in the development of AI literacy. This finding reveals that the integration of TPACK, SAMR, and TIM models into the context of special education strengthens the relationship between digital competencies and AI literacy. These findings expand Kaya and Yılayaz's (2013) studies on technology integration models in teacher education with the dimension of AI literacy. The findings expand Dönmez's (2022) proposal for an integration management model in Turkey on the axis of digital competence and AI literacy. In terms of application, this study emphasizes the need to enrich teacher candidates' professional development programs with AI-focused strategies. The results predict that digital competence training contents will have positive effects on learning outcomes when developed in parallel with AI literacy. In this context, it is recommended that SAMR and TPACK models be used together in the design of digital literacy programs in special education. Moreover, it becomes clear that education policies need to produce policies that integrate digital skills and artificial intelligence literacy.

In line with all these findings, the study also has some limitations. First of all, the fact that the sample was selected only from special education departments of certain universities in Turkey limits the general validity level. This situation indicates that the findings should be approached cautiously in generalizing them to different regional and cultural contexts. In addition, the fact that the data collection tool was self-reported questionnaires may have caused the emergence of a social desirability effect. This effect raises concerns that the participants may have overstated their actual competence levels. The fact that qualitative data collection methods were not used in the study causes the students' experiential perspectives to be lost. In conclusion, the findings should be interpreted with caution and these limitations should be eliminated in future studies. Due to the limited sample size of this study in Turkey, it is necessary to re-examine the interaction between digital competence and AI literacy in different regional and institutional contexts with longitudinal and mixed-method approaches. In addition, models that analyze the mechanisms of influence of mediating variables such as teacher self-efficacy perception, interactive learning environments, and stakeholder collaboration should be developed. In-depth understanding of participant experiences and triangulation of quantitative findings using qualitative data collection methods will increase research reliability. Scale adaptation studies should be planned to expand validity and reliability evidence according to different types of disabilities. Finally, long-term impact analyses should be conducted with periodic evaluations on the sustainability of technology integration models.

Educational institutions should update their teacher training programs by integrating digital competency training with AI literacy modules. At the school and university level, application workshops that include AI-based simulations and experiential learning activities should be organized. Infrastructure investments should be planned by matching

them with AI-supported solutions that are suitable for students' different learning needs. In addition, student progress should be monitored through digital learning analytics panels and feedback loops should be accelerated. Family and community engagement programs should be used to develop learning environments at home and outside of school in collaboration.

CONCLUSION

According to the research results, the digital competence levels and artificial intelligence literacy of special education department students are at a high level. According to the findings, it is seen that there are significant differences in the general scores of digital competences of special education department students in terms of gender. Male students have significantly higher average digital competence scores than female students. However, this difference is limited in terms of artificial intelligence. In terms of the class level analyses, while significant differences are seen in the sub-dimensions of digital competences, it is seen that the class level effect is more pronounced in terms of artificial intelligence literacy. Self-efficacy increases in higher classes. As a result of the regression analysis, it was determined that digital competences are an important predictor of artificial intelligence literacy.

The results of this study emphasize the necessity of integrating technology and artificial intelligence literacy models in the context of special education. When the research results and models based on the technology integration of teacher candidates are evaluated together, important data are provided. Digital and artificial intelligence-based content, suitable for special education student profiles, increases the inclusiveness of learning opportunities. In this context, a perspective is presented for teacher training institutions to integrate these two variables into their programs.

REFERENCES

Afacan, Al-Awidi, H. M., & Aldhafeeri, F. M. (2017). Teachers' readiness to implement digital curriculum in Kuwait. *Education and Information Technologies, 22*(6), 2861–2879.

Alkan, A. (2024). The Role of Artificial Intelligence in the Education of Students with Special Needs. *International Journal of Technology in Education and Science, 8*(4), 542–557. https://doi.or/ 10.46328/ijtes.569

Alnahdi, G. (2014). Assistive technology in special education and the universal design for learning. *Turkish Online Journal of Educational Technology - TOJET, 13*(2), 18–23.

Alper, S., & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. *Journal of Special Education Technology, 21*(2), 47–64. https://doi.org/10.1177/016264340602100204

Anderson, A. (2019). *Virtual reality, augmented reality and artificial intelligence in special education: A practical guide to supporting students with learning differences*. Routledge.

Aubakirova, A., Kurmanbayuly, S., Akhmetova, T., Smailova, K., Koshanova, Z., & Bayekina, N. (2024). The effect of the use of contemporary technologies on teaching new terms in literature. *Journal of Social Studies Education Research, 15*(1), 187-211.

Ay, Y., Karadağ, E., & Acat, M. B. (2015). The Technological Pedagogical Content Knowledge-practical (TPACK-Practical) model: Examination of its validity in the Turkish culture via structural equation modeling. *Computers & Education*, 88, 97-108. https://doi.org./10.1016/j.compedu.2015.04.017

Barua, P. D., Vicnesh, J., Gururajan, R., Oh, S. L., Palmer, E., Azizan, M. M., ... & Acharya, U. R. (2022). Artificial intelligence-enabled personalised assistive tools to enhance education of children with neurodevelopmental disorders—A review. *International Journal of Environmental Research and Public Health, 19*(3), 1192. https://doi.org./10.3390/ijerph.19031192

Bourgonjon, J., Valcke, M., Soetaert, R., & Schellens, T. (2014). Students' perceptions about the use of video games in the classroom. *Computers & Education, 54*(4), 1145–1156. https://doi.org. /10.1016/j.compedu.2009.10.022

Bozdağ, Ç. (2017). Technology Integration in Turkish and German Schools: A Comparative Analysis of eTwinning]. *Ege Eğitim Teknolojileri Dergisi, 1*(1), 42–64.

Bozkurt, S. S. (2017). Özel eğitimde dijital destek: Yardımcı teknolojiler [Digital support in special education: assistive technologies]. *Açıköğretim Uygulamaları ve Araştırmaları Dergisi, 3*(2), 37–60.

Cagıltay, K., Cakır, H., Karasu, N., Islım, O. F., & Cıcek, F. (2019). Use of educational technology in special education: Perceptions of teachers. *Participatory Educational Research, 6*(2), 189–205. https://doi.org./ 10.17275/per.19.21.6.**2**

Carretero, G. S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use.* European Union, Luxembourg, 1-40.

Çelebi, C., Yılmaz, F., Demir, U., & Karakuş, F. (2023). Artificial Intelligence Literacy: An Adaptation Study. *Instructional Technology and Lifelong Learning, 4*(2), 291-306. https://doi.org/10.52911/itall.1401740

Chen, X., Zou, D., Xie, H., Cheng, G., &Liu, C. (2022). Two decades of artificial intelligence in education. *Educational Technology & Society, 25*(1), 28–47. https://doi.org./10.1016/j.caeo.2024.100171

Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. *Computers and Education Open*, 6, 100171. https://doi.org./10.1016/j.caeo.2024.100171

Cooper, J. (2006). The digital divide: The special case of gender. *Journal of Computer Assisted Learning, 22*(5), 320–334. https://doi.org/10.1111/j.1365-2729.2006.00185.x

Dönmez, E. (2022). Türkiye'de Okullarda Eğitim Teknolojileri Entegrasyonu Yönetimine Ilişkin Bir Model Önerisi [A Model Proposal for the Management of Educational Technology Integration in Schools in Turkey]. [PhD thesis, Marmara University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr

Drigas, A. S., &Ioannidou, R.-E. (2012). Artificial intelligence in special education: A decade review. *International Journal of Engineering Education, 28*(6), 1366.

Eniş-Erdoğan, T. & Ekşioğlu, S. (2024). Yapay Zekâ Okuryazarlığı Ölçeği'nin Türkçeye uyarlanması [Adaptation of Artificial Intelligence Literacy Scale into Turkish]. *TEBD, 22*(2), 1196-1211. https://doi.org/10.37217/tebd.1496716

Essuman, B., Barton Essel, H., Steiner, R., Akuteye, A. D., & Essuman, A. B. (2025). Digital Literacy, Motivation, Self-Regulation, Interest, and Task Difficulty as Predictors of Performance in Online Learning: A Path Analysis. *International Journal of Current Educational Studies, 4*(1), 23-46. https://doi.org/10.46328/ijces.164

Ferrari, A. (2013). *DigComp: A framework for developing and understanding digital competence in Europe*. Publications Office of the European Union

Forsling, K. (2023). Collegial learning and digital literacy education in a Swedish preschool. *Early Childhood Education Journal, 51*(1),139-148.https://doi.org/10.1007/s10643-021-01289-9

Garg, S., & Sharma, S. (2020). Impact of artificial intelligence in special need education to promote inclusive pedagogy. *International Journal of Information and Education Technology, 10*(7), 523–527. https://doi.org/10.18178/ijiet.2020.10.7.1418

Gilster, P. (1997). *Digital literacy*. Wiley Computer Pub.

Gulnar, U. (2025). Investigation of the relationship between recreation awareness and technology addiction of university students. *International Journal of Technology in Education, 8*(2), 246-273. https://doi.org/10.46328/ijte.1164

Hatlevik, O. E., Guðmundsdóttir, G. B., & Loi, M. (2015). Examining factors predicting students' digital competence. *Journal of Information Technology Education. Research*, 14, 123. https://doi.org/10.28945/2126

Hopcan, S., Polat, E., Ozturk, M. E., & Ozturk, L. (2023). Artificial intelligence in special education: A systematic review. *Interactive Learning Environments, 31*(10), 7335–7353. https://doi.org/10.1080/10494820.2022.2067186

Ipek, Z.H., Gözüm, A.I.C., Papadakis, S., & Kalogïannakïs, M. (2023). Educational applications of ChatGPT AI system: A Systematic review research. *Educational Process:International Journal,*12 (3), 26-55. https://doi.org/10.22521/edupij.2023.123.2

Johnson, C., Smart, K., &Mahar, P. (2023). Is there a place for generative artificial intelligence in special education? *National Social Science Technology Journal, 11*(2), 48–62.

Kara, S. (2025). The effect of artificial intelligence applications in 6th grade visual arts course on student attitudes and course outcomes. *International Journal of Modern Education Studies, 9*(1), 51-82. https://doi.org/10.51383/ijonmes.2024.405

Karakuş, İ. Sünbül, Ö., & Kılıç, F. (2022). Öğretmen adayı dijital yeterlik algısı ölçeği: Geçerlik ve güvenirlik çalışması [Teacher Candidate Digital Proficiency Perception Scale: Validity and Reliability Study]. *Bayburt Eğitim Fakültesi Dergisi, 17*(35), 935 956. https://doi.org/10.35675/befdergi.883974

Kaya, Z., & Yılayaz, Ö. (2013). Öğretmen eğitimine teknoloji entegrasyonu modelleri ve teknolojik pedagojik alan bilgisi [Technology integration models in teacher education and technological pedagogical content knowledge]. *Batı Anadolu Eğitim Bilimleri Dergisi, 4*(8), 57–83.

Kharbat, F. F., Alshawabkeh, A., &Woolsey, M. L. (2021). Identifying gaps in using artificial intelligence to support students with intellectual disabilities from education and health perspectives. *AslibJournal of Information Management, 73*(1), 101–128. https://doi.org/10.1108/ajim-02-2020-0054

Krumsvik, R. J. (2014). Teacher educators' digital competence. *Scandinavian Journal of Educational Research, 58*(3), 269–280. https://doi.org/10.1080/00313831.2012.726273

Kurt, A. A., & Ayas, T. (2021). Özel eğitim öğretmen adaylarının dijital pedagojik yeterliklerinin incelenmesi [Examining the digital pedagogical competencies of special education teacher candidates]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 41*(2), 933–957. https://doi.org/10.17152/gefad.1194652

Long, D., & Magerko, B. (2020, April). *What is AI Literacy? Competencies and Design Considerations*. In Proceeding of the 2020 CHI conference on human factors in computing systems(pp.1-16). https://doi.org/10.1145/3313831.3376727

Marín, V. I., & Castaneda, L. (2023). Developing digital literacy for teaching and learning. In *Handbook of Open, Distance and Digital Education* (pp. 1089-1108). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2080-6-64

Miestamo, M., Bakker, D., & Arppe, A. (2016). Sampling for variety. *Linguistic Typology, 20*(2), 233-296.https://doi.org/10.1515/lingty-2016-0006

Moreno-Guerrero, A. J., López-Belmonte, J., Marín-Marín, J. A., & Soler-Costa, R. (2020). Scientific development of educational artificial intelligence in Web of Science. *Future Internet, 12*(8), 124. https://doi.org/10.3390/fi12080124

Nam, C. S., Bahn, S., & Lee, R. (2013). Acceptance of assistive technology by special education teachers: A structural equation model approach. *International Journal of Human-Computer Interaction, 29*(5), 365–377.https://doi.org/10.1080/10447318.2012.711990

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education, 59*(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Özkan, Z. C. (2024). Examining the Relationships between Media Literacy, Technology Integration Skills, and STEM Applications Self-Efficacy Perception via a Structural Equation Model: A Study of Visual Arts Teacher Candidates. *International Journal of Modern Education Studies, 8*(1), 72-90. https://doi.org/10.51383/ijonmes.2024.364

Pinski, M. (2024). *Artificial Intelligence Literacy-Conceptualization, Measurement, Enablement, and Its Impact on Individuals and Organizations*. [PhD thesis, Technische Universität Darmstadt]. Germany.

Ribble, M. (2011). *Digital citizenship in schools: Nine elements all students should know* (2nd ed.). International Society for Technology in Education.

Sector, U. E. (2021). *AI and education: guidance for policy-makers*. United Nations Educational, Scientific and Cultural Organization: Paris, France.

Shettar, M. R., Lathiwale, Z. S. M., & Kulhalli, M. (2021). The role of ICT in higher education in selected places during COVID-19. *Journal of Research in Social Sciences and Language, 1*(1), 42-54. Retrieved from https://www.jssal.com/index.php/jssal/article/view/2

Spasopoulos, T., Sotiropoulos, D., Kalogiannakis, M. (2025). Generative AI in Pre-Service Science Teacher Education: A Systematic Review. *Advances in Mobile Learning Educational Research, 5*(2), 1501-1523. https://doi.org/10.25082/amler.2025.02.007

Stolpe, K., & Hallström, J. (2024). Artificial intelligence literacy for technology education. *Computers and Education Open*, 6, 100159. https://doi.org/10.1016/j.caeo.2024.100159

Şen, N., & Akbay, T. (2023). Artificial intelligence and innovative applications in special education. *Instructional Technology and Lifelong Learning, 4*(2), 176–199. https://doi.org/10.52911/itall.1297978

Takona, J. (2024). AI in Education: Shaping the Future of Teaching and Learning. International *Journal of Current Educational Studies, 3*(2), 1-25. https://doi.org/10.46328/ijces.121

Tondeur, J., Aesaert, K., Pynoo, B., van Braak, J., Fraeyman, N., & Erstad, O. (2017). Developing a validated instrument to measure preservice teachers' ICT competencies: Meeting the demands of the 21st century. *British Journal of Educational Technology, 48*(2), 462–472. https://doi.org/10.1111/bjet.12380

Uğraş, H., Uğraş, M., Papadakis, S., & Kalogiannakis, M. (2024). ChatGPT-supported education in primary schools: The potential of ChatGPT for sustainable practices. *Sustainability, 16*(22), 9855. https://doi.org/10.3390/su16229855

Uğraş, H., Uğraş, M., Papadakis, S., & Kalogiannakis, M. (2025). Innovative Early Childhood STEM Education with ChatGPT: Teacher Perspectives. *Technology, Knowledge and Learning, 30*(2), 809-831. https://doi.org/10.1007/s10758-024-09804-8

Ünal, E. (2013). *Öğretmen adaylarının teknoloji entegrasyonu öz-yeterlik algıları ve teknolojik pedagojik içerik bilgisi yeterlikleri arasındaki ilişkinin incelenmesi [Integration Self-Efficacy and Technological Pedagogical Content Knowledge Competencies].* [Master's thesis, Ankara

University]. Council of Higher Education Thesis Center. https://doi.org/10.15869/itobiad.1260939

Volman, M., & van Eck, E. (2001). Gender equity and information technology in education: The second decade. *Review of Educational Research, 71*(4), 613–634. https://doi.org/10.3102/00346543071004613

Vuorikari, R., Punie, Y., Carretero Gomez, S., & Van den Brande, G. (2016). DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: *The Conceptual Reference Model*. Joint Research Centre Report EUR 27948 EN. Publication Office of the European Union. Retrieved from https://doi.org/10.2791/11517

Wallace, T., &Georgina, D. (2014). Preparing Special Education Teachers to Use Educational Technology to Enhance Student Learning. *ERIC. 11th International Conference on Cognition and Exploratory Learning in Digital Age* (CELDA,11th ,Porto,Portugal, Oct 25-27,2014)

Wang, B., Rau, P.L. P., & Yuan, T. (2023). Measuring user competence in using artificial intelligence: validity and reliability of artificial intelligence literacy scale. *Behavior& Information Technology, 42*(9), 1324–1337. https://doi.org/10.1080/0144929x.2022.2072768

Waterfield, D. A., Watson, L., & Day, J. (2024). Applying artificial intelligence in special education: Exploring availability and functionality of AI platforms for special educators. *Journal of Special Education Technology, 39*(3), 448–454. https://doi.org/10.1177/01626434241257237

Woodward, J., & Cuban, L. (2001). *Technology, curriculum, and professional development: Adapting schools to meet the needs of students with disabilities*. Corwin Press, Inc.

Yao, N., & Wang, Q. (2024). Factors influencing pre-service special education teachers' intention toward AI in education: Digital literacy, teacher self-efficacy, perceived ease of use, and perceived usefulness. *Heliyon, 10*(14). https://doi.org/10.1016/j.heliyon.2024.e34894

Yenmez, A. A., & Gökçe, S. (2019). Using the SAMR model for evaluating technology-aided mathematics activities. *HAYEF Journal of Education, 16*(2), 221–245. https://doi.org/10.5152/hayef.2019.1901

Yim, I. H. Y. (2024). A critical review of teaching and learning artificial intelligence (AI) literacy: Developing an intelligence-based AI literacy framework for primary school education. Computers and Education: *Artificial Intelligence*, 100319. https://doi.org/10.1016/j.caeai.2024.100319

Data Availability Declaration

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim

is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

The sole author of this research, Mehrossâdat Vosough Matin was responsible for the conceptualization, methodology formulation, data collection, analysis, and interpretation.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Biographical notes: Asst. Prof. Mehrossadat Vosoughmatin is a faculty member in the Department of Special Education. Her academic interests focus on inclusive education, digital competence, artificial intelligence literacy in teacher education, family education, and autism studies. She has contributed to several national and international research projects aiming to enhance the digital transformation of special education practices and teacher training.

Mehrossadat Vosoughmatın:[2] She is an Assistant Professor in the Department of Special Education at Hasan Kalyoncu University.

Scopus Author Identifier Number: None

Web of Science Researcher ID: None

Google Scholar Researcher ID: RUkrIZIAAAAJ

[2] Corresponding Author

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Artificial Intelligence in Education: Insights from a Bibliometric Study (2010–2025) Based on Scopus and Web of Science"

Güler SHAIKH [1] **Semra KIRANLI GÜNGÖR** [2]

Article Type
Original Research
International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 526-555
http://www.ijonmes.net

Article Info:

Received 04.08.2025
Revision 30.09.2025
Accepted 07.10.2025

Abstract:

This bibliometric study examined articles on artificial intelligence (AI) in education from 2010 to 2025, using data from Scopus and Web of Science. The results indicate a sharp rise in AI-related educational research, particularly in 2024. In the Scopus database, the term "artificial intelligence" emerged as the most prevalent keyword, appearing 44 times. It was followed by "higher education" and "ChatGPT." In contrast, the Web of Science database exhibited a different trend, with "ChatGPT" and "artificial intelligence" appearing equally at four instances each. Additionally, it highlighted emerging terms such as "LLM" and "GPT-4." The United States demonstrated a leading position in terms of publication output in both datasets, with countries such as China, Spain, the UK, and Türkiye following closely behind, exhibiting only minor variations in document counts. Notable authors in this field include Chai Ching Sing and Mishra, with the latter contributing 13 publications. These findings reflect the expanding role of AI in transforming educational practices and emphasise the growing interest in this field.

Keywords: Artificial Intelligence, Bibliometric analysis, Scopus index, Web of Science, VOSviewer

Citation:

Shaikh, G. & Kıranlı, Güngör S. (2025). Artificial Intelligence in Education: Insights from a Bibliometric Study (2010–2025) Based on Scopus and Web of Science. *International Journal of Modern Education Studies, 9*(2), 526-555. https://doi.org/10.51383/ijonmes.2025.428

[1] English Language Teacher, Ministry of National Education, Kocaeli, Türkiye. gulershaikh@gmail.com
https://0000-0002-1094-6110
[2] Prof. Dr. Eskişehir Osmangazi University, Faculty of Educational Sciences, Eskişehir, Türkiye. semk2009@gmail.com
https://0000-0001-5785-8137

INTRODUCTION

In recent years, significant advancements in technology have paved the way for the development of systems that exhibit functional similarities to human intelligence. These developments include enhanced information processing capabilities and substantial progress in big data analytics. In this context, artificial intelligence (AI) has emerged as a multidisciplinary research field that aims to enable machines and software to perform human-like cognitive skills such as thinking, learning, decision-making, and problem-solving. The field of AI encompasses not only the development of algorithms but also the continuous learning and self-renewal of these systems through data they acquire from their environments (Benko & Lányi, 2009; Crevier, 1993).

Artificial Intelligence is regarded as a strategic instrument that has evolved in parallel with information technologies. It facilitates innovative applications in numerous fields, including education, healthcare, engineering, economics, and public administration. In this regard, AI is not merely a technical innovation; it has become a pivotal component of a comprehensive transformation process that profoundly impacts how individuals, institutions, and societies access information, reshapes decision-making processes, and sparks new research debates (Haenlein & Kaplan, 2019).

In today's rapidly digitalising world, artificial intelligence (AI) has emerged as a significant phenomenon in education, with the potential to reshape learning and teaching practices on a global scale. AI-driven applications are now widely used to personalise instruction, reduce teachers' administrative workload, monitor student performance, and enhance feedback mechanisms. When integrated with big data analytics, these systems can effectively analyse learners' needs and progress, enabling more targeted and efficient teaching strategies (Chen et al., 2020; Ng et al., 2024). Beyond offering technological convenience, AI has contributed to the restructuring of instructional design, the expansion of learner-centred approaches, and the promotion of equity in education. Accelerated feedback systems have further enabled educators to follow students' development in a systematic and data-informed manner, thereby making the learning process more adaptive and dynamic (Chan, 2023; Chang et al., 2023).

Recent studies in the field of AI in education have focused on the potential of intelligent systems to support and optimise pedagogical processes. Researchers have investigated how AI algorithms can interpret learning data, predict academic performance, and guide educators in designing more effective and individualised learning experiences. The integration of AI into learning analytics and assessment platforms allows for continuous progress monitoring and data-driven decision-making, making educational practices more responsive and evidence-based. As digital transformation continues to advance, AI has evolved from a supportive technological tool into a fundamental element of innovative and sustainable educational ecosystems. Therefore, outlining AI's major applications and recent research developments is essential to contextualise this study and underscore its

contribution to the expanding literature in this domain (Hwang et al., 2020; Qadir, 2023; Su & Yang, 2023).

In this respect, artificial intelligence is considered a strategic element in the digital transformation process of education systems, both pedagogically and administratively.

This article aims to review articles written in the past fourteen years to answer these questions.

Purpose of the Study

This study aims to examine the evolution and growing significance of artificial intelligence (AI) in the field of education. In recent years, AI has increasingly shaped fundamental educational parameters such as teaching methods, learning personalisation, assessment systems, and administrative decision-making. As AI technologies have become more integrated into educational settings, the academic interest in understanding their pedagogical and institutional implications has expanded considerably. Using data from the Scopus and Web of Science databases, this study analyses publication trends, frequently used keywords, citation dynamics, and the contributions of countries, institutions, and authors. Analytical tools such as VOSviewer are employed to identify emerging topics—including ChatGPT, large language models (LLMs), and GPT-4- revealing how the field has diversified and deepened over time. By mapping the Global Research landscape, the study aims to highlight how AI has transformed educational research priorities and to provide insights that may guide future scholarly and practical developments in this evolving domain.

In this respect, artificial intelligence is considered a strategic element in the digital transformation process of education systems, both pedagogically and administratively.

This article aims to review articles written in the past fourteen years to answer these questions.

1. What are the most common keywords in Artificial Intelligence research?
2. Who has been the most cited author in the field of Artificial Intelligence?
3. Which publications are the most cited in the field of Artificial Intelligence?
4. What is the most cited year in the field of Artificial Intelligence?
5. Who are the most active authors and what are their demographics?
6. What is the year with the most Artificial Intelligence studies in education?
7. Which universities lead the most research in the field of Artificial Intelligence?
8. Which Universities are cited the most in the field of Artificial Intelligence?
9. Which countries lead in the production of Artificial Intelligence studies in education?
10. Which countries are cited the most in the field of Artificial Intelligence?

To answer these questions, a bibliometric analysis of the last fifteen years' corpus, as accessed on the Web of Science, will be conducted using both Scopus Analytics and Web of Science for comparison.

METHOD

This section presents the nature of the study, data collection process, inclusion criteria, and the tools used for analysis. A bibliometric approach was applied using data from Scopus and Web of Science. VOSviewer software was used to analyze keyword frequencies, citation patterns, and author collaborations to ensure systematic and reliable findings.

Research Design

In this research, a bibliometric analysis, a quantitative approach for evaluating scholarly output, was employed to examine academic publications systematically. This method focuses on measurable indicators such as citation counts, download frequencies, and appearances in other academic works, encompassing sources like journal articles, books, and conference proceedings (Ellegaard & Wallin, 2015). Bibliometric analysis serves as an objective tool to assess the research productivity and academic influence of individuals or institutions, using metrics such as publication volume, citation impact, and the quality of published work (Donthu et al., 2012). Moreover, it plays a vital role in uncovering patterns and shifts within a specific field by identifying trending topics, expanding research domains, and emerging scholarly interests. These insights not only reflect the evolving landscape of academic inquiry but also inform strategic research planning and policy-making by providing evidence-based guidance (Öztürk et al., 2024).

Data Collection Tools and Procedures

This study utilised the Scopus database, a comprehensive and interdisciplinary platform for citation analysis, to carry out data evaluation. Scopus offers a built-in feature known as Scopus Analyse, which enables users to perform bibliometric assessments by filtering and examining data based on variables such as authorship, institutional affiliation, journal titles, keywords, publication dates, citation metrics, and country of origin. Additionally, the platform provides indexing and abstracting services linked to full-text sources (Falagas et al., 2007).

In this research, the "Analyze Results" function available in the Web of Science platform was also employed to facilitate data interpretation. This feature offers a range of graphical tools—such as bar graphs and treemap visualisations, that enable users to gain clearer insights into patterns within scientific publications. Bar graphs are commonly used to display bibliometric indicators, including citation frequencies, publication years, and subject categories, making it easier to observe changes or distributions over time (Mongeon & Paul-Hus, 2015).

This study also incorporated the use of VOSviewer, a specialised software designed for constructing and analysing bibliometric networks, to compare data across the two databases. VOSviewer allows researchers to visualize and investigate the connections among publications, authors, journals, and thematic research domains. By employing co-citation analysis, the software identifies key publications and prominent contributors based on the frequency with which they are cited together in the literature (Van Eck & Waltman, 2009).

Data Analysis

The research process began with the formulation of clear research objectives and the central research question. The study focuses on publications from 2010 onwards to capture the most recent developments and trends in artificial intelligence applications in education, reflecting the rapid growth and evolving nature of the field over the past decade. Moreover, to gather relevant academic sources, a comprehensive literature search was carried out across multiple databases. The keyword "*artificial intelligence*" was used as the primary search term to focus the inquiry, and the discipline filter was set to *"education"* to exclude unrelated fields and refine the dataset.

An extensive keyword search for "Artificial Intelligence" initially retrieved 441,103 records from Scopus and 279,684 records from the Web of Science. For Scopus, the search was refined to include publications from 2010 to 2026, within the Social Sciences subject area, limited to articles, and filtered for the exact keyword "Education". In Web of Science, the query incorporated Keyword Plus® terms "artificial intelligence" and "education," spanning the years 2011–2025, restricted to Open Access articles within relevant education categories. After applying these selection criteria, 798 documents from Scopus and 72 documents from Web of Science were retained for analysis. The datasets were meticulously cleaned and organised, encompassing metadata such as authors, institutional affiliations, journals, publication years, and citation metrics. This curated collection provided a robust foundation for bibliometric analysis, with visualisations—including charts, graphs, and network maps— used to reveal research trends, thematic patterns, and collaboration networks in the field of Artificial Intelligence in Education.

Ensuring the reliability and validity of data in bibliometric analyses is essential for maintaining the scientific accuracy and reproducibility of research. In this study, data were retrieved from Web of Science and Scopus, both of which are internationally recognized databases that index peer-reviewed and high-quality publications. A transparent search strategy was implemented using predefined keywords, filters, and document types, while duplicate and irrelevant records were systematically removed to enhance data consistency. To ensure reliability, the datasets from both databases were compared across indicators such as publication year, author, country, and citation count (Donthu et al., 2021; Van Eck & Waltman, 2009).

The validity of the dataset was maintained by aligning keyword selection and time frames with the research objectives and including only studies directly relevant to the topic. Bibliometric indicators, including citation counts, h-index, and co-authorship networks, were used to reflect the study's scope. Through careful data cleaning and cross-validation, the findings were ensured to be both methodologically sound and content-valid, providing a robust foundation for the bibliometric analysis.

RESULTS

This part of the study presents an analysis of the data retrieved from the Scopus and Web of Science databases concerning the subject of Artificial Intelligence between the years 2010 and 2025. VOSviewer was utilised to map and visualise the bibliometric data gathered during the search process. A comparative evaluation was conducted based on the results extracted from both databases, along with the network visualisations generated through VOSviewer, to highlight similarities and differences in publication trends and scholarly patterns.

Results About Year Analysis

The increasing focus on artificial intelligence in education is largely driven by the rapid advancements in technology that are reshaping the landscape of education, both in terms of pedagogy and learning methodologies. A significant factor contributing to this surge of interest is the worldwide transition towards digital learning, which was particularly accelerated by the global Coronavirus pandemic (Singh et al., 2024). This shift has brought to the forefront the necessity for education systems that are more adaptable and robust. AI-based tools have been shown to facilitate learning, provide real-time support, and enable more personalised learning experiences. These capabilities are often challenging for traditional classroom models to achieve (Solanki et al., 2021; Roll & Wylie, 2016).

Overall, the rise of AI in education isn't just about embracing new technology—it reflects a deeper change in how we think about teaching, learning, and the role of data in shaping educational experiences. As this field continues to grow, it holds the promise of making education more inclusive, responsive, and aligned with the needs of a rapidly evolving world (Rospigliosi, 2023).

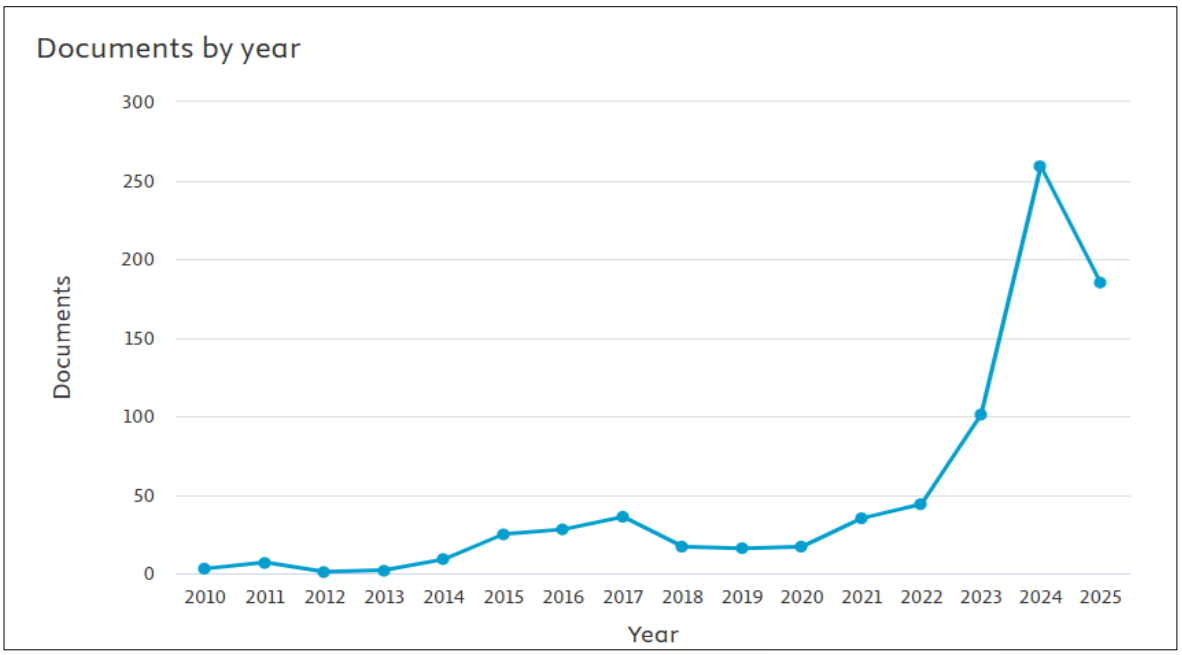


Figure 1. Annual publication distribution according to the Scopus database

(retrieved July 12, 2025).

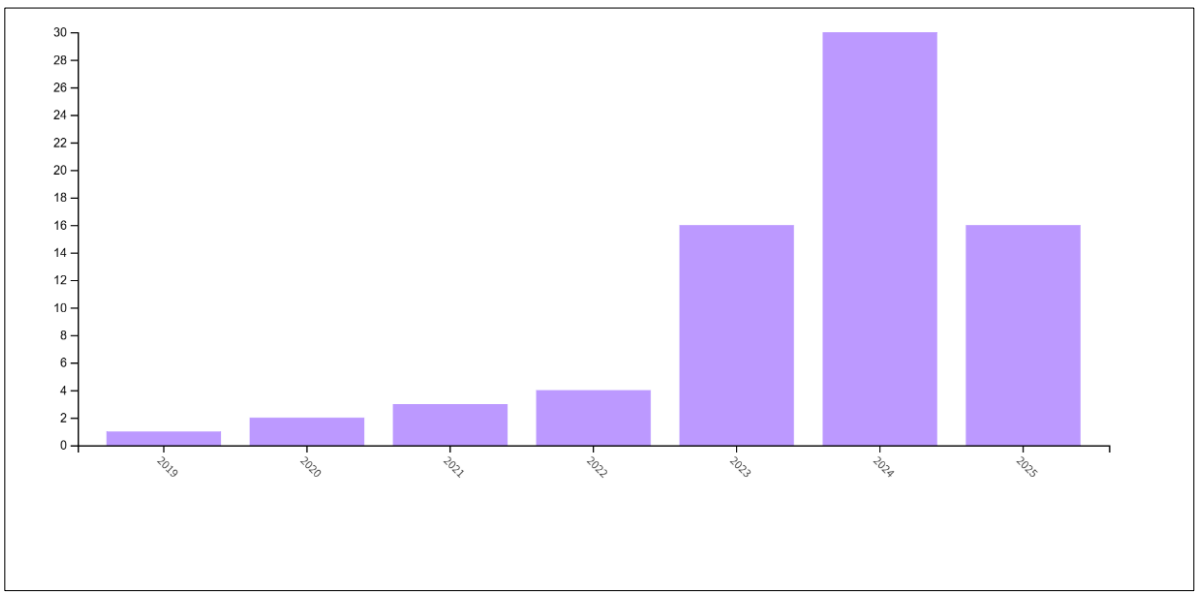


Figure 2. Annual publication distribution according to the Web of Science database

(retrieved July 12, 2025).

The research included 798 articles from the Scopus database and 72 articles from the Web of Science database, published between 2010 and 2025. While the years between 2010 and 2025 were selected as the research year, it was observed that the Web of Science database began documenting Artificial Intelligence data in education in 2019, initially with a single document. While 30 data records were documented in 2024, the number decreased to 17 in 2025. Similarly, a close examination of the data obtained from Scopus reveals a marked increase in the number of documents, which rose from 3 in 2010 to 259 in 2024 and further decreasing to 197 in the first half of 2025.

Furthermore, an analysis of both databases reveals that the highest number of publications appeared in 2024. The upward trend in research focusing on artificial intelligence in education over the years is consistent with the findings reported in prior studies (Gan & Yusof, 2020; Shrivastava et al., 2022). Figures 1 and 2 provide a detailed overview of the annual distribution of articles published between 2010 and 2025, as indexed in both the Scopus and Web of Science databases.

Result About Keywords Analysis

Keywords play a vital role in helping researchers narrow down their searches and access literature that closely aligns with their areas of inquiry. In the context of academic research, this level of precision is especially important given the overwhelming amount of information available in digital databases and scholarly archives. During the literature review process, selecting appropriate keywords allows researchers to locate studies, articles, and academic publications that are directly relevant to their specific research focus (Liu et al., 2006).

The data presented in this figure were retrieved from the Scopus Database (2025) and analysed using the VOSviewer software to identify the most frequently occurring keywords in the field of Artificial Intelligence in Education between 2010-2025 (see Figure 3).

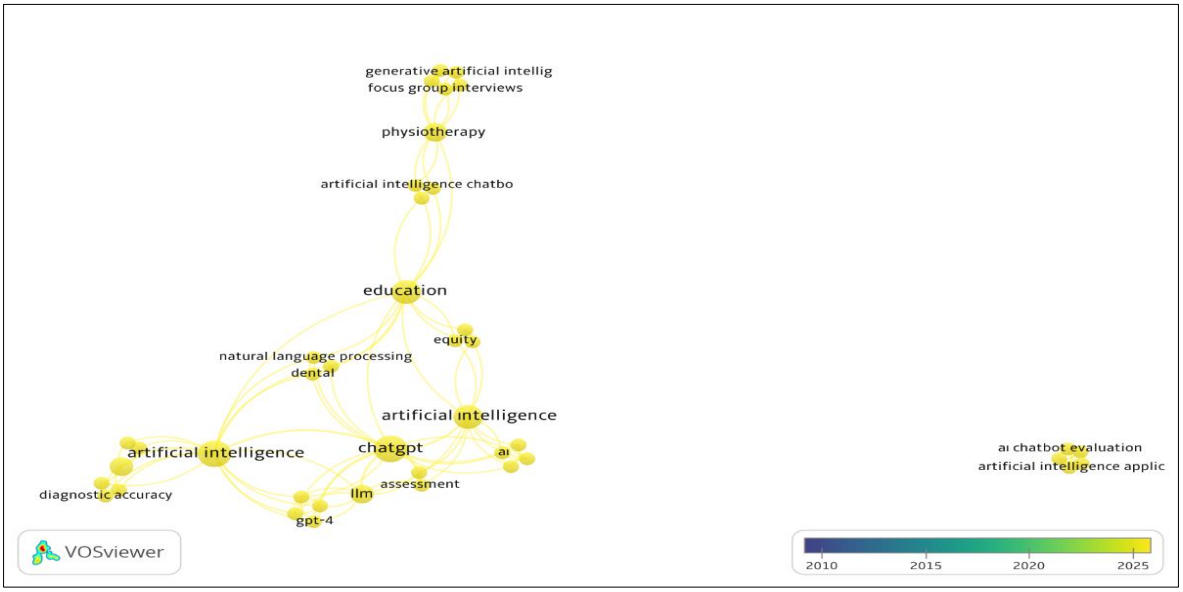


Figure 3. Most frequently used keywords on Artificial Intelligence in Education on Scopus

The data presented in this figure were retrieved from the Web of Science Core Collection (2010- 2025) and analyzed using the VOSviewer software to identify the most frequently occurring keywords in the field of Artificial Intelligence in Education between 2010-2025 (see Figure 4).

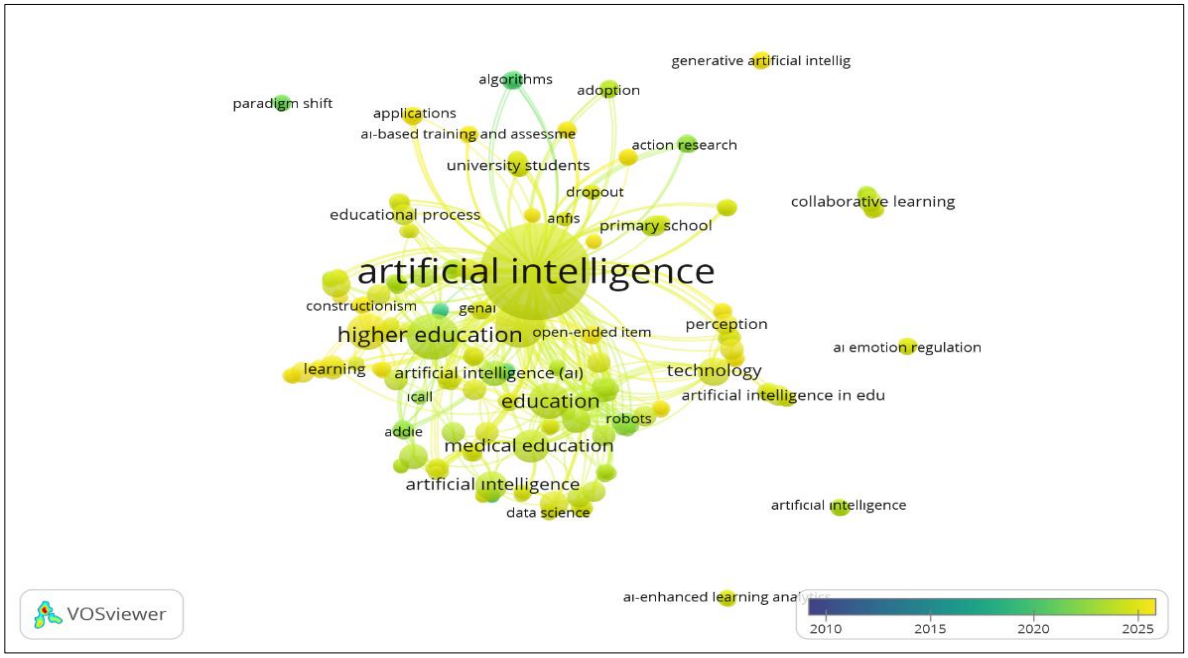


Figure 4. Most frequently used keywords on Artificial Intelligence in Education according Web of Science

Figures 3 and 4 indicate the most commonly occurring keywords in academic articles published between 2010 and 2025 in both the Scopus and Web of Science databases. The

Scopus data showed *"artificial intelligence"* as the most dominant keyword, appearing 44 times across the examined publications. The next most frequent term was *"higher education,"* which occurred 10 times. Additional frequently used keywords, in descending order, included *"ChatGPT," "education," "generative artificial intelligence," "medical education,"* and *"technology."*

In contrast, analysis of the Web of Science dataset revealed that the terms *"ChatGPT"* and *"artificial intelligence"* were among the most frequently used keywords, each appearing four times. These were followed by the term *"education"* and the phrase *"large language model (LLM)"*, both of which appeared twice. Other notable keywords—listed in decreasing order of frequency—included *"physiotherapy," "medical education," "answer rationales," "clinical vignettes,"* and *"GPT-4."*

Result About Citation Analysis

References are a foundational element of academic research, fulfilling multiple essential functions within scholarly work. They allow authors to properly attribute ideas, findings, and data to their original sources, recognizing the contributions of previous researchers. By clearly identifying the origins of specific information, citations help maintain academic honesty and protect against plagiarism—a serious breach of ethical standards that can compromise the credibility of research. Additionally, referencing authoritative sources strengthens the validity of an author's arguments, providing evidence that supports their claims. This practice not only reflects a comprehensive review of the existing literature but also situates the new research within the ongoing academic conversation. Through citations, researchers connect their work to a wider body of knowledge, highlighting its relevance and contribution to the field (Balaban, 1996; Garfield, 1972).

The data presented in this figure were retrieved from the Scopus database (2010-2025) and analyzed using VOSviewer software to identify the most cited authors in the field of Artificial Intelligence in Education (see Figure 5).

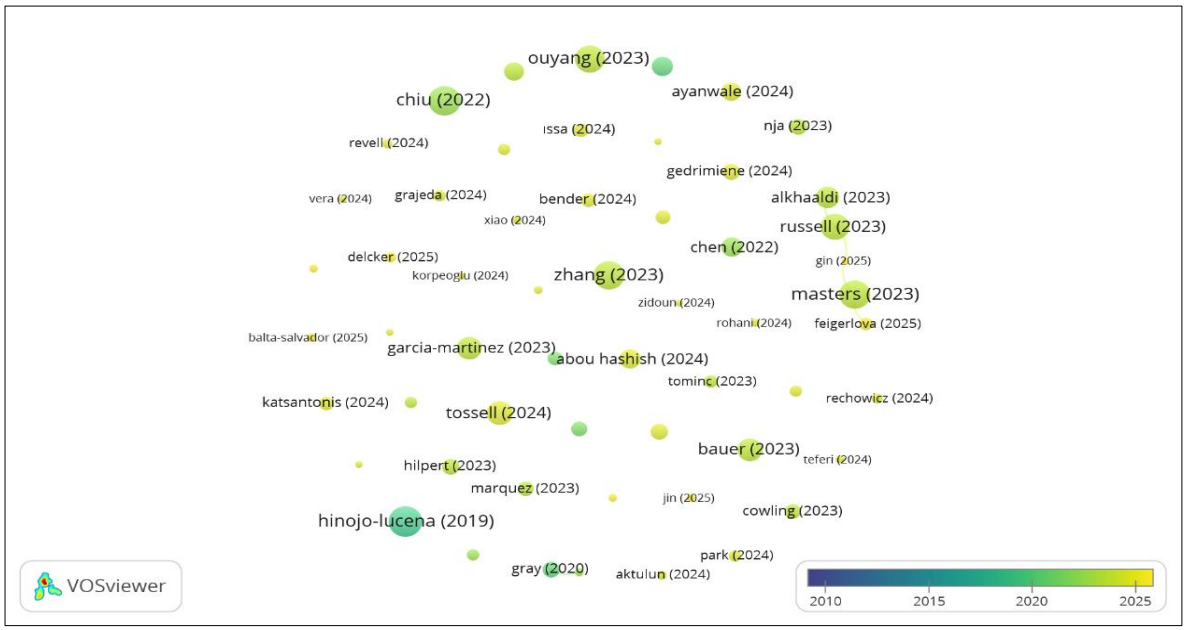


Figure 5. The Most Cited Authors on Artificial Intelligence in Education According to Scopus

The data presented in this figure were retrieved from the Web of Science Core Collection (2010- 2025) and analysed using VOSviewer software to identify the most cited authors in the field of Artificial Intelligence in Education (see Figure 6).

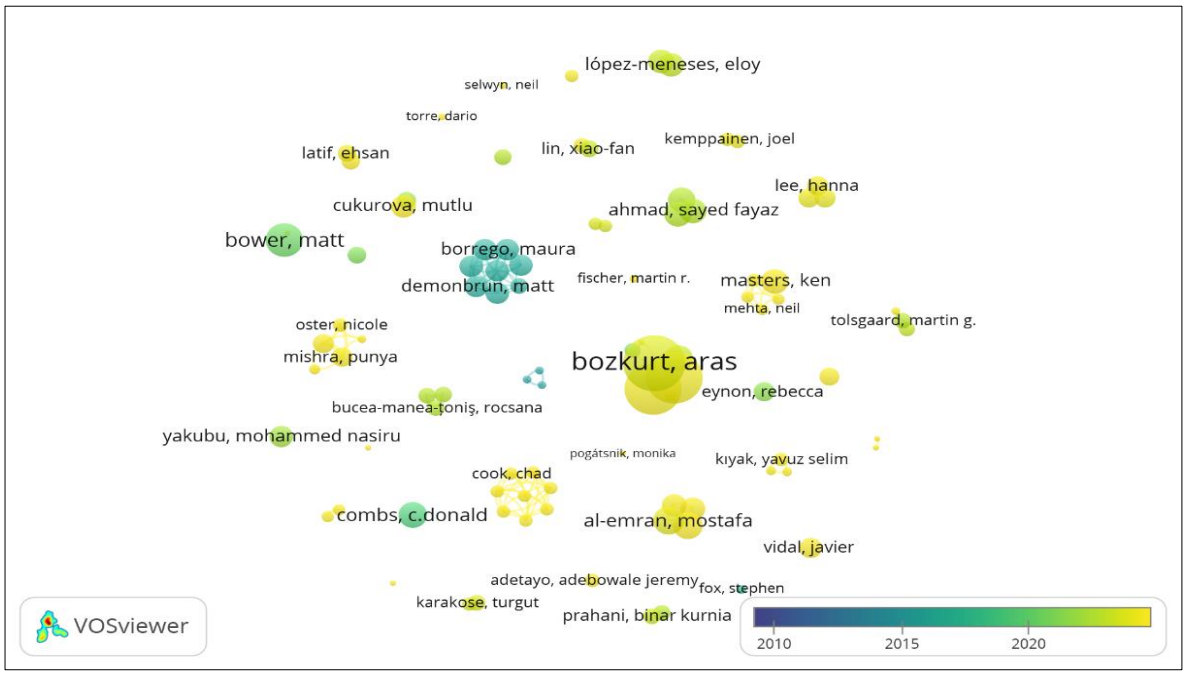


Figure 6. The Most Cited Authors on Artificial Intelligence in Education According to Web of Science

Table 1.

Most cited publications on Artificial Intelligence according to Scopus Database

Rank	*From 2010 to 2015*		*From 2016 to 2025*	
	Documents	*Citations*	*Documents*	*Citations*
1.	(Bower et al., 2015)	353	(Tlili et al., 2023)	985
2.	(Mok, 2014)	272	(Lim et al., 2023)	736
3.	(Zhu et al., 2015)	215	(Roll & Wylie, 2016)	576
4.	(Velegol et al., 2015)	131	(Sima et al., 2020)	465
5.	(Hu et al., 2015)	84	(Kamalov et al., 2020)	393
6.	(Yelamarthi &Drake, 2015)	74	(Kurdi et al.,2020)	378
7.	(Shekbar et al., 2015)	73	(Kooli,2023)	353
8.	(Singleton et al., 2011)	55	(Halaweh, 2023)	314
9.	(Haudek et al., 2011)	48	(Timms,2016	281
10.	(Kang & Landry, 2014)	46	(Chui & Chai., 2020)	228

Table 1 presents the most cited researchers in the field of Artificial Intelligence, based on data extracted from the Scopus database. Applying a threshold of at least one publication and a minimum of six citations, we analyzed the citation patterns of authors in this domain. From 2010 to 2015, the most cited publication is by Bower et al. (2015), with 353 citations, followed by Mok (2014) with 272 citations, and Zhu et al. (2015) with 215 citations. These authors made significant early contributions to the field of Artificial Intelligence, and their work has continued to influence subsequent research.

Moreover, from the full dataset, the most cited author up to 2023 is Tlili et al. (2023), with 985 citations, followed by Lim et al. (2023), with 736 citations, and Roll & Wylie (2016) with 576 citations, ranking third. These findings indicate a significant concentration of influence among a select group of researchers within the last decade.

Table 2.

Most cited publications on Ethical leadership according to Web of Science Database

Rank	*From 2019 to 2025*	
	Documents	*Citations*
1.	(Hinojo-Lucena et al., 2019)	136
2.	Chiu et al., 2022)	118
3.	(Masters, 2023)	103
4.	(Zhang et al., 2023)	97
5.	(Ouyang et al., 2023)	90
6.	(Russell et al.,2023)	83
7.	(Tossell et al., 2024)	55
8.	(Bauer et al., 2023)	53
9.	(Garcia- Martinez et al., 2023)	47
10.	(Alkhaaldi et al., 2023)	40

Given the temporal limitation of the records in the Web of Science, which commences in 2019, notably, the top ten records have been incorporated into the table. This approach excludes the records that span the period from 2010 to 2018.

Between 2019 and 2025, the landscape of highly cited leadership research shifted, with Hinojo-Lucena et al. (2019) emerging as the most cited study, accumulating 136 citations. This was closely followed by Chiu et al. (2022) with 118 citations and Masters (2023) with 103 citations, highlighting a growing scholarly interest in recent studies. The presence of several 2023 publications, such as those by Zhang, Ouyang, Russell, and Bauer, among the top ten, further reflects the rapid acceleration in research and citation impact, in just a short span. Notably, even 2024 publications, like Tossell et al., already appear with considerable citation counts, demonstrating the immediacy with which impactful work is recognised in the field. These data illustrate a dynamic and fast-evolving body of literature where recent studies are rapidly shaping the discourse around Artificial Intelligence in Education (Chen et al., 2022; Lim et al., 2023).

The data presented in this figure were retrieved from the Scopus Database (2010–2025) and analysed using VOSviewer software to show the most cited years on Artificial Intelligence in Education (see Figure 7).

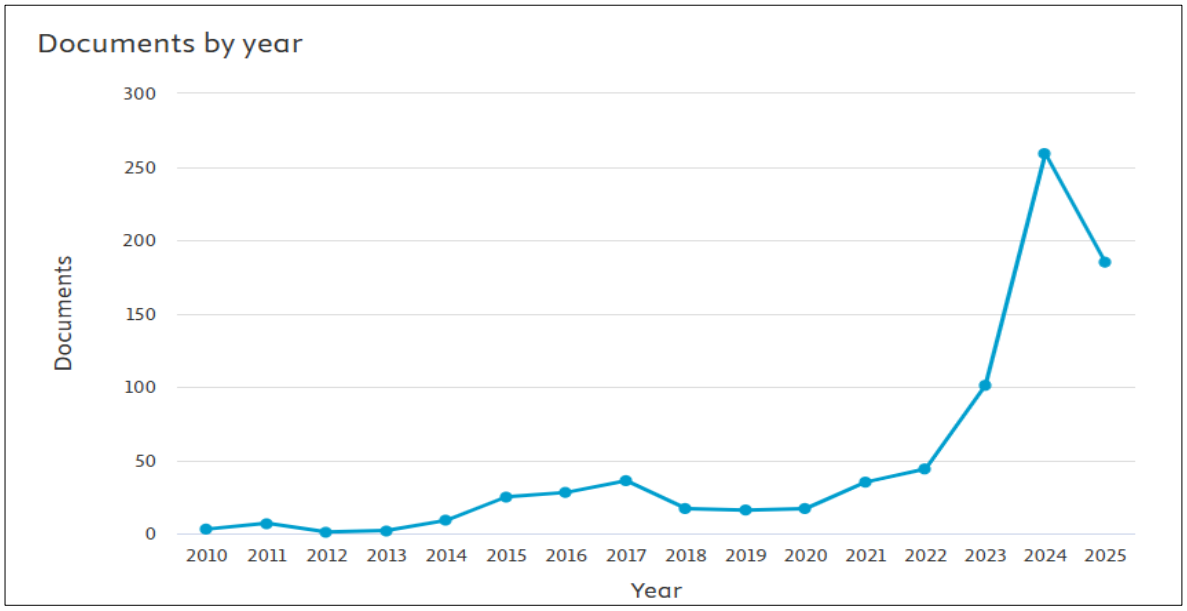


Figure 7. Most cited years on Artificial Intelligence in Education according to Scopus

The data presented in this figure were retrieved from the Web of Science Core Collection (2010-2025) and analysed using VOSviewer software to show the most cited years in Artificial Intelligence in Education (see Figure 8).

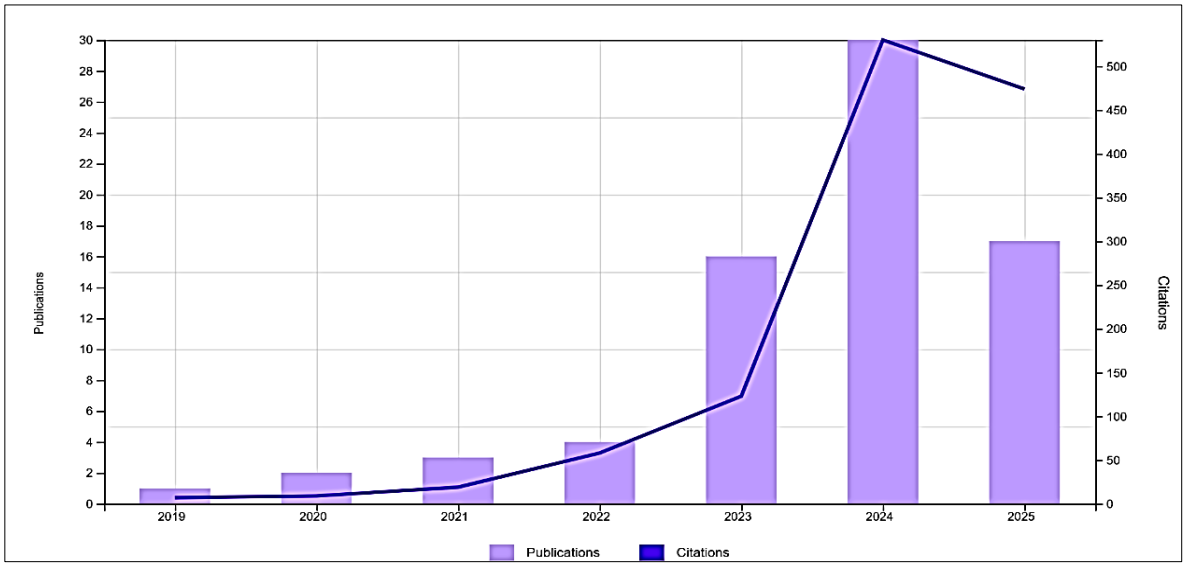


Figure 8. Most cited years on Artificial Intelligence in Education according to Web of Science

Figures 7 and 8 illustrate the annual distribution of documents on artificial intelligence in education from 2010 to 2025. For much of the early period, from 2010 to 2020, publication numbers remained relatively modest, fluctuating between 5 and 40 documents per year. There were only slight increases in certain years, such as in 2015 and 2017. However, a noticeable upward trend began in 2021, gaining momentum in 2022 and reaching a significant peak in 2024 with over 250 publications. Though there was a slight decline in 2025, the number of publications remained substantially higher than in previous years. This sharp rise from 2021 onward indicates growing interest and intensified research activity in artificial intelligence in education, likely influenced by evolving global educational challenges and a post-pandemic focus on effective practices ((Singh et al., 2024; Solanki et al., 2021).

The data presented in this figure were retrieved from the Scopus database (2025) and analyzed using VOSviewer software to identify the most active authors in the field of Artificial Intelligence in Education (see Figure 9).

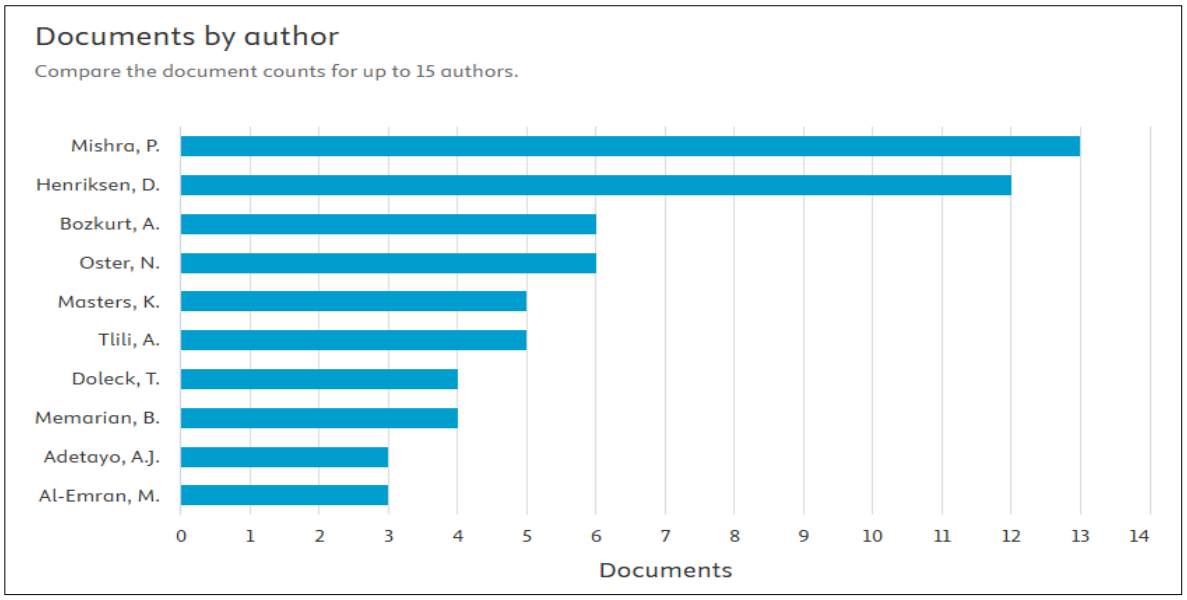


Figure 9. Most Active Authors on Artificial Intelligence according to Scopus Database

Figure 9 illustrates the authors who have contributed most significantly to the field of *Artificial Intelligence*, based on data filtered from the Scopus database. Leading the list is *P. Mishra*, who has authored 13 publications on the topic. His 2024 article, *"Generative AI, Teacher Knowledge and Educational Research: Bridging Short- and Long-Term Perspectives,"* currently holds the highest citation count among his works, with 23 citations. *D. Henriksen* follows closely, having written 12 articles in the field. Her 2023 publication, *"Can We Just Please Slow It All Down? School Leaders Take on ChatGPT,"* has received notable attention as well, accumulating 18 citations.

The data presented in this figure were retrieved from the Web of Science Core Collection (2025) and analyzed using VOSviewer software to identify the most active authors in the field of Artificial Intelligence in Education (see Figure 10).

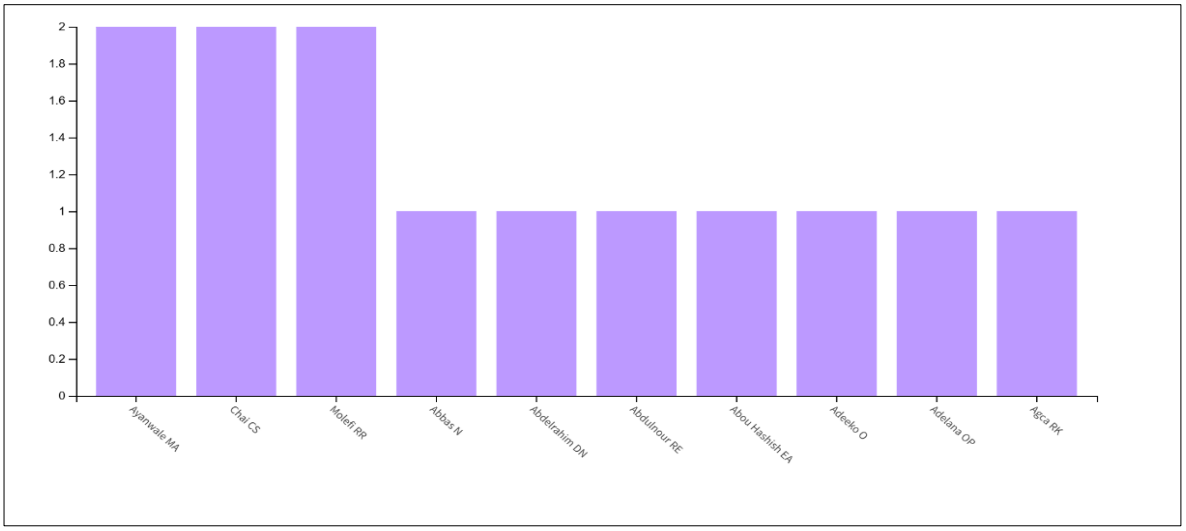


Figure 10. Most Active Authors on Artificial Intelligence according to the Web of Science Database

A review of the literature reveals that Chai Ching Sing: "Creation and Evaluation of a Pretertiary Artificial Intelligence (AI) Curriculum", Ayanwale Musa Adekunle: "Examining artificial intelligence literacy among pre-service teachers for future classrooms", and Molefi Rethabile Rosemary: "Do in-service teachers accept artificial intelligence-driven technology? The mediating role of school support and resources" were the most prolific authors in the field, with 128, 23, and 9 citations, respectively. Each of these authors has authored two articles in the field.

Countries and Affiliations

Countries increasingly recognize that research and development (R&D) serves as a critical engine for both societal advancement and economic prosperity. A key area emerging within this landscape is artificial intelligence (AI), particularly its integration into education. As research in AI continues to evolve, it is transforming traditional learning environments through personalized instruction, intelligent tutoring systems, and data-driven decision-making. These innovations not only enhance student engagement and learning outcomes but also support educators in curriculum planning and classroom management (Chen et al., 2020). A strong commitment to research in AI and education is, therefore, essential not just for academic progress, but for building future-ready societies. Moreover, investments in health, science, and technology, including AI applications, are contributing to public well-being, job creation, and sustainable growth (Devedzic, 2004; Zawacki-Richter et al., 2019).

Universities serve as key engines of research, often leading initiatives that aim to enhance societal well-being. Research on AI in education provides valuable insights that can inform curriculum development, instructional design, and institutional policy. By incorporating AI-driven tools and methods into academic programs, universities equip students and educators with innovative resources that enhance learning outcomes, promote

personalized education, and support data-informed decision-making (Lameras & Arnab, 2021).

The data presented in this figure were retrieved from the Scopus database (2010-2025) and analyzed using VOSviewer software to identify the most active universities in the field of Artificial Intelligence (see Figure 11).

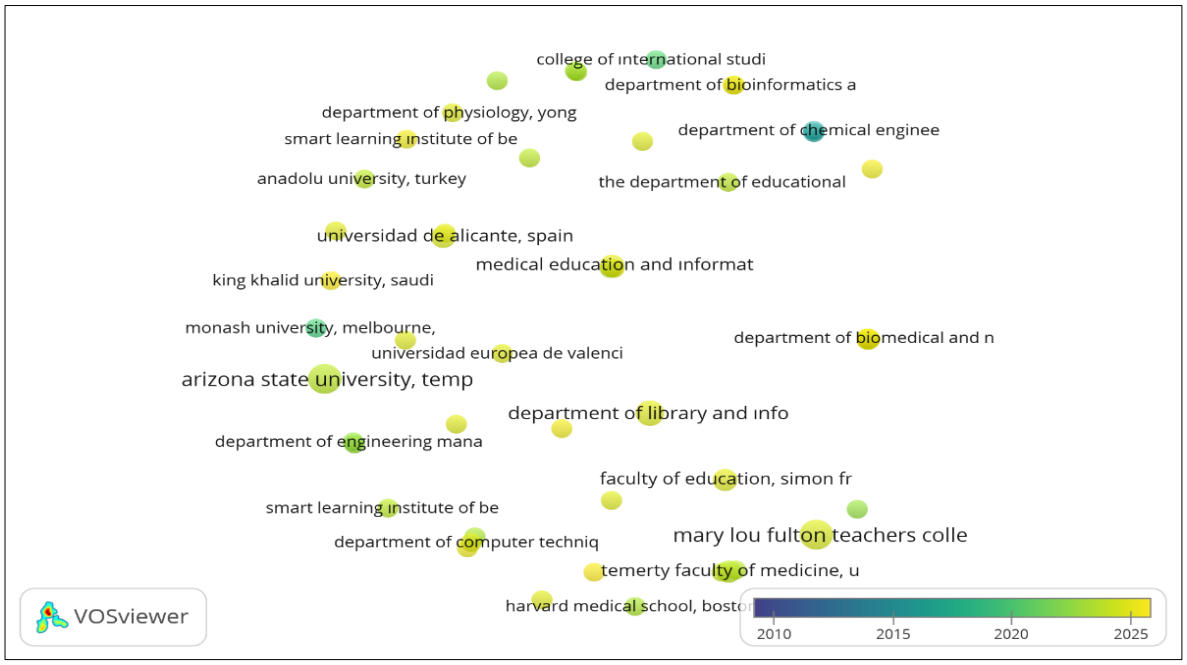


Figure 11. The most active universities on Artificial Intelligence, according to VOSviewer, based on Scopus Data

The data presented in this figure were retrieved from the Scopus database (2025) and analysed using VOSviewer software to identify the most active universities in the field of Artificial Intelligence (see Figure 12).

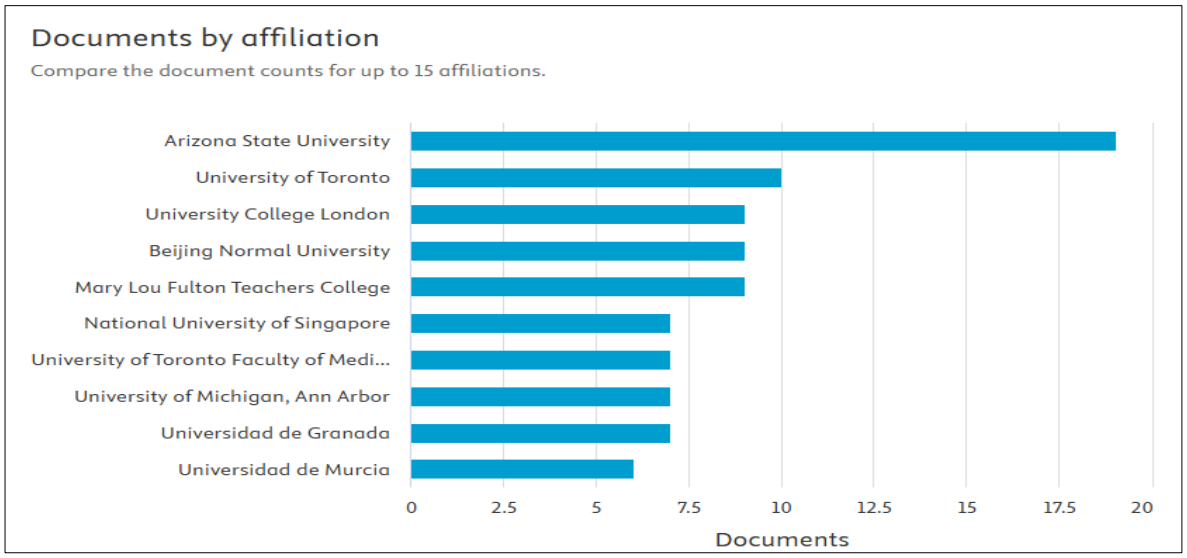


Figure 12. The most active universities in Artificial Intelligence according to the Scopus Database

It is evident that Arizona State University leads in the field, contributing nearly 19 documents, with the highest number of publications, followed closely by the University of Toronto with 10 publications. Other prominent institutions include University College London, Beijing Normal University, and Mary Lou Fulton Teachers College, each with 9 documents. Additional contributors with 8 publications include the National University of Singapore, University of Toronto Faculty of Medicine, University of Michigan at Ann Arbor, Universidad de Granada, and Universidad de Murcia. This analysis reflects a broader engagement from global institutions in ethical leadership research. These figures revise earlier conclusions which highlighted institutions such as the Rotterdam School of Management, Erasmus University, and the University of Leuven based on Scopus and VOSviewer data. While those universities showed significant influence in terms of citations, the latest document count positions Arizona State University and The University of Toronto as current leaders in publication volume.

In contrast, a comparison of figures 11 and 12 reveals a striking discrepancy in the number of documents attributed to specific universities, as evidenced by a notable variation between the VOSviewer map and the bar chart. For instance, Arizona State University appears to have only around 2–3 documents in the VOSviewer illustration, yet the bar chart reveals it has 19 publications, indicating a significant underrepresentation in the network map. Similarly, Mary Lou Fulton Teachers College displays approximately 2–3 documents in VOSviewer, but is credited with 9 publications in the bar chart. On the other hand, institutions such as Monash University and Universidad de Alicante are visible in the VOSviewer map with two documents each, but they do not appear in the top 10 institutions in the bar chart. Meanwhile, universities like Universidad de Granada, Universidad de Murcia, and the University of Michigan, Ann Arbor, are featured prominently in the bar chart with 7–8 documents each, yet they are not visible in the VOSviewer map. These discrepancies likely stem from differences in visualisation thresholds, co-authorship connections, or inclusion criteria between the two data presentations.

The data presented in this figure were retrieved from the Web of Science Core Collection (2010-2025) and analysed using VOSviewer software to identify the most active universities in the field of Artificial Intelligence (see Figure 13).

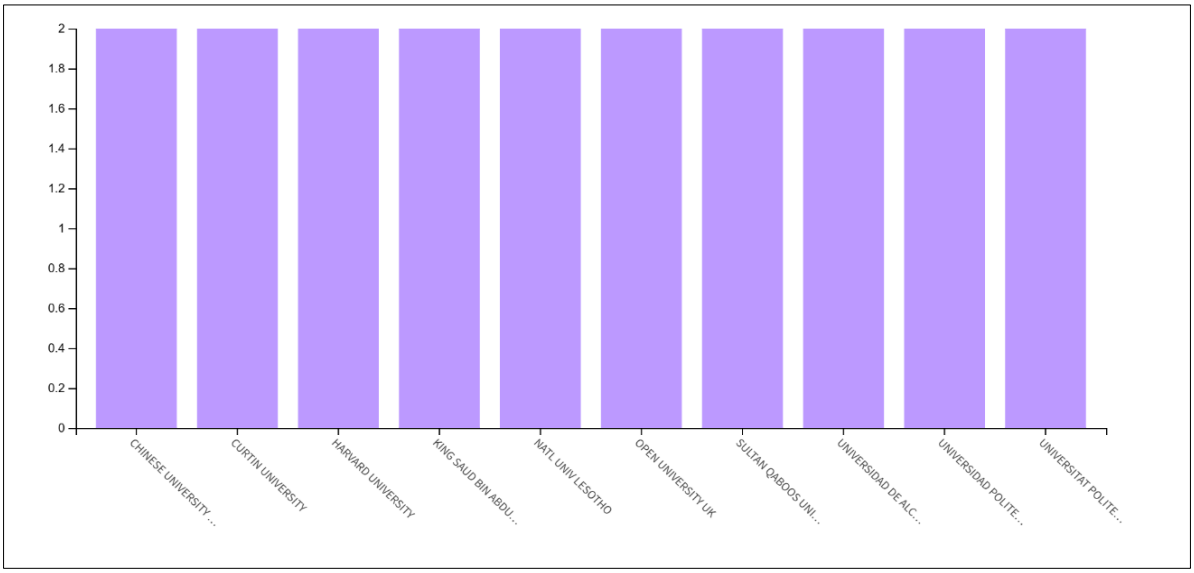


Figure 13. The most active universities in Artificial Intelligence, according to the Web of Science database

The data presented in this figure were retrieved from the Web of Science Core Collection (2010-2025) and analyzed with VOSviewer software to identify the most active universities in the field of Artificial Intelligence (see Figure 14).

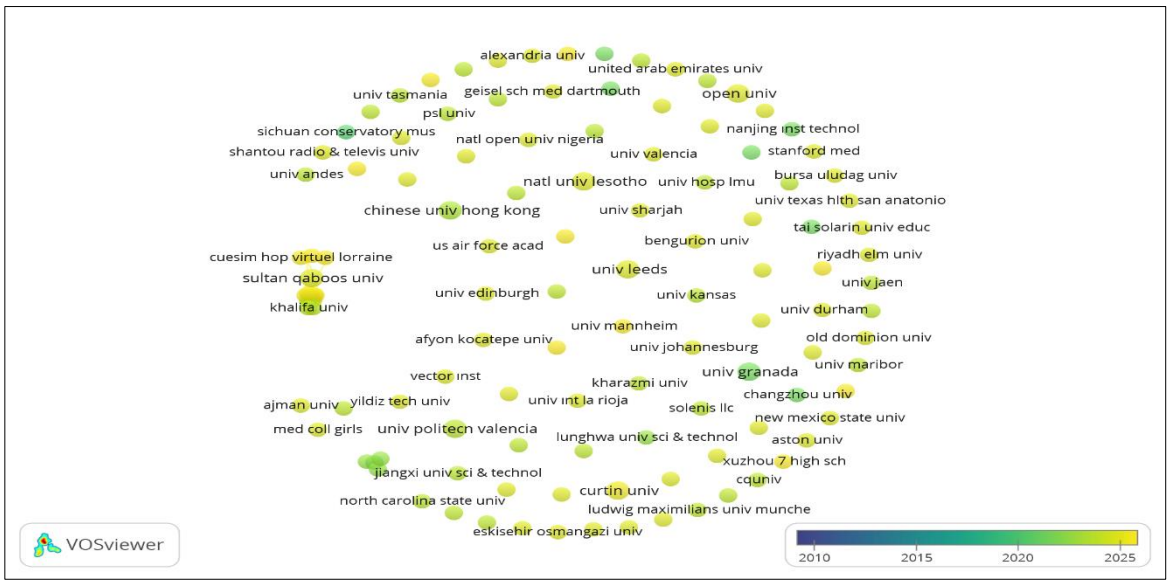


Figure 14. The most active universities on Artificial Intelligence according to VOSviewer based on Web of Science database

A comparative analysis of figures 13 and 14 reveals both clear overlaps and notable differences in the institutions listed. The data indicates that universities such as the Chinese

University of Hong Kong; Curtin University; Sultan Qaboos University; National University of Lesotho; Open University UK; and Universidad Politécnica de Valencia each contributed two publications. This consistency suggests that the core data are reliable across both sources. However, the second figure includes some institutions not seen in the first, such as Harvard University, King Saud Bin Abdulaziz University for Health Sciences, Universidad de Alcalá, and Universidad Politécnica de Madrid. The initial figure enumerates universities such as the University of Granada and the University of Leeds with two publications, while also including several organizations with a single document, which are absent from the subsequent list. These differences may be attributable to the method of grouping of affiliations, the manner in which the data was extracted, or the specific criteria employed in each analysis. While the primary contributors are similar, the figures offer slightly divergent perspectives on the data (Mongeon & Paul-Hus, 2015).

The data presented in this figure were retrieved from the Scopus database (2010-2025) and analysed using VOSviewer software to identify the most active countries in the field of Artificial Intelligence (see Figure 15).

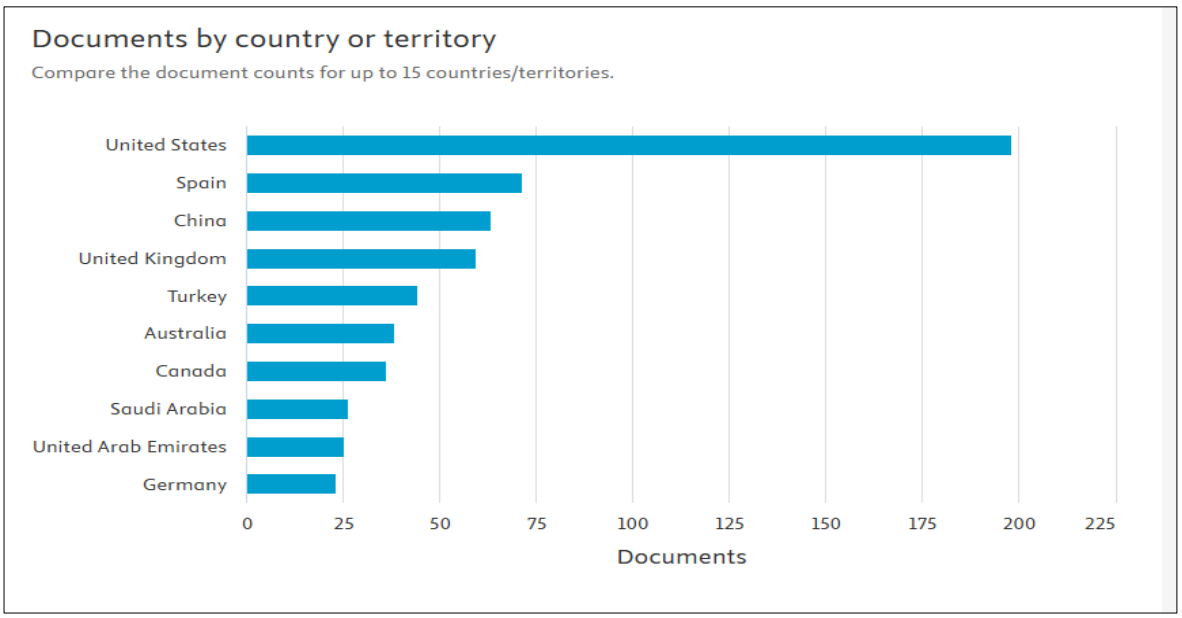


Figure 15. The most active countries in Artificial Intelligence, according to the Scopus Database

The data presented in this figure were retrieved from the Scopus database (2010-2025) and analysed using VOSviewer software to identify the most active countries in the field of Artificial Intelligence (see Figure 16).

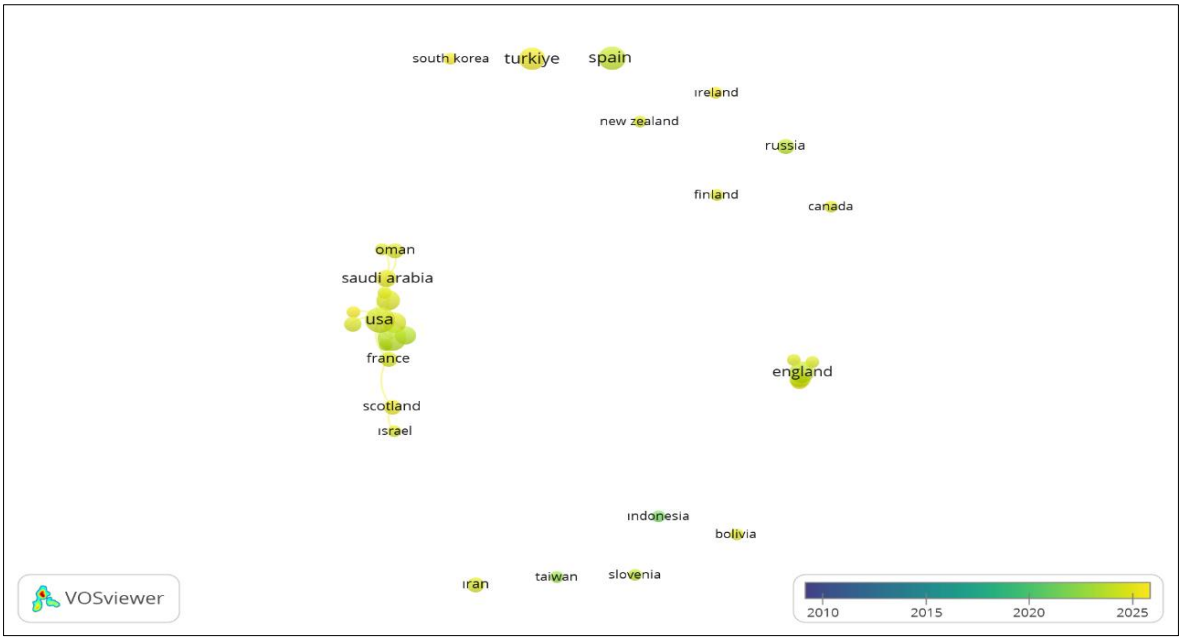


Figure 16. The most active countries in Artificial Intelligence, according to VOSviewer, based on the Scopus Database

A comparison of figures 15 and 16 reveals a high degree of consistency in the ranking of the top publishing countries. However, there are minor discrepancies in the exact document counts. A close examination of the data reveals that the United States has published the highest number of articles, with 197 publications identified in the VOSviewer data, and approximately 215 publications as indicated by the bar chart. This finding substantiates the claim that the United States is the most active contributor in the field. Spain, China, the United Kingdom, Türkiye, Australia, Canada, Saudi Arabia, the United Arab Emirates, and Germany appear in the same order across both visuals, with slightly varying publication numbers. For instance, China has 64 documents in the VOSviewer table, but shows a slightly higher count in the bar chart. These minor variations may be attributable to rounding or time-based modifications in data retrieval processes.

Furthermore, the VOSviewer table incorporates countries not displayed in the bar chart, including India, Malaysia, Brazil, South Korea, and Italy. This observation suggests that the bar chart focuses exclusively on the top ten countries. The VOSviewer data offer a more comprehensive perspective by incorporating citation counts and total link strength, providing a more detailed view of each country's research impact and collaboration. A comparative analysis of the two figures reveals a substantial degree of agreement regarding the identification of the most prolific countries. However, minor discrepancies may emerge from variations in the scope of the data sets or limitations inherent in the visualisation techniques employed.

The data presented in this figure were retrieved from the Web of Science Core Collection (2010-2025) and analysed using VOSviewer software to identify the most active countries in the field of Artificial Intelligence (see Figure 17).

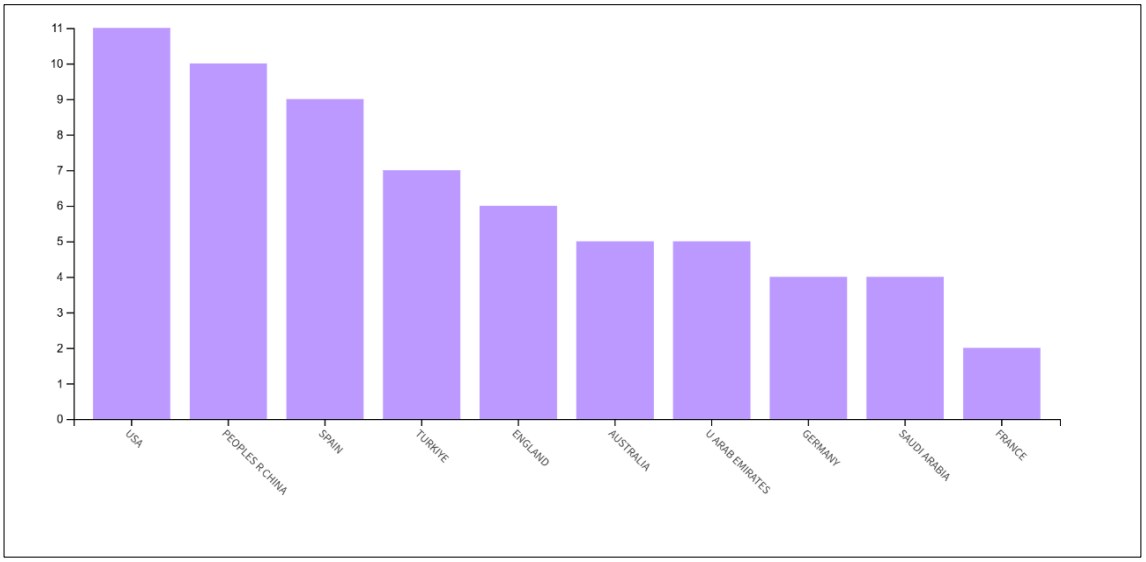


Figure 17. The most active countries in Artificial Intelligence, according to the Web of Science Database

The data presented in this figure were retrieved from the Web of Science Core Collection (2010-2025) and analysed using VOSviewer, software used to identify the most active countries in the field of Artificial Intelligence (see Figure 18).

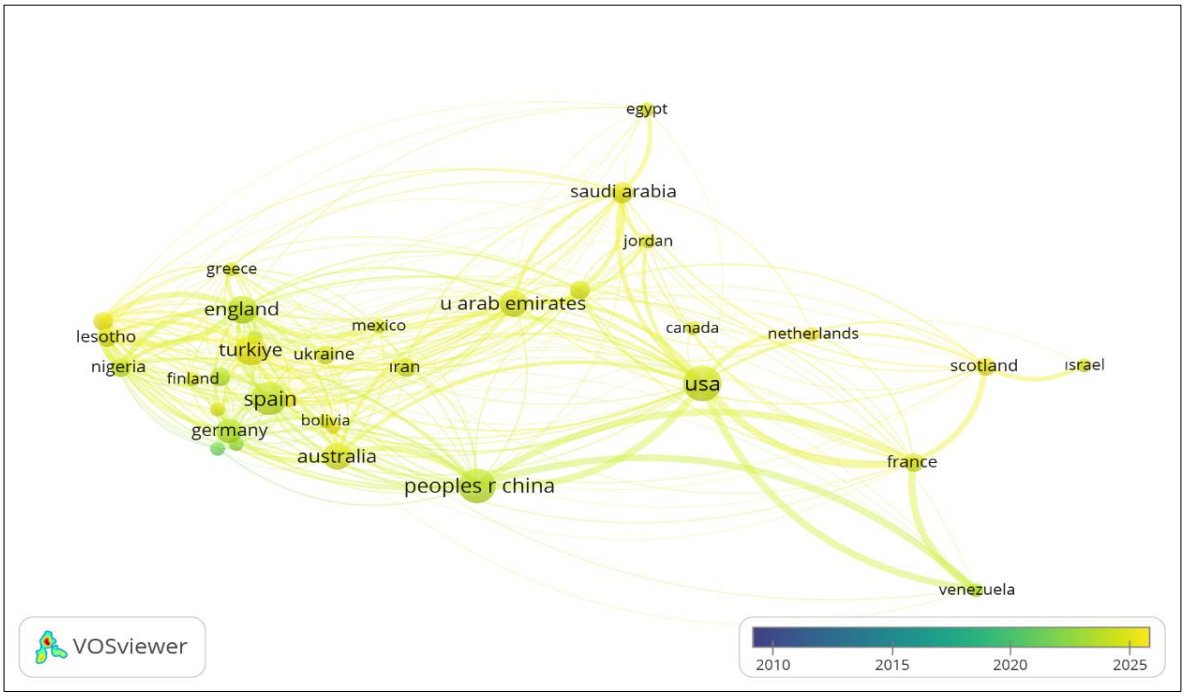


Figure 18. The most active countries in Artificial Intelligence, according to VOSviewer, based on the Web of Science Database

A comparative analysis of these figures reveals a notable similarity in the overall rankings and publication numbers for both countries, despite the differing data presentation methods used. The analysis reveals that the United States is the predominant contributor, with a total of 11 publications. It is closely followed by China, which published 10 publications, and Spain, with 9 publications. The list continues with Türkiye, England, Australia, the United Arab Emirates, Germany, Saudi Arabia, and France, each with 2 to 7 publications. The uniformity observed in both visual representations serves to substantiate the veracity of the data presented.

However, the first figure goes a step further by including citations and total link strength, offering insight into not just how many documents a country produced, but also how well-connected and cited those works are. For instance, the United States and China demonstrate leadership in both publication count and measures of link strength and citation frequency. This finding suggests that these nations exhibit robust international collaboration and significant impact. In contrast, the second figure is more focused and simpler, counting documents without offering any details on influence or network strength. Therefore, while both visual representations concur on the leading contributing nations, the initial visual depiction offers a more comprehensive and detailed analysis of each nation's academic influence (Mongeon & Paul-Hus, 2015).

CONCLUSION & DISCUSSION

Bibliometric analysis is a quantitative research technique used to explore the patterns, trends, and impact of scientific studies through the analysis of publication and citation data (Van Eck & Waltman, 2009). In this study, an overview of articles on artificial intelligence in education published between 2010 and 2025 was conducted using data from Scopus and Web of Science. By employing tools such as VOSviewer, publication trends, commonly used keywords, and citation distributions were examined, providing an objective picture of research activity in this field.

The analysis also highlighted the most influential researchers, leading institutions, and active countries, indicating where knowledge production is concentrated. The results reveal a marked increase in scholarly attention to AI in education, suggesting that the topic has gained momentum over time. This surge reflects not only growing interest among researchers but also the expanding role of AI in shaping teaching methods, learning environments, and educational policies. The identified patterns suggest that AI has become a central focus within educational research, pointing to both its practical relevance and its potential to guide future studies and institutional strategies (Mishra et al., 2024; Ouyang & Jiao, 2021).

The keywords obtained from the Scopus dataset reveal that "artificial intelligence" is the most frequently used term, appearing 44 times. "Higher education" is the second most frequent term, appearing 10 times. Other notable keywords include "ChatGPT,"

"education," "generative artificial intelligence," "medical education," and "technology," indicating a focus on general educational contexts and emerging AI tools. In contrast, the Web of Science dataset has a more balanced distribution of keywords. "ChatGPT" and "artificial intelligence" are each mentioned four times. Terms such as "education," "large language model (LLM)," "physiotherapy," "medical education," "answer rationales," "clinical vignettes," and "GPT-4" appear less frequently. Moreover, these patterns suggest that Scopus captures broader, more established topics, while Web of Science highlights emerging, specialized areas within AI applications in education. The differences reflect the field's development, showing both the advancement of foundational themes and the exploration of new, innovative directions. This points to the evolving focus and growing diversity of research interests in AI-enhanced educational practices (Kamble et al., 2018; Knox, 2020; Mongeon & Paul-Hus, 2015; Rospigliosi, 2023; Tlili et al., 2023).

Data from Scopus, Web of Science, and VOSviewer show a clear pattern regarding the most active countries in AI research within education. The United States leads in all datasets, with 197 publications in VOSviewer and approximately 215 in the bar chart, highlighting its dominant role in the field. Other countries such as Spain, China, the United Kingdom, Türkiye, Australia, Canada, Saudi Arabia, the UAE, and Germany also appear consistently, though the exact number of publications varies slightly between sources. For example, China has 64 documents in VOSviewer but a slightly higher count in the bar chart, likely due to updates or rounding differences. VOSviewer additionally identifies countries not included in the bar chart, such as India, Malaysia, Brazil, South Korea, and Italy, demonstrating a broader scope of global participation.

Beyond publication counts, citation numbers, and link strength in VOSviewer provide insight into research influence and collaboration networks. Notably, projections suggest that 2024 will emerge as the peak year for both publications and citations in Scopus and Web of Science, reflecting increasing scholarly interest in AI's applications in education. Therefore, these patterns indicate that AI research is expanding globally, with certain countries leading in output while others contribute through growing collaboration and influence, suggesting a dynamic and internationally connected research landscape (Arrieta et al., 2019; Gocen & Aydemir, 2020; Pedro et al., 2019).

Chai Ching Sing, Ayanwale Musa Adekunle, and Molefi Rethabile Rosemary are among the most productive authors in the field of artificial intelligence in education. Each of these authors has published two articles, receiving 128, 23, and 9 citations , which reflects both their output and the impact of their work. Mishra stands out with 13 publications, including a 2024 study, cited 23 times, indicating consistent contribution and recognition in the field. Similarly, D. Henriksen has produced 12 articles, with a 2023 study receiving 18 citations, highlighting his influence. The results suggest that while some authors have a smaller number of highly cited works, others like Mishra and Henriksen demonstrate both

productivity and sustained impact, revealing different ways researchers contribute to the development of AI in education.

The United States holds the highest number of publications in both datasets, indicating its leading role in AI research in education. Similar patterns are observed for Spain, China, the United Kingdom, Türkiye, and Australia, although minor differences exist in the exact number of documents. Notably, VOSviewer includes additional countries such as India, Brazil, and South Korea, which do not appear in the bar chart limited to the top ten, offering a broader perspective on global participation. On the other hand, VOSviewer provides supplementary information on citation counts and collaboration strength, enabling a deeper understanding of research influence and international networks. Overall, a comparative analysis of both datasets shows substantial overlap in the most productive countries, suggesting that the global distribution of AI research in education is consistent across different bibliometric sources, while also highlighting emerging contributors beyond the top-ranked nations (Abad-Segura et al., 2020; Hwang et al., 2020).

LIMITATIONS AND RECOMONDATIONS

While this bibliometric analysis provides valuable insights into the development of artificial intelligence research in education, several limitations should be noted. The study is based solely on data from Scopus and Web of Science, which, although extensive, may not capture all relevant publications, particularly from regional journals or emerging databases. Differences in author-defined keywords and indexing practices can create inconsistencies in thematic categorization, potentially affecting the accuracy of keyword and trend analyses. Moreover, the study primarily relies on quantitative measures such as publication counts, citation metrics, and co-authorship networks, which may not fully reflect the qualitative depth or practical impact of the research. Finally, the focus on publications from 2010 to 2025 may overlook earlier foundational works or very recent studies not yet indexed, influencing longitudinal interpretations.

Based on the findings of this study, several recommendations emerge for researchers, educators, and practitioners. Researchers are encouraged to investigate underrepresented regions, institutions, and emerging educational contexts to achieve a more globally inclusive perspective on AI in education. Integrating bibliometric analyses with content or systematic reviews can provide richer qualitative and quantitative insights. Given the rapid rise of tools such as ChatGPT, large language models (LLMs), and GPT-4, longitudinal studies are recommended to track their evolving effects on teaching and learning. Expanding the scope of data sources to include regional or specialized repositories may enhance comprehensiveness in future analyses. Moreover, it is important for educators to develop training programs that enable effective use of AI tools in the classroom and to leverage AI-powered analytics to identify student learning needs for more targeted lesson planning. School administrators can use AI data to monitor teacher performance and

student achievement, while also informing intra-institutional collaboration and resource allocation decisions.

Finally, it is recommended that policymakers support international collaboration in AI-related education research and consider the development of policies that address ethical aspects and equitable access to AI technologies. Implementing such measures may help the educational community utilize AI tools more effectively while mitigating potential challenges.

REFERENCES

Abad-Segura, E., González-Zamar, M., Infante-Moro, J. C., & García, G. R. (2020). Sustainable Management of Digital Transformation in Higher Education: Global Research Trends. *Sustainability*, *12*(5), 2107. https://doi.org/10.3390/su12052107

Arrieta, A. B., Díaz-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S., Barbado, A., Garcia, S., Gil-Lopez, S., Molina, D., Benjamins, R., Chatila, R., & Herrera, F. (2019). Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Information Fusion*, *58*, 82–115. https://doi.org/10.1016/j.inffus.2019.12.012

Balaban, A. T. (1996). How should citations to articles in high- and low-impact journals be evaluated, or what is a citation worth? *Scientometrics*, *37*(3), 495–498. https://doi.org/10.1007/bf02019260

Bnko, A., & Lányi, C. S. (2009). History of artificial intelligence. In *IGI Global eBooks* (pp. 1759–1762). https://doi.org/10.4018/978-1-60566-026-4.ch276

Chen, X., Xie, H., Zou, D., & Hwang, G. (2020). Application and theory gaps during the rise of Artificial Intelligence in Education. *Computers and Education Artificial Intelligence*, *1*, 100002. https://doi.org/10.1016/j.caeai.2020.100002

Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, *20*(1). https://doi.org/10.1186/s41239-023-00408-3

Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two decades of Artificial Intelligence in Education: contributors, collaborations, research topics, challenges, and future directions. *DOAJ (DOAJ: Directory of Open Access Journals)*. https://doaj.org/article/f8b4d7534bfc42a4818ca1d6bf7e4d4b

Crevier, D. (1993). AI: the tumultuous history of the search for artificial intelligence. *Choice Reviews Online*, *31*(03), 31–1555. https://doi.org/10.5860/choice.31-1555

Devedzic, V. (2004). Web intelligence and artificial intelligence in education. *Educational Technology & Society*, *7*(4), 29–39. http://www.ifets.info/journals/7_4/6.pdf

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2007). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *The FASEB Journal*, *22*(2), 338–342. https://doi.org/10.1096/fj.07-9492lsf

Garfield, E. (1972). Citation analysis as a tool in journal evaluation. *Science*, *178*(4060), 471–479. https://doi.org/10.1126/science.178.4060.471

Gocen, A., & Aydemir, F. (2020). Artificial intelligence in education and schools. *Research on Education and Media*, *12*(1), 13–21. https://doi.org/10.2478/rem-2020-0003

Haenlein, M., & Kaplan, A. (2019). A Brief History of artificial intelligence: on the past, present, and future of artificial intelligence. *California Management Review*, *61*(4), 5–14. https://doi.org/10.1177/0008125619864925

Hwang, G., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of Artificial Intelligence in Education. *Computers and Education Artificial Intelligence*, *1*, 100001. https://doi.org/10.1016/j.caeai.2020.100001

Kamalov, F., Calonge, D. S., & Gurrib, I. (2023). New era of Artificial intelligence in Education: Towards a sustainable Multifaceted Revolution. *Sustainability*, *15*(16), 12451. https://doi.org/10.3390/su151612451

Knox, J. (2020). Artificial intelligence and education in China. *Learning Media and Technology*, *45*(3), 298–311. https://doi.org/10.1080/17439884.2020.1754236

Lameras, P., & Arnab, S. (2021). Power to the Teachers: An Exploratory review on Artificial intelligence in education. *Information*, *13*(1), 14. https://doi.org/10.3390/info13010014

Lim, W. M., Gunasekara, A., Pallant, J. L., Pallant, J. I., & Pechenkina, E. (2023). Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators. *The International Journal of Management Education*, *21*(2), 100790. https://doi.org/10.1016/j.ijme.2023.100790

Liu, F., Yu, C., Meng, W., & Chowdhury, A. (2006). Effective keyword search in relational databases. *Proceedings of the 2006 ACM SIGMOD International Conference on Management of Data*, 563–574. https://doi.org/10.1145/1142473.1142536

Mishra, P., Oster, N., & Henriksen, D. (2024). Generative AI, Teacher Knowledge and Educational Research: bridging Short- and Long-Term Perspectives. *TechTrends*, *68*(2), 205–210. https://doi.org/10.1007/s11528-024-00938-1

Mongeon, P., & Paul-Hus, A. (2015). The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics*, *106*(1), 213–228. https://doi.org/10.1007/s11192-015-1765-5

Ng, D. T. K., Tan, C. W., & Leung, J. K. L. (2024). Empowering student self-regulated learning and science education through ChatGPT: A pioneering pilot study. *British Journal of Educational Technology*, *55*(4), 1328–1353. https://doi.org/10.1111/bjet.13454

Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. *Computers and Education Artificial Intelligence*, *2*, 100020. https://doi.org/10.1016/j.caeai.2021.100020

Öztürk, O., Kocaman, R., & Kanbach, D. K. (2024). How to design bibliometric research: an overview and a framework proposal. *Review of Managerial Science*, *18*(11), 3333–3361. https://doi.org/10.1007/s11846-024-00738-0

Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education : challenges and opportunities for sustainable development. *MINISTERIO DE EDUCACIÓN*. http://repositorio.minedu.gob.pe/handle/20.500.12799/6533

Qadir, J. (2023). Engineering Education in the Era of ChatGPT: Promise and Pitfalls of Generative AI for Education. *2022 IEEE Global Engineering Education Conference (EDUCON)*, 1–9. https://doi.org/10.1109/educon54358.2023.10125121

Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education*, *26*(2), 582–599. https://doi.org/10.1007/s40593-016-0110-3

Rospigliosi, P. '. (2023). Artificial intelligence in teaching and learning: what questions should we ask of ChatGPT? *Interactive Learning Environments*, *31*(1), 1–3. https://doi.org/10.1080/10494820.2023.2180191

Singh, K., Kaur, N., & Prabhu, A. (2024). Combating COVID-19 Crisis using Artificial Intelligence (AI) Based Approach: Systematic Review. *Current Topics in Medicinal Chemistry*, *24*(8), 737–753. https://doi.org/10.2174/0115680266282179240124072121

Solanki, V., Solanki, U., Baliyan, A., Kukreja, V., Lamba, V., & Sahoo, B. K. (2021). Importance of Artificial Intelligence and Machine Learning in fighting with COVID-19 Epidemic. *2021 5th International Conference on Information Systems and Computer Networks (ISCON)*, 1–8. https://doi.org/10.1109/iscon52037.2021.9702316

Su, J., & Yang, W. (2023). Unlocking the power of ChatGPT: a framework for applying generative AI in education. *ECNU Review of Education*, *6*(3), 355–366. https://doi.org/10.1177/20965311231168423

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, *10*(1). https://doi.org/10.1186/s40561-023-00237-x

Van Eck, N. J., & Waltman, L. (2009). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1). https://doi.org/10.1186/s41239-019-0171-0

Data Availability Declaration

Data Availability Upon Formal Request: While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity

Author Contributions

All authors, Güler SHAIKH and Semra KIRANLI GÜNGÖR, contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. All authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors have a scholarly interest in the intersection of educational technologies and data-driven research methodologies. This study was conducted with the aim of contributing to the academic understanding of how artificial intelligence is shaping educational practices globally. The authors affirm that the research was carried out independently and with academic integrity.

Acknowledgements: The authors express their sincere gratitude to the institutions and academic databases that made this research possible, particularly Scopus and Web of Science for providing access to comprehensive bibliographic data. Special thanks are also extended to the developers of VOSviewer for offering valuable tools that facilitated the analysis and visualization of bibliometric networks. The authors also appreciate the constructive feedback and encouragement received from colleagues during the preparation of this study.

Biographical notes:

Güler SHAIKH[1] *:* She holds a Master's degree from Mardin Artuklu University and is currently pursuing a doctorate at Osmangazi University. She has previously completed a degree in English Language Teaching at Dokuz Eylül University. She is currently employed as the principal at the Provincial Directorate of National Education.

[1] Corresponding Author

Scopus Author Identifier Number: 57222097462

Web of Science Researcher ID: AED-6244-2022

Google Scholar Researcher ID: 6lQ-RlYAAAAJ&hl

Semra KIRANLI GÜNGÖR [2]*:* She holds a Master of Arts in Educational Administration from Eskişehir Osmangazi University's Social Sciences Institute, with a specialisation in supervision and planning. She also holds a Bachelor of Arts in Foreign Language Education from Anadolu University's Faculty of Education. She currently serves as a Professor at Eskişehir Osmangazi University.

Scopus Author Identifier Number: 57204102316

Web of Science Researcher ID: CTN- 763-2018

Google Scholar Researcher ID: ImKVSV0AAAAJ

Appendix 1 : Scopus

KEY ((artificial intelligence) AND PUBYEAR > 2009 AND PUBYEAR < 2027 AND PUBYEAR > 2009 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Education"))

Appendix 2 (Web of Science)

Refine results for artificial intelligence (Keyword Plus ®) AND education (Keyword Plus ®) and 2011 or 2014 Key (artificial intelligence (Title) and education (KeywordPlus®) and 2011 or 2014 or 2017 or 2018 or 2019 or 2025 or 2024 or 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2014 or 2011 (Publication Years) and Open Access and Article (Document Types) and Education Educational Research or Education Scientific Disciplines (Web of Science Categories) and All Open Access (Open Access)017 or 2018 or 2019 or 2025 or 2024 or 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2014 or 2011 (Publication Years) and Open Access and Article (Document Types) and Education Educational Research or Education Scientific Disciplines

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Technology Integration in Art Education: Fine Arts Students' Skills and Perceptions of Ready-Made Images

Omer Tayfur Ozturk[1]

Article Type
Original Research
International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 556-579
http://www.ijonmes.net

Article Info:

Received 30.07.2025
Revision 10.09.2025
Accepted 12.10.2025

Abstract:

The aim of this study is to examine the perceptions of the Faculty of Fine Arts students regarding technology integration skills and the use of ready-made images in a relational manner in terms of some variables. For this purpose, the research was conducted with 314 students studying at the Faculties of Fine Arts of 10 universities. 'Technology Integration Skills Scale' and 'Perception Scale for the Use of Ready-Made Images' were used as data collection tools. According to the research findings, the technology integration skills of the Faculty of Fine Arts students are at a moderate level and their perceptions towards the use of ready-made images are generally high. According to the gender variable, it was found that male students' technology integration skills are higher than female students, however, there is no significant difference in perceptions regarding the use of ready-made images in general. When the grade level variable is examined, it was determined that fourth grade students have higher technology integration skills and perceptions of the use of ready-made images. Finally, technology integration skills were found to significantly predict the use of readily available images. Based on the findings of this study, recommendations are presented for improving technology integration in art education programs and the effective use of readily available images.

Keywords: Fine Arts Education, Technology Integration, Stock Images, Student Attitude.

Citation:
Ozturk, O. T. (2025). Technology Integration in Art Education: Fine Arts Students' Skills and Perceptions of Ready-Made Images. *International Journal of Modern Education Studies, 9*(2), 556- 579. https://doi.org/10.51383/ijonmes.2025.426

[1] Assistant Professor, Necmettin Erbakan University, Faculty of Fine Arts and Architecture, Konya, Turkey. ozt1983@gmail.com, https://orcid.org/0000-0002-5757-1707

INTRODUCTION

Today, technology has become an integral part of educational processes; teaching methods, learning environments, and artistic production styles have undergone a radical transformation. This transformation is reshaping not only teaching processes but also forms of creative expression. The rapid diversification and increased accessibility of digital tools necessitates redefining the concepts of originality, copyright, and creative autonomy, and this demand calls for new regulations in arts education at the policy, assessment, evaluation, and curriculum levels (Boruta & Sokolov, 2024; Huang et al., 2024).

The use of digital tools in artistic production adds new dimensions to students' creative processes; in this context, technology integration is becoming not only a technical competence but also a requirement of contemporary art understanding (Akram et al., 2021; Davies & West, 2013; Pavlou, 2020). In this context, fine arts students' skills in technology integration are important as an indicator of the extent to which they can adapt to today's artistic production practices (Ceran, 2022; Guzek, 2024; Kibici & Sarıkaya, 2021). However, this integration process is not limited to the ability to use digital tools alone. It also encompasses the relationship established with ready-made images created through these tools. Ready-made images are visual materials widely available in the digital environment, often produced by other users, and the use of such materials in the artistic process is directly related to concepts such as originality, creativity, and ethics (Price, 2023; Sakr et al., 2018). The educational implications of the concept of the ready-made image have become even more complex as post-Duchamp aesthetic debates have taken on new forms in the digital age, and this complexity is directly reflected in the production practices of art students (Boruta & Sokolov, 2024). In postmodern and post-digital aesthetics, concepts of originality and creativity are considered alongside strategies of repurposing, montage, and appropriation, and this way of thinking requires pedagogical guidance in educational settings (Koczynska, 2022; Scha, 2001). However, when practices such as ethics, copyright, and process reporting are not systematically structured in the classroom treatment of the ready-made image, students are reported to gravitate towards superficial visual assemblages and neglect conceptual justifications (Ceran, 2022; Sakr et al., 2018). As digital archives, AI-assisted image production models, and online sharing platforms expand access to stock images, it is argued that institutions' policy documents, rubrics, and copyright guidelines need to be updated, and this necessity is strongly advocated in the literature (Boruta & Sokolov, 2024; Huang et al., 2024). In this context, it is recognized that the implementation of stock images in education is not merely a technical matter but also related to the development of students' ethical reasoning, visual literacy, and aesthetic appreciation skills (Pavlou, 2020; Price, 2023).

The position of fine arts students in the digital age is strengthened by the democratization and increased accessibility of digital production tools, while it is also complicated by the blurring of boundaries between ethics, copyright, and originality. This

complexity is frequently noted in the literature (Akram et al., 2021; Pavlou, 2020; Price, 2023). Students are observed to hybridize technology-based learning practices with online collaborative platforms, augmented reality applications, and artificial intelligence-supported production tools, and this observation expands the pedagogical dimensions of technology integration (Akram et al., 2021; Özaltun & Kahraman, 2024). Although technology integration is viewed positively because it provides a foundation that supports learner autonomy and metacognitive skills, it is reported that integration remains stuck at a superficial and instrumental level when teacher beliefs, institutional policies, and infrastructure resources are inadequate (Kim et al., 2013; Keengwe et al., 2008). The interaction between art, education, and digitalization is recognized not only as a matter of technical adaptation but also as a problem of ethical, aesthetic, and epistemological repositioning, and this recognition forms the thematic basis of this research (Tai et al., 2024). The extent to which fine arts students integrate technology into their artistic production processes and their attitudes toward ready-made images are crucial for assessing the quality of contemporary art education. In this context, the purpose of this study is to examine the perceptions of Fine Arts Faculty students regarding technology integration skills and the use of ready-made images in a relational manner, in terms of several variables.

Theoretical Framework

Technology Integration into Art Education and Fine Arts Students' Technology Integration Skills

Technology integration is defined as the pedagogical rationalization of digital tools, platforms, and processes within teaching-learning environments in line with instructional objectives, and it is particularly emphasized that technology is a tool, not an end in itself (Okojie et al., 2006; Davies & West, 2013). Technology integration in education is not viewed as merely the provision of hardware or the use of software; instead, it is considered a holistic process of change that requires the transformation of instructional design, assessment and evaluation approaches, and learner autonomy (Keengwe et al., 2008; Özkan, 2024). The impact of digital transformation on education is not limited to the digitalization of learning materials; it also includes the redefinition of knowledge production methods, interdisciplinary interaction, and creativity processes. In this context, technology integration is positioned as an interactive component of teacher beliefs, institutional culture, technical infrastructure, and continuous professional development opportunities, and is viewed as a complex change management problem (Kim et al., 2013; Mills & Tincher, 2003).

It is accepted that faculty members' level of technology adoption and pedagogical competencies are decisive in the digitalization processes of educational organizations. Therefore, it is argued that integration efforts should focus not only on technical skills but also on pedagogical transformation (Davies & West, 2013). It is observed that reductionist approaches to the instrumentalization of technology, especially in art and design-based fields, lack pedagogical depth, and therefore, integration should be approached with

domain specificity in mind (Kara, 2021; Nguyen & Szymanski, 2013). In this process, it is suggested that digital tools embedded in instructional design should be structured to support learners' metacognitive monitoring and self-regulation skills; otherwise, superficial and display uses of technology become dominant (Okojie et al., 2006). It is reported that when the visions adopted at the policy level in institutions are not directly reflected in classroom practices, integration is confined to the individual efforts of the teacher, leading to sustainability issues (Keengwe et al., 2008). Although the requirements of the digital age necessitate technological literacy, it has been determined that the expected transformation in learning outcomes does not occur when integration is not used for pedagogical purposes (Mills & Tincher, 2003). Therefore, it is emphasized that technology should be integrated in a way that is compatible with course objectives, assessment strategies, and the epistemic nature of the discipline (Davies & West, 2013; Akram et al., 2021; Tai et al., 2024). Similarly, it is stated that technology integration should be considered in conjunction with the principles of justice, inclusiveness, and accessibility, and it is warned that inequalities in opportunity may deepen due to the digital divide (Keengwe et al., 2008).

Considering the prominent integration models in this field, the TPACK model focuses on teachers' capacity to integrate technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) components intersectionally and attempts to explain the dynamic relationships of these intersections (Mishra & Koehler, 2006; Ay et al., 2013). The SAMR model classifies technological integration levels within a hierarchical framework with the steps of redefinition, modification, augmentation, and substitution and explains the degree of transformation that occurs in learning processes at each level (Davies & West, 2013). The TAM, on the other hand, predicts technology acceptance through the variables of perceived usefulness and perceived ease of use and presents a socio-behavioral model that explains individuals' intentions and behaviors (Kim et al., 2013; Jia et al., 2017). These three models enable a multidimensional assessment of technology integration in terms of knowledge components, levels of pedagogical transformation, and individual acceptance processes, thus providing researchers with conceptual and measurement tools (Nguyen & Szymanski, 2013; Huang et al., 2024). However, the view that rapid technological transformations, especially AI-enabled creative tools, challenge traditional model assumptions and require models to be supplemented with updated frameworks has become prominent in recent years (Huang et al., 2024).

The use of technology in fine arts education encompasses a wide range of applications, from digital drawing tablets and 3D modeling software to animation and motion capture technologies and augmented reality applications, and the pedagogical positioning of these tools varies (Akram et al., 2021). These tools are used not only to acquire technical skills but also to develop aesthetic perception, multiple forms of representation, and interdisciplinary thinking skills (Kibici, 2022; Nguyen & Szymanski, 2013). Digital archives and open-source image databases offer students the opportunity to conduct comparative analysis between historical and contemporary productions, but it has been stated that the ethical boundaries

and copyrights of this use should be clearly integrated into the teaching process (Sakr et al., 2018). Furthermore, it has been stated that students' attitudes toward technology are closely related to their concerns about aesthetic perception and creative originality, and therefore, integration strategies should be designed with an approach that takes student subjectivity into account (Ceran, 2022).

The literature indicates that technology integration has positive effects on fine arts students' motivation, engagement, and creative problem-solving skills, but this effect is closely linked to teaching strategies and ethical frameworks (Pavlou, 2020; Akram et al., 2021). It has been stated that augmented reality and artificial intelligence tools have deepened discussions about originality, plagiarism, and ethical boundaries because they facilitate students' access to ready-made images (Özaltun & Kahraman, 2024). Therefore, it has been argued that technology integration should be conducted not only through a tool-focused lens but also within a critical digital literacy and visual ethics perspective (Sakr et al., 2018).

Teachers' beliefs and self-efficacy regarding technology are stated to play a central role in determining the level and quality of classroom practices, and this increases the importance of structuring in-service training based on TPACK (Kim et al., 2013; Rahmat & Au, 2017). Furthermore, it is stated that art education students' use of collaborative platforms in digital production processes increases critical peer feedback and democratizes production. However, it is also emphasized that this complicates copyright and ownership relations (Price, 2023). Fine arts students' attitudes toward technology are explained by variables such as perceived usefulness, ease of use, aesthetic-ethical compatibility, and creative self-efficacy, and it is stated that these variables interact with individual, institutional, and cultural contexts (Akram et al., 2021; Tai et al., 2024). It is suggested that the relationship between students' attitudes and technology integration skills can be weakened or strengthened by intervening variables such as teacher beliefs, institutional support and access opportunities, and therefore holistic, multi-level analytical frameworks are needed (Kim et al., 2013; Keengwe et al., 2008).

Ready-Made Images and the Use of Ready-Made Images in Art Education

The concept of the readymade image, particularly with Duchamp's readymade interventions, is considered a turning point in art history that radically questioned the ontological status of the art object, the processes of aesthetic value formation, and the artist's subjective position. This historical rupture is currently being updated and acquired new meanings in the context of digital aesthetics (Guzek, 2024; Scha, 2001; Sirisena, 2021). In the postmodern era, the transfer of theoretical discussions such as originality, aura, the death of the author, and intertextuality to the visual sphere allows the readymade image to be considered not merely a material choice but rather a refunctionalization of signs in cultural circulation (Prince, 2011; McInneny, 2021). The digital transformation shifts the concept of the readymade image from object to event, from object to process, from material carrier to

data flow, and thus, it is argued, the conceptualization of the "digital readymade" has gained strength (Boruta & Sokolov, 2024).

The proliferation of visual culture on digital platforms has trivialized the copyability, reassembly, and algorithmic reproduction of images, transforming the use of ready-made images from a mere aesthetic choice into a normative reflection of the digital economy and user-generated content (Hernsberger, 2006; Papavasileiou, 2023). In this context, the ready-made image is being reshaped in contemporary production processes through datasets, image banks, AI-generated images, and text-to-visual transformation models, demonstrating that the boundaries between the constructive role of the artist and machine-generated content are becoming increasingly permeable (; Boruta & Sokolov, 2024; Huang et al., 2024). The theoretical foundations of the concept of the ready-made image are not limited to Duchamp's ready-made interventions; they also encompass the aesthetic and political implications of new media automation processes, archival logics, and the circulation of images (Guzek, 2024; Scha, 2001).

The reflection of the ready-made image on art education creates a more complex debate. In the post-digital aesthetic, the uniqueness of the object is sought to be preserved through technologies such as blockchain and NFTs; however, at the same time, practices of copyability and repurposing are rapidly spreading. This creates a complex conceptual climate in art education, complicating teaching processes for students (Boruta & Sokolov, 2024). It is argued that to address the ready-made image pedagogically, students must possess not only technical access but also critical visual literacy and ethical reasoning skills, and it is suggested that these competencies should be considered in conjunction with technology integration (Pavlou, 2020; Kim et al., 2013). Theoretical literature indicates that the aesthetic status of the ready-made image consistently resists attempts to "define" and "draw boundaries" because the concept has historically been constructed upon the violation of these boundaries. This situation makes it difficult to establish normative criteria in educational settings (Guzek, 2024; Prince, 2011). In this context, it is argued that the historical and theoretical foundations of the ready-made image should be reconsidered in light of contemporary digital practices and discussed alongside their ethical and political implications in the context of art education. It is important to address these issues at a pedagogical level in a way that supports students' creative autonomy.

It has been reported that when the use of ready-made images in art education is not linked to a planned pedagogical strategy, students tend to resort to superficial collage practices and their original problem-posing skills are weakened, and this risk is closely related to the quality of the instructional design (Akram et al., 2021; Price, 2023). It has been reported that when the integration of ready-made images into courses is supported by critical discussion sessions, visual ethics workshops, and copyright awareness seminars, students are more able to discuss the relationships between originality, plagiarism, and aesthetic value, a result increasingly emphasized in the literature (Boruta & Sokolov, 2024;

Huang et al., 2024). It is emphasized that teachers need to have strengthened pedagogical skills in critical theory, visual culture studies, and digital ethics to ensure that students use ready-made images problematize rather than instrumentalize them. In addition, in evaluating the use of ready-made images, product-oriented criteria alone are not sufficient, and the need for rubrics that measure process-oriented, reflective and text-visual relationship-building skills is highlighted, and this requirement is systematically repeated in the literature (Boruta & Sokolov, 2024; Özaltun & Kahraman, 2024).

It is noted that the literature contains an extremely limited number of studies that jointly model fine arts students' technology integration skills and their attitudes toward ready-made images, and this limitation highlights the need for a holistic conceptual framework in the field (Pavlou, 2020; Akram et al., 2021; Boruta & Sokolov, 2024; Tai et al., 2024). A significant portion of existing research explains technology integration through faculty beliefs, institutional barriers, or infrastructure opportunities; however, it fails to adequately develop an analytical approach that articulates these explanations with ethical, aesthetic, and copyright sensitivities toward ready-made images, creating a serious gap at the empirical level (Kim et al., 2013; Keengwe et al., 2008; Davies & West, 2013; Nguyen & Szymanski, 2013). However, at a time when artificial intelligence-supported production and augmented reality are rapidly penetrating art education curricula, the conceptual evolution of ready-made images along with the digital transformation has not yet been systematically reflected in scales, rubrics, and institutional policies, representing a current gap (Boruta & Sokolov, 2024; Huang et al., 2024). While it is assumed that variables such as gender, field of study, years of experience, and cultural context may play a mediating or moderating role in the relationships between attitudes and skills, multivariate models that test these effects simultaneously are limited (Rahmat & Au, 2017; Tai et al., 2024). Furthermore, it has been noted that a significant portion of studies on technology integration in art education are teacher-centered, while student attitudes and skills are often considered secondary variables. This situation increases the importance of student-centered, field-specific, and holistic designs (Akram et al., 2021; Pavlou, 2020). In this context, the current study aims to develop and test a domain-specific theoretical framework that explains attitudes towards ready-made images together with technology integration skills (Davies & West, 2013; Ceran, 2022).

Hypotheses of the study/ Sub-problems

H1: Participating students' technology integration skills significantly predict their perceptions of ready-made image use.

The purpose of this study is to examine the perceptions of Fine Arts Faculty students regarding technology integration skills and the use of ready-made images in a relational manner, based on several variables. The study will address the following sub-problems and test hypotheses:

Among students of the Faculty of Fine Arts:

- What are their perceptions of technology integration skills and the use of readily available imagery?
- Do their perceptions of technology integration skills and the use of readily available imagery differ by gender?
- Do their perceptions of technology integration skills and the use of readily available imagery differ by grade level?

METHOD

The "Method" section of a research paper or study is a crucial part that details how the research was conducted. Its purpose is to provide enough information so that other researchers could replicate the study if they wished. Line spacing should be 1.15.

Research Model

The study utilized the comparative relational screening model, a quantitative research method, and employed a survey method as a measurement tool. In the comparative relational screening method, determining whether a comparative change has occurred between two or more independent and dependent variables is of primary importance. Defined as a research model that investigates who benefits from the change in the event of a change, the comparative relational screening method focuses on the co-movement of variables (Piwowarski, 2001). Based on this method, this study will examine the relationship between technology integration skills and perceptions of ready-made image use among students studying at Fine Arts Faculties in Turkish universities. In this context, it also aims to reveal the results of the relationship between demographic variables such as gender and class.

Research Group

The research population consisted of students studying in fine arts faculties at Turkish universities. For this purpose, survey instruments were administered to students studying in fine arts faculties at 10 universities using a convenience sampling method. Participants are students of the Faculty of Fine Arts studying at state universities in Konya, Ankara, Istanbul and Eskişehir. Queirós, Faria, & Almeida (2017) defined convenience sampling as a method whose primary objective is to prevent waste of time, resources, money, materials, and labor. For this purpose, the study was conducted with 314 participants. Demographic information about the participants is presented in Table 1.

Table 1.

Distribution of Participants by Gender and Grade Level

Variable	**Category**	**n**	**%**
Gender	Female	209	66,8
	Male	104	33,2
Grade Level	1st Grade	79	25,2
	2nd Grade	82	26,2
	3rd Grade	85	27,2
	4th Grade	68	21,4
Total		**313**	**100**

Table 1 presents the distribution of participants by gender and grade level. Accordingly, of the 313 students who participated in the study, 66.8% were female (n=209) and 33.2% were male (n=104). When the distribution by grade level was examined, 25.2% of the participants were first-year (n=79), 26.2% were second-year (n=82), 27.2% were third-year (n=85), and 21.4% were fourth-year (n=68).

Data Collection Tools

In the study, 'Technology Integration Skills Scale' and 'Attitude Towards the Use of Ready-Made Image Scale' were used as data collection tools.

Technology Integration Strategies and Skills Scale

In order to determine the technology integration skills of Faculty of Fine Arts students, the "Technology Integration Strategies Scale" developed by Tıkman & Kaya (2022) was used. The scale, prepared as a five-point Likert-type scale, has a one-dimensional structure and consists of 22 items in total. The construct validity of the technology integration skills scale was tested using Confirmatory Factor Analysis (CFI). Based on the findings of the CFA, model fit indices such as $\chi 2$ and degrees of freedom (1.5), RMSEA (.04), GFI (.90), NNFI (.97), CFI (.97), and SRMR (.02) were at good to very good levels, based on the literature (Tıkman & Kaya, 2022). The minimum score possible from the scale is 22 and the maximum score is 110. In the analysis of the validity and reliability of the technology integration strategies scale by Tıkman and Kaya (2022), Cronbach's Alpha was calculated as 0.98, Guttman split-half test correlation as 0.97, and Spearman-Brown split-half test correlation as 0.97. The Cronbach's Alpha coefficient was found to be 0.91 on the sample of this study.

Perception Scale for the Use of Ready-Made Images

A measurement tool developed by Ceran (2022) was used to measure the perceptions of Faculty of Fine Arts students regarding the use of ready-made images. The measurement tool will be used for perceptions of ready-made image use. It has a 5-point Likert-type structure and consists of 23 questions in total. Exploratory factor analysis was applied to test the construct validity of the Attitude Towards the Use of Ready-Made Images Scale. The KMO value was calculated as 0.91. According to this value, the sample size was sufficient for factor analysis. The Barlett test results showed that the data were suitable for factorization (Barlett Sphericity $\chi 2 = 5044.52$; $p<0.001$). Varimax factor analysis revealed that the scale had a two-factor structure. Exploratory factor analysis showed that the factor loadings of the items in the scale ranged from 0.42 to 0.79. The two-factor structure explained 46% of the total variance. As a result of exploratory and confirmatory factor analyses, it was found that the scale has a three-factor structure. These factors are named as "Timing of Ready-made Imagery Use Subscale," "Function of Ready-made Imagery Use Subscale," and "Gender-Specific Use Subscale," respectively. The reliability coefficient of the scale was calculated as 0.73. The reliability coefficient of the scale and its subscales on the sample of this study ranged from 0.72 to 0. 81..

Data Collection and Data Analysis Techniques

Research data was collected online in May and June 2025. Participants were encouraged to participate voluntarily during the data collection process. The purpose of the study was first stated, and information was provided regarding the absence of any risks, the possibility of participants withdrawing from the study at any time, and data security. Participants were undergraduate students studying at fine arts faculties at various universities in Türkiye. To reach these students, digital forms were shared through social media platforms and student communities, and responses were collected through secure survey platforms.

The data obtained were evaluated using statistical methods using the SPSS program during the analysis phase of the study. In the first part of the study, the technology integration skills and ready-made image use of the Faculty of Fine Arts students were analyzed descriptively. In the second stage of the study, which was based on the comparative screening design, the normal distribution assumptions of the scales were first tested. As a result of the Kolmogorov-Smirnov test analyses performed for this purpose, it was observed that the normal distribution assumptions were met for the scores obtained from the students' scales. In this context, the Unrelated Samples t-test was used to compare the technology integration skills and ready-made image use scale scores according to the participants' gender. The F-test was used to compare the scores obtained from the two scales according to the educational status variable. Finally, the Multiple Regression Analysis Technique was used to test the effects of the technology integration skills of the Faculty of Fine Arts students on their use of ready-made imagery.

Ethical considerations

Before starting the research, ethical principles were applied to the Necmettin Erbakan University Social and Human Sciences Research and Publication Ethics Committee, and an ethics committee approval certificate numbered (Date: 23.06.2025, No: #25865) was obtained.

FINDINGS

The findings regarding the first research question, namely the perception levels of the fine arts faculty students regarding technology integration skills and the use of ready-made images, are presented in Table 2.

Table 2.

Descriptive Findings on the Perception Levels of Technology Integration Skills and Ready-Made Image Use of Fine Arts Faculty Students

Data Collection Tool	N	Minimum	Maximum	$\bar{X}$	Ss
Technology Integration	314	1,41	5,00	3,37	0,53
Timing of Ready-Made Image Use	314	1,00	5,00	4,02	0,80
Function of Ready-Made Image Use	314	1,33	5,00	3,70	0,72
Gender-Specific Use	313	1,00	5,00	3,12	0,64
Attitudes Towards Ready-Made Image Use (Total)	313	2,00	5,00	3,61	0,54

The table shows the means and standard deviations of the data obtained from the participants' technology integration skills scale and the perception and use of ready-made images scale scores. According to the analysis, the participants' mean score on the technology integration skills scale was 3.37±0.53; the mean score on the timing of use of ready-made images subscale of the second scale was 4.02±0.80; the mean score on the function of use of ready-made images subscale was 3.70±0.72, the mean score on the gender-specific use subscale was 3.12±0.64, and the total mean score was 3.61±0.54. These findings indicate that the participants' technology integration skills were at a moderate level, and their perceptions of ready-made images on the timing of use of ready-made images and the function of use subscales were high, whereas their perception of gender-specific use was at a moderate level. In general, students of the faculty of fine arts have a high level of ready-made image use.

Table 3.

Examining the Technology Integration Skills of Fine Arts Faculty Students According to the Gender Variable

Variable	Gender	N	$\bar{X}$	Ss	t	P
Technology Integration	Female	209	3,32	0,45	-2,20	0,03*
	Erkek	104	3,46	0,64		

*p<0,05.

Table 3 shows the t-test analysis conducted between male and female students' technology integration skills. The analysis revealed a significant gender-related difference in the technology integration skills scale mean scores (p<0.05). Based on the group means, male students' technology integration skills were found to be higher than female students.

Table 4.

Examining the Perceptions of Fine Arts Faculty Students on the Use of Ready-Made Images According to Gender

Variable	Gender	N	$\bar{X}$	Ss	t	P
Timing of Ready-Made Image Use	Female	209	3,99	0,80	-0,99	0,32
	Male	104	4,08	0,79		
Function of Ready-Made Image Use	Female	209	3,68	0,71	-0,45	0,66
	Male	104	3,72	0,74		
Gender-Specific Use	Female	208	3,01	0,59	-1,96	0,04*
	Male	104	3,25	0,72		
Attitudes Towards Ready-Made Image Use (Total)	Female	208	3,58	0,52	-1,40	0,16
	Male	104	3,67	0,58		

*p<0,05.

An examination of Table 4 reveals that there are no significant gender-related differences in the "Timing of Use of Ready-Made Imagery" subscale, "Function of Use of Ready-Made Imagery" subscale, and total mean scores on the "Perception of Ready-Made Imagery" scale (p>0.05). However, there is a significant difference between the perceptions of male and female participants on the "Gender-Specific Use" subscale. According to the

group means, male participants use and perceive ready-made imagery at a higher rate than their female counterparts.

Table 5.

Examining the Technology Integration Skills of Fine Arts Faculty Students According to the Class Variable

Variable	Grade	N	$\bar{X}$	Ss	F	p
Technology Integration	1st Grade	79	3,27	0,46	8,788	0,00**
	2nd Grade	82	3,26	0,51		
	3rd Grade	85	3,34	0,45		
	4th Grade	68	3,64	0,61		

**p<0,01.

Table 5 shows the F-test analysis conducted between the technology integration skills of students at different grade levels. The analysis revealed a significant difference in the technology integration skills scale mean scores based on grade level ($p<0.05$). Further analysis using the Scheffe test found that fourth-grade students had higher technology integration skills than students in lower grades.

Table 6.

Examining the Perceptions of Fine Arts Faculty Students on the Use of Ready-Made Images According to the Class Variable

Variable	Grade	N	$\bar{X}$	Ss	F	p
Timing of Ready-Made Image Use	1st grade	79	3,92	0,85	3,867	0,010*
	2nd grade	82	3,92	0,77		
	3rd grade	85	3,99	0,75		
	4th grade	68	4,30	0,78		
Function of Ready-Made Image Use	1st grade	79	3,58	0,62	2,670	0,048*
	2nd grade	82	3,60	0,73		
	3rd grade	85	3,77	0,75		
	4th grade	68	3,86	0,75		
	1st grade	79	3,15	0,52	3,138	0,026*

Gender-Specific Use	2nd grade	81	2,94	0,57		
	3rd grade	85	3,16	0,70		
	4th grade	68	3,24	0,73		
Attitudes Towards Ready-Made Image Use (Total)	1st grade	79	3,55	0,50	4,725	0,003*
	2nd grade	81	3,49	0,49		
	3rd grade	85	3,64	0,59		
	4th grade	68	3,80	0,56		

*p<0,05.

An examination of Table 6 revealed a significant difference in the total and subscale scores of the scale for perceptions of the use of ready-made images based on grade level (p<0.05). Analysis using the Scheffe test revealed that fourth- and third-year students had higher and more positive perceptions of the use of ready-made images compared to first- and second-year participants. In general, it was observed that as grade level increased, Fine Arts Faculty students' use of ready-made images also increased.

Table 7.

Regression Analysis Findings on technology integration skills and the use of ready-made images

Variables	**B**	**Std. Deviation**	**Beta**	**T**	**p**	**R^2**	**F**	**p**
(Constant)	2,488	,189		13,189	0,00**	0,102	36,39	p<0,01
Technology Integration Skills	,334	,055	,324	6,032	0,00**			

Dependent Variable: Ready-Made Image Use, R= 0,32

Table 7 presents the results of the regression analysis conducted to reveal the impact of technology integration skills on the use of ready-made images among students at the Faculty of Fine Arts. According to the findings in the table, the linear regression model between the variables of technology integration skills and ready-made image use was found to be significant (F=36.39; p<0.05). Technology integration skills significantly explained approximately 10.2% of the variation in participants' use of ready-made images. It can be concluded that students at the Faculty of Fine Arts with high levels of technology integration skills also had high levels of ready-made image use.

DISCUSSION AND COMMENTARY

This study examined the perceptions of Fine Arts Faculty students regarding technology integration skills and the use of ready-made images in a relational manner across several variables. The descriptive findings of the study reveal that the students' technology integration skills are generally moderate, with relatively high tendencies in the timing and function dimensions of ready-made images. This suggests that students have the capacity to use technical tools, but the pedagogical depth of integration remains open to development. The general positive attitude towards ready-made images appears to be consistent with the current learning ecosystem, where contact with visual culture and access to digital resources are widespread. The findings indicate that the tendency towards the use of ready-made images is well-founded and that students are open to referencing, recontextualizing, and transforming processes in their production. This also indicates that technology integration resonates at an instrumental level but can become superficial when not supported by pedagogical guidance and ethical frameworks (Okojie et al., 2006; Davies & West, 2013; Ay et al., 2015). Therefore, the findings highlight the importance of integrating components such as critical visual literacy and process reporting (Price, 2023).

Research findings are consistent with studies showing that technology integration is shaped by intention, belief, and contextual opportunities (Keengwe et al., 2008; Kim et al., 2013). However, it should be noted that if the creative and ethical dimensions of arts education are not considered, moderate integration may have limited contribution to learning outcomes. Positive attitudes towards ready-made images can be linked to the broad repertoire offered by digital archives and platforms, and this relationship reinforces the need for pedagogical guidance (Sakr et al., 2018). These findings suggest that digital tools serve as catalysts in arts education, but can remain superficial when not supported by design and evaluation principles. They reveal that students are open to the possibilities of the digital era but need these opportunities to be integrated with ethical and aesthetic principles. This need provides a framework consistent with the opportunity-risk dichotomy outlined in the existing literature (Keengwe et al., 2008; Davies & West, 2013).

Technology Integration Skills and Visuals Usage Status by Gender

The findings indicate that technology integration skills differ by gender, with male students demonstrating a relatively higher level of these skills. Conversely, no significant gender-related differences were observed in the timing and functionality dimensions of ready-made imagery, but male students exhibited a higher tendency toward gender-specific usage. This finding is partially consistent with studies indicating that self-efficacy and usage habits for technology can intersect with gender (Rahmat & Au, 2017). Furthermore, despite the absence of differences in certain sub-dimensions of ready-made imagery, the observed gender-specific differences in perceptions of use suggest that the ways in which visual culture is established can be shaped by social learning. This finding suggests that pedagogical interventions require not only technical skills but also content that fosters

discussion of cultural practices and forms of representation. Gender differences in technology integration can be explained by the contributions of components such as access, experience, and self-efficacy, necessitating inclusive designs for these in-service training programs (Kim et al., 2013). However, the difference in gender-specific usage dimension indicates the need for a more intensive pedagogical examination on the axes of representation and identity.

The literature emphasizes that technology integration is strongly linked to context and beliefs, and this study concretizes this relationship within the framework of gender (Keengwe et al., 2008; Davies & West, 2013). The findings indicate that a gender perspective should be systematically integrated into technology integration and the content of ready-made image pedagogy. Thus, areas where gender differences are evident can be supported through targeted interventions, and equitable learning opportunities can be strengthened. In general, it can be seen that the principles of inclusivity and accessibility should be integral parts of technology integration strategies (Keengwe et al., 2008).

Technology Integration Skills and Visuals Usage Status by Grade Level

Research findings indicate that technology integration skills differ significantly by grade level, with higher levels of these skills in higher grades. Furthermore, a positive increase was observed in all sub-dimensions and the overall tendency toward ready-made imagery as the grade level progressed. This result points to a development consistent with the cumulative nature of technology experience and the internalization of pedagogical guidance over time. This increase in upper grades is a result of the fact that critical visual literacy and ethical reasoning can be strengthened through pedagogical processes. The literature suggests that technology integration deepens through planned guidance and modeling, and current findings support this notion (Nguyen & Szymanski, 2013; Pavlou, 2020). Increasing trends toward ready-made imagery with grade level indicate that students increasingly internalize conceptual frameworks and established ethical principles. The findings confirm that technopedagogical deepening is a time-consuming experience and that targeted outcomes are strengthened through continuous learning designs. The results indicate that the workshop-studio intensity and critical feedback culture offered by upper grades contribute to the quality of integration. Thus, as grades progress, the relationship between technology and ready-made imagery becomes more refined and aligned with field-specific ethical aesthetic principles. This is consistent with the emphasis on pedagogical maturation and structured experience in the literature (Mills & Tincher, 2003; Pavlou, 2020).

The Relationship Between Technology Integration Skills and the Use of Stock Images

Research findings indicate that technology integration skills significantly predict the use of pre-made imagery, and a significant linear relationship exists between the two variables. This result suggests that increases in integration skills can support the intensity and maturity of pre-made imagery practices. This predictive relationship indicates that

creative processes are enriched when pedagogical design is aligned with technology. This pattern is consistent with theories emphasizing that technology acceptance and pedagogical beliefs shape practice (Kim et al., 2013; Özaltun & Kahraman, 2024). Furthermore, the transformational stages defined in the TPACK and SAMR frameworks suggest that pre-made imagery can produce more sustainable outcomes when considered in conjunction with ethical aesthetic frameworks (Davies & West, 2013; Ceran, 2022). Findings indicate that the internalization of pre-made imagery depends not only on resource abundance but also on pedagogical competence that aligns technology with goals. This predictive finding further reinforces the strategic importance of in-service training and guidance.

The results indicate that progress in technology integration leads to greater awareness of the use of pre-made images. This relationship suggests that pedagogical deepening is possible when critical engagement with visual culture is mediated through technological tools. Thus, integration skills and pre-made image practices create a mutually reinforcing learning process (Keengwe et al., 2008; Nguyen & Szymanski, 2013). Overall, the predictive relationship suggests that pedagogical interventions that enhance integration skills are directly reflected in the quality of pre-made image use. This finding suggests that programs investing in technology integration may also improve ethical and aesthetic outcomes. This relationship suggests that model-based and domain-specific integration can strengthen students' creative autonomy and refine their visual ethical sensibilities.

Implications of the Findings

The findings reveal that technology integration in the context of art education is not merely a technical achievement but also a pedagogical transformation that must be supported by ethical and aesthetic principles. This study demonstrates that technology integration can produce creative learning outcomes when strengthened by teacher beliefs, institutional policies, and process-oriented assessment. It demonstrates that positive tendencies toward ready-made imagery can evolve into more ethical, conceptual, and critical practices with increased integration skills, and embodies this in a field-specific context (Pavlou, 2020; Price, 2023). The results suggest that models such as TPACK and SAMR should not be considered merely as functional maps in the context of art education, but rather as a holistic approach with process design, feedback, and visual ethics modules. Pedagogically, the structuring of sequential studio experiences and project-based learning with technology creates a production culture that problematizes and documents ready-made imagery. Institutionally, integration, supported by infrastructure investments, open-licensed source policies, and copyright guidelines, reinforces the principles of inclusivity and accessibility. At the policy level, transparent guidelines regarding the production of ready-made images and AI and the institutionalization of an open attribution culture are important.

The findings make an original contribution to the literature, demonstrating that attitudes toward technology integration and ready-made images can be explained within

the same model. They reveal that indicators of integration and ready-made images mature simultaneously as grade levels progress, and that this maturation is associated with sequential studio experiences. This expansion suggests that the positive patterns observed in upper grades can be carried forward into earlier stages of curriculum design. The findings establish a new bridge by connecting the literature on technology acceptance and pedagogical beliefs to the ethical and aesthetic requirements of art education (Kim et al., 2013). This bridge supports approaches that emphasize the need to address ready-made images with a principled and process-oriented pedagogy rather than prohibitive policies (Guzek, 2024). Furthermore, the results suggest that implementing process-oriented assessment tools in conjunction with academic integrity and copyright awareness can enhance the quality of integration (Price, 2023). This framework calls for the embedding of open-source archives and a culture of ethical citation in studio practices. In practice, the creative potential of the ready-made image can be strengthened through mechanisms such as in-class critique sessions, peer feedback, and documentation standards.

Limitations

This research is limited in terms of generalizability because it relies on a sample of students selected from multiple universities using a convenience sample. The reliance of self-reported data collection tools raises the possibility of social desirability effects on attitudes and skill perceptions. The cross-sectional design of the study cannot directly reveal the causal dynamics of the relationships between variables over time. Conducting predictive modeling at a single point in time, as well as descriptive and comparative analyses, may limit the internal validity of developmental patterns. Because contextual variables such as institutional policy, infrastructure, and faculty beliefs were not directly measured, the interpretations address their effects indirectly. The limited consideration of demographic or academic variables other than gender and grade level limits the visibility of different moderator or mediator effects. The failure to triangulate ethical copyright sensitivities regarding stock imagery with performative indicators may lead to an overreliance on self-reporting in interpretations.

CONCLUSION AND RECOMONDATIONS

This study establishes a conceptual bridge between approaches in the art education literature by considering technology integration skills and ready-made image attitudes within the same model. The findings demonstrate that integration skills are significantly related to the use of ready-made imagery, and this relationship is strengthened by the ethical-aesthetic dimensions of pedagogical design. The study demonstrates that indicators of integration and ready-made imagery mature as grade levels progress, emphasizing the need for a sequential and process-oriented curriculum structure. Furthermore, gender-related patterns highlight the importance of inclusive pedagogical interventions and suggest integrating discussions of the ethics of representation into art education. These contributions demonstrate that technology integration in the context of art education is not

solely limited to technical competence but rather should be considered holistically, encompassing process design, visual ethics, and institutional policy. The study fills a research gap in the literature by providing a measurable and pedagogical basis for modeling integration and ready-made imagery together. It proposes a framework that simultaneously activates the ethical, aesthetic, and pedagogical components of digital transformation in art education, and through this framework, it highlights the transformative impact of integration on creativity and critical thinking. When this impact is sustained through institutional policies, teacher professional development, and process-oriented assessment tools, students' capacity to both use technology consciously and engage with the ready-made image at an ethical conceptual level is significantly strengthened. Thus, the research embodies the adaptability of arts education to the digital ecosystem, and its potential to transform it, both theoretically and practically, and offers a lasting contribution to the field.

Future research could explore the dynamic relationship between technology integration and ready-made imagery through longitudinal and mixed-method designs. Embedding TPACK and SAMR adaptations into studio practices through micro-modules from early grades could accelerate the maturational patterns seen in upper grades. Teacher professional development requires support with workshops that address technology acceptance and visual ethics together. For research, adopting data strategies that triangulate ready-made imagery practices through performance tasks, studio observations, and document analysis is crucial. Pedagogical framing of AI-supported productions with principles such as dataset transparency, source traceability, and production logging could be explored. Qualitative research based on inclusive content designs and representation-focused critical sessions could be conducted to investigate differences observed in gender-specific use. At the institutional policy level, systematic integration of openly licensed visual resources and ethical use training into courses is recommended. Incorporating qualitative dimensions that make student subjectivity and cultural context visible in design will contribute to flexible and context-sensitive policy implementation. Early ethical awareness training can be more robustly grounded in later technology-integrated arts practices. Support mechanisms aimed at reducing technology access and equipment disparities are crucial for fostering equitable participation. Finally, program evaluation mechanisms can be a crucial step toward ensuring the effectiveness of technology use in arts education by regularly monitoring the quality of integration and providing improvement cycles.

REFERENCES

Akram, N., Batool, S. H., Hussain, T., Safdar, M., & Hussain, S. (2021). Evolving visual arts' faculty pedagogical skills through technology integration in higher education. *Library Philosophy and Practice*, (e-journal). 4913. https://digitalcommons.unl.edu/libphilprac/4913

Ay, Y., Karadağ, E., & Acat, M. B. (2015). The Technological Pedagogical Content Knowledge-practical (TPACK-Practical) model: Examination of its validity in the Turkish culture via

structural equation modeling. *Computers & Education*, *88*, 97-108. https://doi.org/10.1016/j.compedu.2015.04.017

Boruta, E. V., & Sokolov, B. G. (2024). From object to event: digital transformation of art and the concept of 'digital readymade. *Studia Culturae*, (59), 144–154. http://dx.doi.org/10.31312/2310-1245-2024-59-144-154

Ceran, S. (2022). *Grafik tasarım eğitimi alan lisans öğrencilerinin hazır imge Kullanımına yönelik tutumları [Attitudes of undergraduate graphic design students towards the use of ready-made images]*. Doctoral Dissertation. Necmettin Erbakan University, Institute of Educational Sciences. https://tez.yok.gov.tr/UlusalTezMerkezi/giris.jsp

Davies, R. S., & West, R. E. (2013). Technology integration in schools. In *Handbook of research on educational communications and technology* (pp. 841–853). Springer.

Deveci, M., & Bulut, E. (2015). Öğrencilerin Grafik Tasarımda İmge ve Simgeleri Kullanma Becerilerinin Geliştirilmesine Yönelik Bir Eylem Araştırması [An Action Research to Improve Image and Symbols Usage Skills of Students in Graphic Design]. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *19*(3), 185-216. https://dergipark.org.tr/en/download/article-file/712088

Guzek, Ł. (2024). Readymade: a problem for the definition of art. and its solution. *Art Inquiry*, *26*, 61–82. https://doi.org/10.26485/AI/2024/26/4

Hernsberger, E. (2006). *Photography as readymade art*. (Doctoral dissertation), Graduate Faculty of Texas Tech University. http://hdl.handle.net/2346/22364

Huang, S., Zhang, H., Zhong, L., Chen, H., Gao, Y., Hu, Y., & Qin, Z. (2024). From image to video, what do we need in multimodal llms? *arXiv Preprint arXiv:2404.11865*. https://arxiv.org/pdf/2404.11865?

Izmirli, O., & Baird, B. (2002). A model for integrating arts and technology in a liberal arts college. *Journal of Computing Sciences in Colleges*, *17*(6), 102–109. https://dl.acm.org/doi/10.5555/1088791.1088834

Jia, Q., Keheng, Z., & Haiyang, Y. (2017). Art design education in the new era featured with the integration of arts and motion sensing technology. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(8), 5883–5891. https://doi.org/10.12973/eurasia.2017.01037a

Kara, S. (2021). An Investigation of Technological Pedagogical and Content Knowledge (TPACK) Competencies of Pre-Service Visual Arts *Teachers. International Journal of Technology in Education*, *4*(3), 527-541. https://doi.org/10.46328/ijte.184

Kara, S. (2024). The Effect of Online and Face-To-Face Teaching Method on Course Outcomes and Attitudes in Secondary School 1st Grade Visual Arts Course. *Kastamonu Education Journal*, *32*(3), 464-473. https//doi.org/10.24106/kefdergi.1525362

Kibici, V. B. (2022). An Investigation into Music Teachers' Perceptions of Technological Competencies. *International Journal of Technology in Education and Science, 6*(1), 111-123. https://doi.org/10.46328/ijtes.344

Keengwe, J., Onchwari, G., & Wachira, P. (2008). Computer technology integration and student learning: Barriers and promise. *Journal of Science Education and Technology*, *17*(6), 560–565. https://doi.org/10.1007/s10956-008-9123-5

Kibici, V. B. & Sarıkaya, M. (2021). Readiness levels of music teachers for online learning during the COVID 19 pandemic. International Journal of Technology in Education (IJTE), 4(3), 501-515. https://doi.org/10.46328/ijte.192

Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education*, *29*, 76–85. https://doi.org/10.1016/j.tate.2012.08.005

Koczynska, K. (2022). From Print to Digital: Reappropriation of the Ready-Made Image in the Works of Margit Sielska and Weronika Gęsicka. *Open Library of Humanities*, *8*(1). https://doi.org/10.16995/olh.6390

Lawn, R. J. (1998). Integrating the arts and technology. *Educational Technology*, *38*(6), 56–59. http://www.jstor.org/stable/44428500.

McInneny, A. (2021). Readymade-image-sentence: protest aesthetics in a time of democracy post-1989. *Design/Arts/Culture*, *2*. https://doi.org/10.12681/dac.27489

Mills, S. C., & Tincher, R. C. (2003). Be the technology: A developmental model for evaluating technology integration. *Journal of Research on Technology in Education*, *35*(3), 382–401. https://doi.org/10.1080/15391523.2003.10782392

Mirzahamdamovna, B. K. (2025). Modern technologıes ın vısual arts: ıntegratıon, ımpact, and prospects. *Web of Scientists and Scholars: Journal of Multidisciplinary Research*, *3*(5), 127–129. https://webofjournals.com/index.php/12/article/view/4195/4151

Nairn, A., & Matthews, J. (2023). Exploring the integration of art and technology. *Journal of Pervasive Media*, Vol. 8, pp. 3–10. https://doi.org/10.1386/jpm_00001_2

Nguyen, V., & Szymanski, M. (2013). A state of the art cart: Visual arts and technology integration in teacher education. *Research Perspectives and Best Practices in Educational Technology Integration*, 80–104.

Okojie, M. C., Olinzock, A. A., & Okojie-Boulder, T. C. (2006). The pedagogy of technology integration. *Journal of Technology Studies*, *32*(2), 66–71. https://files.eric.ed.gov/fulltext/EJ847571.pdf

Ostler, E. (1996). *Art and Technology Integration Project: Year 1 Status Report*. https://files.eric.ed.gov/fulltext/ED398906.pdf

Özaltun, G., & Kahraman, M. E. (2024). The Effect of Using Augmented Reality (AR) Technology on Student Attitudes in Basic Design Education. *Electronic Turkish Studies*, *19*(4), 1741-1766. https://dx.doi.org/10.7827/TurkishStudies.78006

Özkan, Z. C. (2024). Examining the Relationships between Media Literacy, Technology Integration Skills, and STEM Applications Self-Efficacy Perception via a Structural Equation Model: A Study of Visual Arts Teacher Candidates. *International Journal of Modern Education Studies, 8(1), 72-90*. https://doi.org/10.51383/ijonmes.2024.364

Papavasileiou, I. G. (2023). The Post Readymade Photographed Object. *The International Journal of the Image*, *11*(2), 33. https://cgscholar.com/bookstore/works/the-post-readymade-photographed-object

Pavlou, V. (2020). Art technology integration: digital storytellying as a transformative pedagogy in primary education. *International Journal of Art & Design Education*, *39*(1), 195–210. https://doi.org/10.1111/jade.12254

Piwowarski, W. (2001). Relational model-survey results as related to quantitative description of random process. *Gospodarka Surowcami Mineralnymi-Mineral Resources Management*,*17*(1), 75-90.

Price, D.-C. (2023). Visual arts and technology integration: A phenomenological study of Black visual artists choosing to eradicate racism and education inequity (Publication No. 30420738) [Doctoral dissertation, The Chicago School of Professional Psychology]. ProQuest Dissertations and Theses Global.

Prince, M. (2011). The Made v The Readymade. *Art Monthly*, London Iss. 351-5.

Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European Journal of Education Studies, 3*(9), 1-12. http://dx.doi.org/10.5281/zenodo.887089

Rahmat, M. K., & Au, W. K. (2017). Integrating Technology into Art Classrooms: Does the Malaysia Visual Art Education Teachers Ready. *International Journal of Education*, *2*(5), 310–317.

Richard, G. S., Joseph, A., Elikem, K., & Edem, B. K. (2023). Technology integration in technical and vocational education and training (TVET): The role of the art teacher. *Journal of Technical Education and Training*, *15*(4), 73–88. https://doi.org/10.30880/jtet.2023.15.04.007

Sakr, M., Connelly, V., & Wild, M. (2018). Imitative or Iconoclastic? How Young Children use Ready-Made Images in Digital Art. *International Journal of Art & Design Education*, *37*(1), 41–52. https://doi.org/10.1111/jade.12104

Scha, R. (2001). Readymades, artificial art, new media. *Exploding Aesthetics*, *16*, 40–47. https://hdl.handle.net/11245/1.193795

Sirisena, H. (2021). Readymade. *The Georgia Review*, *75*(4), 862–875. https://www.jstor.org/stable/27122324.

Tai, G., Nasir, M., & Binti, N. (2024). A Study on Technology Integration Practices in Arts Instructors: Exploring the Mediating role of Value and Ability Beliefs. *South Asian Journal of Social Sciences & Humanities*, *5*(5), https://dx.doi.org/10.48165/sajssh.2024.5504.

Tıkman, F. & Kaya, E. (2022). Teknoloji Entegrasyon Stratejileri Ölçeğinin Türkçeye Uyarlanması [Adaptation of the Technology Integration Strategies Scale to Turkish]. *International Social Sciences Studies Journal*, *8*(94), 432-438. https://doi.org/10.26449/sssj.3803

Data Availability Declaration

Data Availability Upon Formal Request:

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity

Author Contributions

The sole author of this research, Omer Tayfur Ozturk, was responsible for the conceptualization, methodology formulation, data collection, analysis, and interpretation. Furthermore, Omer Tayfur Ozturk took charge of drafting the initial manuscript, revising it critically for vital intellectual content, and finalizing it for publication. The author has read and approved the final manuscript and takes full accountability for the accuracy and integrity of the work presented.

Author(s)' statements on ethics and conflict of interest

Ethics statement: This study was conducted in accordance with the ethical principles established by Necmettin Erbakan University. Approval for the research was obtained from the Necmettin Erbakan University Social and Human Sciences Research and Publication Ethics Committee (Date: 23.06.2025, No: #25865). All participants were informed about the aim of the research, the voluntary nature of participation, and the confidentiality of their responses prior to data collection. Consent was obtained electronically, and participants were assured that their data would be used solely for academic purposes.

Statement of interest: The author declares that there is no conflict of interest regarding the publication of this paper. The study was conducted independently and without any influence that could compromise the objectivity or integrity of the research findings

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The study was supported solely by the author's institutional resources.

*Acknowledgements:*The author expresses sincere gratitude to the students of the participating Fine Arts Faculties for their voluntary involvement and thoughtful contributions. Appreciation is also extended to the Necmettin Erbakan University Faculty of Fine Arts administration for their institutional support during the data collection process.

Biographical notes:

Omer Tayfur Ozturk: Ömer Tayfur Öztürk is currently working as an Assistant Professor at Necmettin Erbakan University, Faculty of Fine Arts in Konya.

Scopus Author Identifier Number: 58032301000

Web of Science Researcher ID: N/A

Google Scholar Researcher ID: xGeHw6IAAAAJ

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

The Relationship Between Aesthetic Sensitivity and Artistic Creativity: A Meta-Analysis in the Context of Correlational Studies

Selma Ceran[1]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 580-609
http://www.ijonmes.net

Article Info:

Received 16.08.2025
Revision 11.10.2025
Accepted 14.10.2025

Abstract:

Aesthetic sensitivity and artistic creativity together encompass individuals' perceptual, emotional, and cognitive responses that shape original and value-based expressions within social, cultural, and technological contexts. This study performed a meta-analysis of correlational studies to investigate the relationship between aesthetic sensitivity and artistic creativity. Additionally, several potential moderators were identified, including sample group, publication type and year, sample age range, publication culture, and type of artistic creativity. A literature search was conducted on the Web of Science, Scopus, TR Index, and ProQuest academic databases to identify studies for inclusion. The search was current through August 2025. Out of 168 studies identified, 25 were deemed suitable. Publication bias was tested using a Funnel plot and the trim-and-fill method, and the analysis employed a fixed-effects model with effect size as the standard measure of relationship strength and direction. The results indicated a moderate-level positive relationship between aesthetic sensitivity and artistic creativity (r=.55). Moderator analyses revealed that publication year, age group, and creativity type moderated the relationship, while publication type, culture, and participant type did not. In future studies, the relationship between aesthetic sensitivity and artistic creativity could be examined by using broader databases such as ERIC and Taylor & Francis, as well as through professional groups, digital art, and AI-supported processes.

Keywords:
Aesthetic sensitivity, Artistic creativity, Correlational studies, Meta-analysis, Creative thinking.

Citation:
Ceran, S. (2025). The Relationship Between Aesthetic Sensitivity and Artistic Creativity: A Meta-Analysis in the Context of Correlational Studies. *International Journal of Modern Education Studies, 9*(2), 580-609. https://doi.org/10.51383/ijonmes.2025.436

[1] Ph.D., Necmettin Erbakan University, Konya, Türkiye. selmaceran@gmail.com,
https://orcid.org/ 0000-0002-1778-7175

INTRODUCTION

Aesthetic maturity is a fundamental element of the works created by artists. An artist's aesthetic perception, sensitivity, artistic talent, and motivation directly influence the quality of their work (Laçinbay, 2020). Aesthetic sensitivity refers to the entirety of an individual's perceptual, emotional, and cognitive responses to artistic stimuli. Artistic creativity, on the other hand, is a concept that explains the emergence of forms of expression based on originality, flexibility, and aesthetic values (Sacheli et al., 2022).

In artistic environments, in particular, findings that aesthetic experience triggers idea generation and makes the distinction between viewer and creator more fluid raise questions about the role of aesthetic engagement in creative processes (Savas et al., 2021). Findings in neuroscience and cognitive science highlight the importance of multilevel models by showing that aesthetic perception and creative production are processed through distinct but related neural networks in the brain (Sacheli et al., 2022).

The relationship between aesthetic sensitivity and creativity extends beyond individual talent to operate within social, cultural, and technological contexts. In the digital age, AI-powered applications are taking aesthetic experience to new dimensions. In fields like dance, fashion, and performance, the symbiotic relationship between aesthetic and creative processes is directly reflected in production (Ma, 2025; Smith & Southerton, 2025). Therefore, a person's artistic creation is both a reflection of their aesthetic perception and a true result of their artistic motivation.

The relationship between aesthetic sensitivity and artistic creativity has gained increasing attention across diverse fields such as art education, design, and psychology, yet the theoretical and empirical rationale behind this link remains somewhat fragmented. Recent research underscores the importance of aesthetic experience as a mediating or predictive factor in creative performance (Ma & Huang, 2024; Savaş, Verwijmeren, & van Lier, 2021). For instance, Aparicio-Flores et al. (2025) demonstrated that aesthetic experience and attitudes toward artistic expression significantly correlate with creative tendencies, while Burgart's (1961), early work highlighted how engagement with art education enhances both creativity and aesthetic judgment. Despite these insights, studies vary in focus and scope—ranging from traditional artistic contexts to applied domains such as eco-friendly restaurant design (Horng et al., 2013)—suggesting a need for a more unified understanding of how aesthetic sensitivity operates across creative domains.

Furthermore, some research presents nuanced or even conflicting perspectives on the interaction between creativity, technical skill, and aesthetic appeal. Jeffries, Zamenopoulos, and Green (2018), for example, observed that while aesthetic quality often enhances perceptions of creativity, technical execution can mediate this relationship in complex ways. Similarly, Smith and Southerton (2025) explored how AI-driven creative processes may reshape aesthetic engagement, raising questions about the authenticity and human

dimension of aesthetic experience in creativity. Therefore, establishing a clearer rationale for this study involves synthesizing these diverse findings to clarify whether aesthetic sensitivity functions as a cause, correlate, or consequence of creativity. Doing so is essential not only for researchers aiming to refine theoretical models but also for educators and practitioners seeking to cultivate creativity through aesthetic awareness in both traditional and technologically mediated contexts.

In this regard, a broad examination of the scattered quantitative studies and, in particular, the correlational descriptions in the literature is considered critical for revealing the overall picture of the relationship between these variables. The meta-analysis approach has the power to synthesize findings from different contexts within a common methodological framework to determine if a consistent effect pattern exists. This makes it possible to obtain more reliable results about the direction and strength of the relationship between aesthetic sensitivity and artistic creativity (Bektas et al., 2015). In this context, the aim of this study is to provide a meta-analytical evaluation of the relationship between aesthetic sensitivity and artistic creativity based on correlational findings.

THEORETICAL FRAMEWORK

Aesthetic Sensitivity and Approaches to its Measurement

Aesthetic sensitivity is defined as a tendency that encompasses the entirety of individuals' perceptual and emotional responses to artistic or natural stimuli (Zuo, 1998). It is described as a multidimensional area of sensitivity that combines perceptual discernment, emotional intensity, and consistency in evaluation (Myszkowski et al., 2014). This concept is considered a dynamic process that manifests through the dimensions of duration (e.g., gaze persistence), content (e.g., formal features), and context (e.g., cultural norms) of the aesthetic experience (Ward & Kapoula, 2022). Aesthetic sensitivity is conceptualized as a broad context that goes beyond subjective taste to include cognitive-interpretive and bodily-affective processes (Sacheli et al., 2022). Therefore, it is seen not just as a preference but as an information-processing profile that reflects the coordinated regulation of attention, memory, and emotion (Ciricugno et al., 2023).

This concept is interpreted through different theoretical frameworks, especially from the perspectives of aesthetic philosophy, psychology, and art education, with each framework placing a distinct emphasis on the components of experience, judgment, and meaning-making (Hellstrom, 2011). In aesthetic philosophy, aesthetic experience is considered a unity of sensory pleasure, formal integrity, and intuitive understanding, while sensitivity is seen as the threshold of this unity (Freiberga, 2004). In psychology, aesthetic sensitivity is linked to mechanisms like information processing fluency, expectation violation, and the need for explanation, with fluency/disruption models providing a conceptual basis for these relationships (Consoli, 2015). Neurocognitive approaches suggest that partially overlapping networks are activated between visual aesthetics and creative

cognition, and that sensitivity produces a bias field that influences perceptual choices (Sacheli et al., 2022). Eye movements and gaze behaviors are interpreted as behavioral indicators of sensitivity, revealing focus shifts and attention persistence during aesthetic evaluation (Ward & Kapoula, 2022).

In art education theories, aesthetic sensitivity is considered a foundational component of creative learning ecosystems built on inquiry, possibility thinking, and expressive flexibility (Pavlou, 2013). Research on interactive art and audience participation shows that aesthetic experience deepens through action and feedback, and that sensitivity is shaped alongside bodily empathy (Özdemir, 2022; Savaş et al., 2021). In institutional and organizational literature, aesthetics are at the interface of meaning production and sustainability narratives, instrumentally guiding creative practices (Poldner et al., 2017). Cultural philosophy interprets aesthetic sensitivity in the context of the purpose of learning and the ethical-aesthetic direction of life enriched by taste (Ni, 2021). Art research states that aesthetic judgment is shaped in interaction with historical norms and institutions, and that sensitivity is in constant negotiation with these norms (Ozkan, 2022; Snow & Leach, 1996).

The tools developed to measure aesthetic sensitivity vary widely, from performance-based visual aesthetic sensitivity tests to self-report questionnaires (Mullen, 2017). Visual sensitivity tests assess perceptual discernment through true-false choice pairs or scoring mechanisms that operate on the principle of proximity to expert norms (Myszkowski et al., 2014). Eye-tracking and gaze persistence measurements make visible the impact of aesthetic evaluation on attention patterns through behavioral indicators (Ward & Kapoula, 2022). Neuroimaging-based approaches investigate the biomarkers of sensitivity by mapping the shared neural networks of responses to aesthetic stimuli (Sacheli et al., 2022). Self-report scales score subjective experience with factor structures that include components like intensity of appreciation, depth of emotion, and aesthetic interests (Jorgensen, 2018). Studio ethnographies and process data, along with reflective journals, qualitatively capture the manifestations of sensitivity in practice (Lam et al., 2021).

In the educational context, rubrics and product evaluations provide scoring schemes to make the balance between aesthetic emphasis and creative expression visible (Jeffries et al., 2018). In classroom-based collective creativity studies, aesthetic coordination and shared languages of taste are monitored as qualitative indicators alongside participatory strategies (Nouwligbeto, 2024). The combined use of different measurement traditions, through methodological triangulation, allows for a more reliable test of the sensitivity construct (Ward & Kapoula, 2022). Cross-cultural validity and comparability across age groups appear as a fundamental methodological priority in measurement adaptations (Pavlou, 2013).

Artistic Creativity and Theoretical Approaches

Artistic creativity is a multifaceted phenomenon that has been defined sometimes as process-oriented and other times as product-oriented; acquiring context-dependent meanings (Akca & Kavak, 2021; Jorgensen, 2018; Kibici, 2022). Process-oriented approaches emphasize discovery, trial-and-error, and selective regulation, defining creativity as a line of experiential learning (Consoli, 2015). Product-oriented approaches prioritize the qualitative evaluation of the output, highlighting the interaction of novelty and appropriateness with aesthetic value and the role of evaluating communities (Jeffries et al., 2018).

Theoretical approaches to explaining creativity vary along different axes, such as variation-selection, cognitive flow, emotion, and community-based evaluation, and they put forth unique emphases in the artistic context (Consoli, 2015). The approach of blind variation and selective retention opens the discussion on the selection logic of creative production through findings related to aesthetic judgment and personality (Kaufman, 2010). Evolutionary and enactive perspectives suggest that creative effects can be produced through aesthetic engagement even in situations where the agent plays a limited role (Currie & Turner, 2023). Neurocognitive explanations reveal that there are partial overlaps between creative association networks and networks that support aesthetic evaluation, indicating that multiple components operate simultaneously (Sacheli et al., 2022).

Models focusing on perceptual processing discuss how aesthetic experience is layered during the visual processing stream and at which stages of this chain creative decisions emerge (Utz & DiPaola, 2020). Educational theories and philosophies suggest that when aesthetic experience combines with well-being and a search for meaning, it provides a foundation that strengthens creative learning (Jorgensen, 2018). The art education literature suggests that aesthetic inquiry nourishes possibility thinking and that the search for a single correct answer can restrict learner autonomy (Costantino, 2011). Discussions in music and performance art reveal that aesthetic ideals create normative horizons that guide creative processes, and that these horizons need to be critically redefined (Behan, 2022).

The Relationship Between Aesthetic Sensitivity and Creativity

Relevant research shows that aesthetic sensitivity plays a critical role in the development of artistic creativity, a role that is visible at both the process and product levels (Savaş et al., 2021). It is stated that as aesthetic intensity increases, creativity is strengthened in terms of originality and richness of expression (Lam et al., 2021). In prototyping studies, the combination of aesthetic interaction and user experience broadens the range of creative solutions and encourages new combinations (de Farias et al., 2015). In the educational context, it is reported that aesthetic inquiry and possibility thinking activities strengthen students' creative thinking performance (Pavlou, 2013). Aesthetic programs integrated with social studies and art activities can produce lasting and transferable effects on creative

thinking (Dolapcıoğlu et al., 2019). School-based applications of aesthetic-focused creative activities are reported to yield significant gains in problem-solving and expressive flexibility (Gürkan & Dolapcıoğlu, 2020). Interventions in experiential awareness highlight the effects of aesthetic experience processes on creativity learning, demonstrating the cognitive benefits of sensitivity (Yeh et al., 2021). In early childhood, STEAM activities based on "aha" experiences can simultaneously strengthen indicators of aesthetic sensitivity and creativity (Tsuchiya & Gyobu, 2025). Socio-cultural analyses show that aesthetic perceptions activate community-based creative capacity and open up spaces for shared imagination (Farinacci & Stadler, 2024). This suggests that a positive and functional link between aesthetic sensitivity and creativity is likely (Consoli, 2015).

In the relevant literature, a low or non-existent relationship between aesthetic sensitivity and creativity has been reported in some samples, indicating that the relationship is not statistically significant (Myszkowski et al., 2014). Institution-focused critiques argue that aesthetic control and the process of normative taste can limit creative risk-taking and artificially weaken the relationship (Meades, 1979). Evolutionary arguments remind us that aesthetic engagement does not always produce creativity and that context-specific mechanisms are critical (Currie & Turner, 2023). In the performing arts, evaluation-focused pedagogies can limit experiential creativity when aesthetic goals are over-aligned with performance scales (Fryer, 2010). In advertising and creative industries, the integration of expert aesthetics into strategy can, in some cases, lead to standardization and a narrowing of expression, thereby weakening the client-consumer relationship (Bilton, 2009). Discussions in digital culture suggest that AI-powered visual productions can weaken creative identification by creating a sense of aesthetic alienation and non-subjective production (Smith & Southerton, 2025). These different reasons indicate that heterogeneity in the strength of the relationship should be expected due to sample, context, measurement issues, and that regulatory analyses are important.

Problem Statement and Gaps in the Literature

The emergence of different findings regarding the direction and strength of the relationship between aesthetic sensitivity and creativity in the literature highlights the need for a comprehensive synthesis. Some studies suggest that aesthetic experience directly reinforces creative production, while others report that the relationship varies according to context, measurement type, and sample characteristics (Savaş et al., 2021; Lam et al., 2021). Findings that visual aesthetic sensitivity may be partially independent of intelligence and personality, and have only a limited overlap with creativity, can weaken the assumption that there is a high expected correlation (Myszkowski et al., 2014). Models that explain the influence of aesthetic evaluation processes on creative selection, having different predictive Powers, may lead to can increased the heterogeneity of the results (Consoli, 2015).

Although neuroimaging syntheses point to shared networks, findings on how this shared network is reflected at the behavioral level cannot be reduced to a consistent effect

size (Sacheli et al., 2022). While aesthetic activities are expected to support creativity gains in some educational contexts, evaluator biases and contextual effects in design and performance measurements can complicate the relationship (Jeffries et al., 2018; Pavlou, 2013). The psychometric diversity of tools used in childhood and adolescence can limit comparability (Mei-Ju, 2014; Gürkan & Dolapcıoğlu, 2020). The fact that eye-tracking, product evaluation, and self-report-based measurements operationalize the same concept differently can lead to a dispersion of effect sizes (Ward & Kapoula, 2022; Aparicio-Flores et al., 2025). Differences in publication language, discipline, and reporting standards also appear to be a significant source of heterogeneity (Snow & Leach, 1996; Bilton, 2009). Furthermore, the impact of retracted studies on field generalization and the lack of reporting on methodological health indicators makes the need for a reliable synthesis even more important (Zhou, 2021). Therefore, instead of interpreting correlational findings one by one, adopting a systematic and transparent meta-analytic approach seems essential. Such an approach would clarify the confidence interval of the general relationship by separating the effects of methodological differences.

Literature highlighting contextual and individual factors that shape the relationship between aesthetic sensitivity and artistic creativity would provide valuable depth to the theoretical framework. Prior studies suggest that cultural and educational contexts significantly influence how aesthetic experience translates into creative output (Aparicio-Flores et al., 2025; Ma & Huang, 2024). Likewise, differences in sample characteristics—such as age, expertise level, or professional background—can moderate aesthetic engagement and creative expression (Burgart, 1961; Savaş, Verwijmeren, & van Lier, 2021). Moreover, evolving creative environments, including the rise of digital and AI-mediated artistic practices, highlight how temporal and contextual shifts reshape the aesthetic–creative connection (Smith & Southerton, 2025). Integrating such moderating perspectives from the literature would thus enable a more comprehensive understanding of the dynamic and context-dependent nature of the link between aesthetic sensitivity and artistic creativity.

The gap in the literature is not limited to discussions of effect size; it also includes the inability to holistically grasp the regulatory effects of cultural, institutional, and technological contexts on the process. In the fields of visual arts and design, there can be a standardization problem between the evaluation criteria for studio-based productions and the goals of in-class pedagogical interventions (Kılınçer, 2025; Lam et al., 2021; Pavlou, 2013). The institutionalization of aesthetics and innovation cycles expands the diffusion of creativity (Snow & Leach, 1996; Poldner et al., 2017). Cross-cultural ethical and aesthetic discussions redefine the relationship of creativity with social goals, and this relationship sometimes calls into question the cultural sensitivity of the measurement tools (Onyeaghalaji, 2018; Ni, 2021). In higher education classrooms, the aesthetic challenges of social creativity further complicate the balance between individual sensitivity and group processes (Nouwligbeto, 2024). Digital and AI-powered creative productions add new layers to the sensory processing of aesthetic experience, challenging classical measurement

frameworks (Utz & DiPaola, 2020; Smith & Southerton, 2025). For these reasons, the need for a comprehensive synthesis that blends different contexts and methods arises. A meta-analysis that include methodological transparency and an evaluation of publication bias is important in this context. Thus, widespread findings in the literature can be systematically evaluated, and applied results can be more reliably substantiated.

In this study, the relationship between aesthetic sensitivity and artistic creativity was investigated within the context of correlational studies. Additionally, the following were identified as potential moderators affect the average effect size; (i) the sample group, (ii) publication type, (iii) publication year, (iv) the age range of the sample, (v) the culture of publication, and (vi) the type of artistic creativity addressed. Based on these variables and the results of previous research, the following hypotheses were tested:

Hypotheses of the study/ Sub-problems

H1: Aesthetic sensitivity has a positive effect on artistic creativity.

H2: Publication year is a moderator of the positive effect of aesthetic sensitivity on artistic creativity.

H3: Publication type is a moderator of the positive effect of aesthetic sensitivity on artistic creativity.

H4: Culture is a moderator of the positive effect of aesthetic sensitivity on artistic creativity.

H5: Sample age range is a moderator of the positive effect of aesthetic sensitivity on artistic creativity.

H6: Creativity type is a moderator of the positive effect of aesthetic sensitivity on artistic creativity.

H7: Sample group type is a moderator of the positive effect of aesthetic sensitivity on artistic creativity.

METHOD

Study Design

This study used a meta-analysis approach to test the relationship between aesthetic sensitivity and artistic creativity within the context of correlational studies. Meta-analysis is a method for combining the results of multiple independent studies on a specific topic and performing a statistical analysis of the findings (Littel et al., 2008; Petitti, 2000).

Search Strategy and Inclusion/Exclusion Criteria

A literature search was conducted on the Web of Science, Scopus, TR Index, and ProQuest academic databases to identify studies for inclusion in the meta-analysis. The search used specific keywords and their synonyms to comprehensively capture the relevant concepts.

The following search queries were used for English databases:

- *"aesthetic sensitivity" AND ("artistic creativity" OR "art creativity" OR "creative expression")*
- *"aesthetic sensitivity" AND ("correlation" OR "correlational study" OR "relationship" OR "association")*
- *"artistic creativity" AND "aesthetic sensitivity" AND ("meta-analysis" OR "systematic review")*
- *("aesthetic sensitivity" OR "aesthetic awareness" OR "aesthetic perception") AND ("artistic creativity" OR "creative ability") AND ("correlation" OR "relationship")*
- *("aesthetic sensitivity" AND "creativity") AND ("meta-analysis" OR "systematic review")*
- *The same scope was maintained for the Turkish databases by using the corresponding Turkish terms:*
- *"estetik duyarlılık" AND ("sanatsal yaratıcılık" OR "yaratıcılık" OR "sanatsal ifade")*
- *"estetik duyarlılık" AND ("korelasyon" OR "ilişki" OR "ilişkisel çalışma")*
- *"sanatsal yaratıcılık" AND "estetik duyarlılık" AND ("meta-analiz" OR "sistematik derleme")*
- *("estetik duyarlılık" OR "estetik farkındalık" OR "estetik algı") AND ("sanatsal yaratıcılık" OR "yaratıcılık" OR "yaratıcı yeti") AND ("korelasyon" OR "ilişki")*
- *("estetik duyarlılık" AND "yaratıcılık") AND ("meta-analiz" OR "sistematik derleme")*

This strategy aimed to provide the most comprehensive search for studies examining the relationship between aesthetic sensitivity and artistic creativity. The cutoff date for studies included in this research was August 2025. Both master's theses and peer-reviewed journal articles were included in the analysis.

Multiple strategies were used to identify studies suitable for the meta-analysis. First, a broad search of titles, keywords, and abstracts was conducted to create an initial pool of studies (168 total) that could potentially address the relationship between aesthetic sensitivity and artistic creativity. Next, the abstracts were reviewed. Based on the criteria

below, 96 studies were excluded. In the second stage, the remaining 72 studies were examined in depth, and it was determined that 25 were suitable for the meta-analysis, while the rest were not.

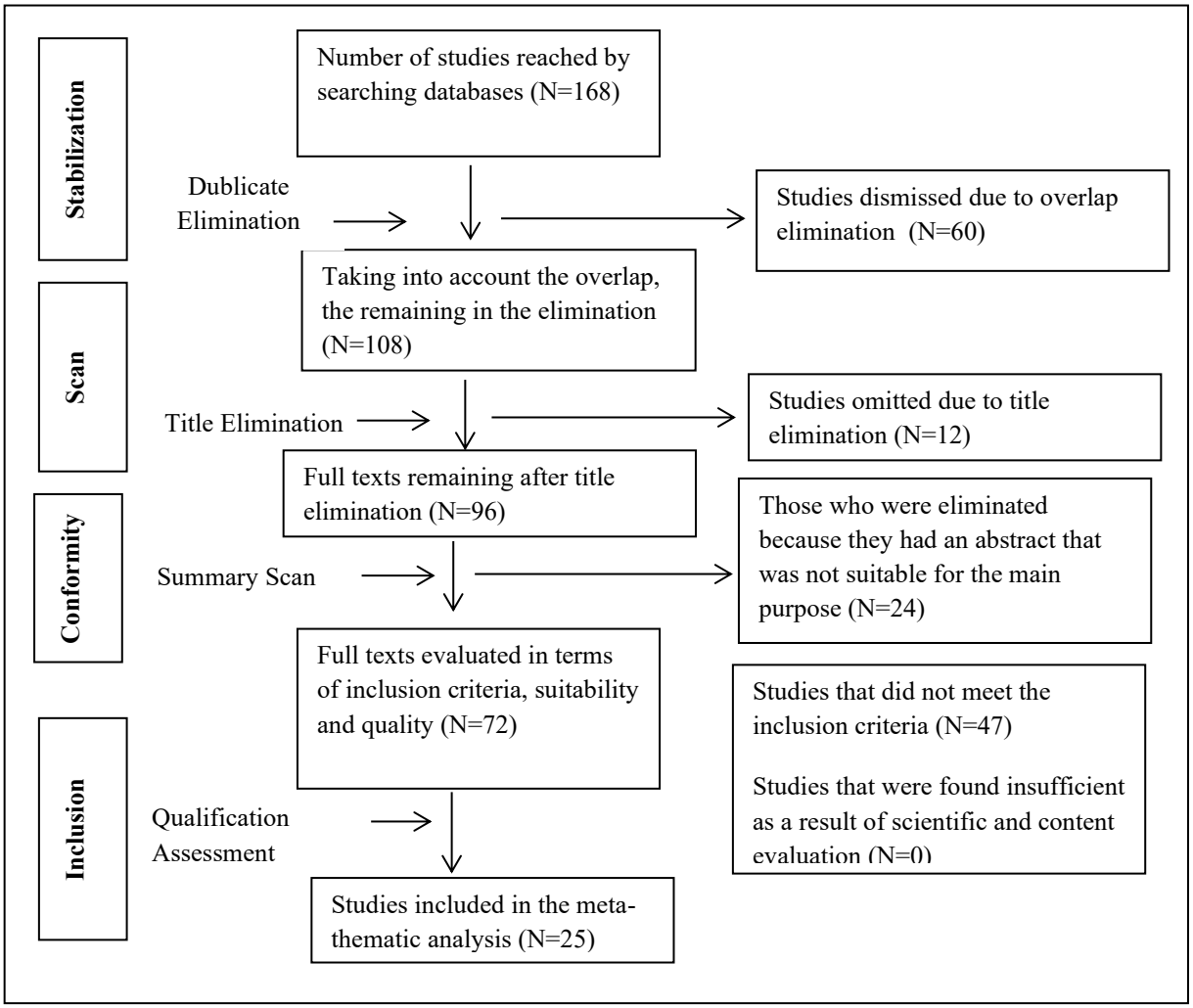


Figure 2. PRISMA Flow Diagram Studies Included in the Analysis

The descriptive statistics for these 25 studies are presented in Table 1.

- The inclusion criteria for this study were as follows:
- The study must contain the necessary statistical information for a correlational meta-analysis (n and r or R^2 values).
- The study must cover the topics of aesthetic sensitivity and artistic creativity.
- The reasons for excluding studies from the meta-analysis were:
- The study did not provide any quantitative data.
- The study did not include a correlation value.

- The study did not use behavior as a unit of measurement.

The characteristics of the studies included in the meta-analysis are presented in Table 1.

Table 1

Characteristics of Included Studies in the Meta-Analysis

Options		**1**	**2**	**3**	**Total**
Research		Before 2000	2001-2020	After 2021	-
Publication Year	*n*	2	7	16	25
	%	8.0	28.0	64.0	100
		Thesis	Article		-
Research Type	*n*	2	23		25
	%	8.0	92.0		100
Research		Expert	Student		
Publication Year	*n*	6	19		25
	%	24.0	76.0		100

According to Table 1, a total of 25 studies were included in the meta-analysis. When examining the distribution of studies by publication year, the vast majority (64%) were published after 2021, with 28% published between 2001 and 2020, and 8% published before 2000. Regarding the type of research, articles constituted the vast majority of studies (92%), while theses accounted for 8%. In terms of the sample group, it was found that 76% of the studies worked with student groups, while 24% worked with expert groups.

Coding Procedure

The coding procedure is a fundamental step for organizing and extracting data, ensuring that only information relevant to the study's purpose is selected from a complex pool of research findings. To this end, a coding form was prepared before the statistical analysis, and the coding was carried out systematically according to this form. The main goal was to create a general framework encompassing all studies and to develop a detailed coding system that would not overlook the unique characteristics of individual studies.

The coding form used in this study consisted of the following components:

- Research bibliography
- Sample information

- Culture where data was collected
- Methodological information
- Quantitative values

Statistical Procedures

The effect size calculated in meta-analyses is accepted as a standard measure to reveal the strength and direction of the relationship within studies (Borenstein et al., 2009). In this study, the Pearson correlation coefficient (r) was used as the indicator of effect size. Since the correlation coefficient can take values ranging from −1 to +1, the r coefficients obtained in the analyses were first converted into a standard form using Fisher's z transformation, and then the calculations were performed (Hedges & Olkin, 1985).

In correlational meta-analyses, when more than one correlation value is reported for the same variable category, there are different approaches for deciding which value to include in the analysis (Borenstein et al., 2009; Kulinskaya et al., 2008). This study followed this procedure: (i) If the reported correlations were independent, all correlation values were included and treated as independent studies. (ii) When correlations were dependent, the average correlation coefficient was used. Although various methods have been proposed in the literature to correct this average, many approaches can lead to an overestimation of the correlation coefficient (Schyns & Schilling, 2013). For this reason, the average correlation value was used in this study as it provides a more conservative estimate.

In meta-analyses, two main models are generally used: the fixed-effects model and the random-effects model. The appropriate model is is chosen by examining which assumptions regarding the characteristics of the included studies are met (Borenstein et al., 2009; Kulinskaya et al., 2008). The fixed-effects model is preferred when (i) the included studies have the same functional structure and (ii) the goal is to calculate the effect size for a specific population. In contrast, the random-effects model is considered appropriate when there are methodological or contextual differences among studies and the goal is to generalize the obtained effect size to a broader population. Considering the characteristics of the studies examined in this research, the random-effects model was chosen for the analyses. All meta-analysis procedures were carried out using Comprehensive Meta-Analysis (CMA) software.

Moderator Variables

Moderator analysis is a statistical technique used within a meta-analysis to examine differences that emerge between subgroups and to test for divergences in the average effect sizes of the moderator variables. In meta-analytic studies, this analysis is pre-structured based on the primary goals of the research and is applied systematically according to the planned steps (Littel et al., 2012). The significance of the differences among the groups created by the moderator variables is typically evaluated using the Q statistic developed by Hedges and Olkin (1985). Within this method, the total Q value is divided into two components: Qbetween (Qb) and Qwithin (Qw). Qw tests the level of homogeneity within the

subgroups of moderator, while Qb indicates the differentiation between the groups (Borenstein et al., 2009; Hedges & Olkin, 1985).

Publication Bias

Publication bias is based on the assumption that not all research on a particular topic is published. The fact that studies with non-significant or low-level findings are not considered worthy of publication can lead to the average effect size obtained in meta-analyses being overestimated (Hanrahan et al., 2013). This situation, also referred to as "missing data" in the literature, biases the overall effect level reached by meta-analyses and reduces their reliability. Therefore, the existence of possible publication bias is always considered in meta-analysis research. In this study, some fundamental questions were addressed to examine publication bias:

- Is there any evidence of publication bias?
- Could the overall effect size be a result of publication bias?
- How much of the total effect is due to publication bias?

In meta-analysis studies, various statistical methods are used to reveal potential biases. One of the most common techniques is the funnel plot technique. Although a funnel plot does not provide an absolutely objective measurement, it gives an idea of whether there is publication bias in the included studies. In this research, the findings regarding publication bias of the studies included in the meta-analysis are presented via a funnel plot in Figure 2.

An examination of Figure 1 reveals no findings suggesting publication bias in the data from the studies. In the presence of publication bias, the funnel plot is expected to be markedly asymmetrical. Specifically, a clustering of studies on one side of the vertical line representing the average effect size (mostly on the right side) in the lower sections of the funnel on one side of the vertical line representing the average effect size (mostly on the right side) in the lower sections of the funnel would indicate bias. However, no such finding was observed in the distribution of the 25 studies examined in this research, and no strong evidence of publication bias was found.

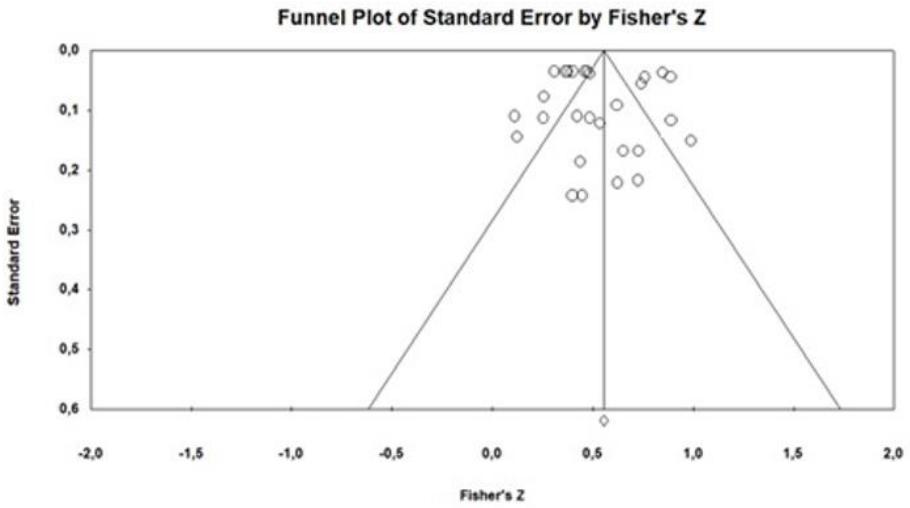


Figure 2. Funnel Plot of Effect Size for Publication Bias

Although no evidence of publication bias was found in the funnel plot analysis, Duval and Tweedie's *trim and fill* method was applied to determine the extent to which the effect size obtained from the random-effects meta-analysis was affected by potential publication bias. The results of this test are presented in Table 2.

Table 2

Duval, Tweedie's trim and fill test results

	Studies Trimmed	Point Estimate	CI (Confidence Interval) Lower Limit	CI (Confidence Interval) Upper Limit	Q
Observed values		0.55	0.48	0.63	577.74
Adjusted values	0	0.55	0.48	0.63	577.78

An examination of Table 2 shows that there is no significant difference between the observed effect size and the estimated (imputed) effect size calculated to address the effect of bias. The main reason for the absence of this difference is that the studies are generally distributed symmetrically on both sides of the central line.

Ethical considerations

This meta-analysis was conducted in strict accordance with the ethical standards of scientific research and publication. Since the study synthesized data derived from previously published empirical studies, no new data were collected directly from human participants or animals. Therefore, formal institutional ethics approval was not required.

RESULTS

The results of the meta-analysis on the correlation between aesthetic sensitivity and artistic creativity are presented in Table 3.

Table 3

Correlation Findings Between Aesthetic Sensitivity and Artistic Creativity: Meta-Analysis Results

Variable	K	*r*	CI (Confidence Interval)		Q	Q_b
			Lower Limit	Upper Limit		
Artistic Creativity	25	.55*	.47	.63	577.74*	
Moderator [Publication Year]						**15.25***
1961	1	.71*	.42	.86		
1992	1	.63*	.29	.82		
2013	1	.33	-.36	.73		
2017	2	.35*	.03	.60		
2018	2	.59*	.38	.74		
2019	2	.26	-.40	.63		
2021	7	.70*	.59	.79		
2024	2	.55*	.30	.72		
2025	7	.43*	.29	.55		
Moderator [Publication Type]						**1.14**
Article	23	.54*	.45	.62		
Thesis	2	.67*	.42	.82		
Moderator [Culture]						**.26**
Horizonal-Individualis	10	.58*	.44	.69		
Vertical-Collectivist	15	.54*	.44	.63		
Moderator [Participant Age Group]						**7.31**
18-20	8	.48*	.33	.61		
21-25	11	.57*	.45	.66		
26-30	2	.83**	.61	.92		
31 and over	4	.42*	-.24	.81		
Moderatör [Creative Type]						**26.81****
Artistic	14	.44*	.34	.52		
Design	6	.67*	.51	.79		
General	2	.58*	.36	.74		
Product based	3	.81*	.71	.88		
Moderator [Participant Type]						**1.42**
Experts	6	.66*	.46	.79		
Undergraduate students	19	.53*	.44	.61		

N=8767, *p<.01, **p<.05

Table 3 contains the meta-analysis results on the relationship between aesthetic sensitivity and artistic creativity. The findings supported hypothesis H1, which posited a positive relationship between aesthetic sensitivity and artistic creativity. The effect size of aesthetic sensitivity on artistic creativity was calculated as r=.55. This value indicates that aesthetic sensitivity has a moderate-level effect on artistic creativity (see Cohen, 2013).

The moderator analysis supported hypothesis H2, which stated that publication year acts as a moderator of the effect size between aesthetic sensitivity and artistic creativity. It was found that aesthetic sensitivity had varying levels of effect on artistic creativity in studies published in 1961 (r=.71), 1992 (r=.63), 2017 (r=.35), 2018 (r=.59), 2021 (r=.70), and 2024 (r=.55). In contrast, the effect of aesthetic sensitivity on artistic creativity was not found to be statistically significant in studies published in 2013, 2019, and 2025. The moderator analysis, conducted using the random-effects model, showed that the difference in effect size among publication years is statistically significant (Q_b=15.25,$p<.05$).

The findings did not support hypothesis H3, which posited that publication type acts as a moderator of the effect size of aesthetic sensitivity on artistic creativity. The moderator analysis found no statistically significant difference in effect size between articles (r=.54) and theses (r=.67) (Q_b=1.14,$p>.05$). Despite this result, the effect of aesthetic sensitivity on artistic creativity is large in both articles and theses.

The findings did not support hypothesis H4, which stated that culture acts as a moderator of the effect size of aesthetic sensitivity on artistic creativity. The moderator analysis found no statistically significant difference in effect size between horizontal-individualist (r=.58) and vertical-collectivist (r=.54) culture types (Q_b=0.26,$p>.05$). The effect of aesthetic sensitivity on artistic creativity is significant in both culture types.

The findings supported hypothesis H5, which stated that participant age group acts as a moderator of the effect size of aesthetic sensitivity on artistic creativity. The moderator analysis showed that the difference in effect size among age groups is statistically significant (Q_b=7.31,$p<.05$). Within this scope, large effect size of aesthetic sensitivity on artistic creativity was found in the 26 to 30 age group (r=.83), while a medium effect size was found in the other age groups (18 to 20: r=.48, 21to 25: r=.57, and 31 and above: r=.42).

The study supported hypothesis H6, which stated that creativity type acts as a moderator of the effect of aesthetic sensitivity on artistic creativity. The moderator analysis showed that the difference in effect size among creativity types is statistically significant (Q_b =26.81,$p<.05$). In this context, a strong effect of aesthetic sensitivity on artistic creativity was found in the product-based creativity type (r=.81), while moderate-to-strong effects were found in the artistic (r=.44), design (r=.67), and general (r=.58) creativity types.

The findings did not support hypothesis H7, which posited that participant type acts as a moderator of the effect size of aesthetic sensitivity on artistic creativity. The moderator analysis found no statistically significant difference in effect size between experts (r=.66) and

undergraduate students (r=.53) (Qb=1.42,p>.05). In both groups, the effect of aesthetic sensitivity on artistic creativity is significant.

DISCUSSION

This study comprehensively examined the relationship between aesthetic sensitivity and artistic creativity through a meta-analysis of correlational findings. The question of how the perceptual, emotional, and cognitive components of aesthetic sensitivity intersect with creative production has become a shared area of interest for fine arts, art education, psychology, philosophy, and cultural studies, and this common ground makes the need for large-scale data more visible (Sacheli et al., 2022).

First, the research tested the overall direction and consistency of the relationship between aesthetic sensitivity and artistic creativity. The results demonstrate that aesthetic sensitivity exerts a generally positive and significant influence on artistic creativity. Individuals exhibiting higher aesthetic sensitivity tend to perform more effectively in creative thinking and expressive endeavors, suggesting that aesthetic sensitivity extends beyond personal preferences or affective reactions and is directly manifested in creative production (Lam et al., 2021; Savaş et al., 2021). Empirical evidence further indicates that engagement in aesthetic exploration and possibility-oriented thinking enhances creative outcomes (Dolapcıoğlu et al., 2019). Nevertheless, several studies have emphasized that this relationship may differ depending on contextual variables, as institution-centered or normatively constrained aesthetic frameworks can restrict creative risk-taking and innovation (Myszkowski et al., 2014). Such variability underscores the moderating influence of contextual factors in explaining the heterogeneity observed across the literature. In certain cultural or methodological contexts, the association between aesthetic sensitivity and creativity has been reported as comparatively weaker (Currie & Turner, 2023). Despite these discrepancies, the overall meta-analytic findings confirm a robust, positive, and significant mean relationship, aligning with prior evidence that aesthetic sensitivity facilitates creative cognition (Consoli, 2015; Yeh et al., 2021). Moreover, studies in early childhood contexts indicate that aesthetic experiences foster creativity by eliciting insight-driven "aha" moments (Tsuchiya & Gyobu, 2025). Collectively, these findings suggest that aesthetic sensitivity functions as a foundational component that supports and enriches creative production, although its magnitude may vary across developmental stages and contexts. The observed positive and significant association provides empirical support for Hypothesis 1.

The study's second goal was to test whether publication year plays a moderator role in the relationship between aesthetic sensitivity and creativity. The findings revealed that in some periods, the relationship was markedly strong (Burgart, 1961; Dou et al., 2025; Jeffries et al., 2018; Wilson, 1992; Yeh et al., 2021), in some, it was at a medium level (Ma & Huang, 2024; Myszkowsk et al., 2018; Stojilović, 2017; Savaş et al., 2021), and in some years, findings that did not meet the significance threshold were reported (Han et al., 2019; Horng et al.

2013). The presence of patterns in recent studies reporting a weak or non-significant relationship indicates that differences in measurement tradition, task design, and reporting standards should be considered together with the year effect. Period aesthetic emphases, the widespread adoption of interactive art applications, and the integration of out-of-studio production ecosystems with consumption accelerate aesthetic feedback loops, making the production of creative options more visible during certain periods (Lam et al., 2021; Savaş et al., 2021; Utz & DiPaola, 2020). At the same time, normative frameworks in evaluation languages and the emphasis on technical accuracy and performance thresholds in rubrics can, in some periods, push aesthetic risk-taking behavior into the background, reducing the visibility of the transfer (Behan, 2022). From a meta-analytic perspective, year is not read as a causal lever on its own but as an indicator variable for the composite of components such as methodological maturity, sample diversification, and reporting transparency (Borenstein et al., 2009).

Early studies reported stronger relationships in certain contexts can be explained by the more frequent intersection of aesthetic evaluation and creative selection within the same task language. In contrast, in some recent periods, the full alignment of measurement tools with the genre and context may weaken visibility (Jeffries et al., 2018; Myszkowski et al., 2014). Cultural philosophy and sociological readings show that normative aesthetic horizons can expand and contract with the periodical discursive climate, and this fluctuation can have outcomes that are either in favor of or against creative expression (Ni, 2021; Sobande & Osei, 2020). In digital production environments, the acceleration of versioning, prototyping, and user feedback loops can lead, in some years, to a more direct transfer of sensitivity perceptions to creative selection. In other years, however, tool-oriented practices may overshadow aesthetic reasoning (de Farias, Keller et al., 2015; Lam et al., 2021; Utz & DiPaola, 2020). Nevertheless, it is observed that in periods when open data and supplementary material practices are widespread, evidence for measurement and task alignment is tracked more reliably, and the relationship pattern is depicted more clearly (Hedges & Olkin, 2014). In this context, it is suggested that publication year works as a moderator, changing the visibility and strength of the aesthetic sensitivity-creativity relationship by acting in concert with artistic emphasis, measurement tradition, and reporting standards.

The study also tested whether the relationship differed based on publication type and examined the significant difference between theses and peer-reviewed articles. The findings show that the difference in publication type does not alter the overall relationship, indicating a convergence between the types (Borenstein et al., 2009). The data revealed that practices such as methodological rigor, peer-review processes, and coding transparency limit the difference between types (Hedges & Olkin, 2014). In terms of content, the psychometric properties of measurement tools, the aesthetic decision points of task design, and sample diversity appear to be more decisive than publication type in interpreting the relationship (Consoli, 2015). Open data and supplementary material practices increase

reusability across publication types and facilitate meta-analytic synthesis (Borenstein et al., 2009). Pedagogical implications require that aesthetic inquiry be designed in alignment with the theoretical framework, regardless of type (Gürkan & Dolapcıoğlu, 2020; Pavlou, 2013). The consistency in the context of publication type indicates that the relationship between the two variables is strong and its strength remains constant.

Another finding of the study was whether cultural orientations significantly change the relationship pattern. According to the findings, although expressive pathways and artistic practices differ among cultures, a similar coordination is maintained in the functional core. The data reveal that cultural norms affect creative evaluation thresholds but do not entirely break the continuity of the fundamental link between sensitivity and creativity. Proximal contextual variables such as design, measurement tool, and participant profile can direct the interpretation of the relationship more signifcantly than culture (Jeffries et al., 2018). Research grounds sensitivity in existential meaning-seeking and value systems, and this grounding offers nuances on how creative decisions are guided by cultural contexts (Jorgensen, 2018; Ni, 2021). Sociological approaches emphasize that aesthetic sensitivity is in negotiation with norms and that production outcomes are shaped by this negotiation (Sobande & Osei, 2020). In the educational context, localized aesthetic activities enhance creative expression by qualitatively transforming it, thus making its value evident (Gürkan & Dolapcıoğlu, 2020). Digital culture can contribute to the convergence of aesthetic patterns by accelerating cross-cultural circulation (Smith & Southerton, 2025). The rapid cycles of user feedback in the fields of design and fashion can highlight similar decision points across cultures (Lam et al., 2021). In this context, the findings indicate that culture functions as an indirect, overarching framework. The comparative meta-analysis suggests a continuity that operates alongside context rather than a major cultural divergence.

The study also tested whether the relationship between aesthetic sensitivity and artistic creativity changes according to developmental stages in different age groups. The findings showed that significant differences emerged among age groups. The data revealed that aesthetic sensitivity has a large-level effect on artistic creativity in the 26–30 age group, while the effect remains more limited in other age groups. It is understood that the young adult period, in particular, is when the link between aesthetic sensitivity and creativity is strongest. This indicates that the function of aesthetic sensitivity in creative processes interacts with developmental factors. The education literature suggests that differentiations can occur in creativity indicators as age progresses and that the ways aesthetic experiences are perceived can change (Pavlou, 2013; Lam et al., 2021). The findings suggest that aesthetic sensitivity is used more effectively and creativity is more strongly supported during the transition from adolescence to adulthood. Unexpectedly, the relationship was found to be relatively lower in the 31, and older age groups. This result suggests that different responsibilities in adulthood may limit the transfer of aesthetic sensitivity to creative processes. Previous research has also reported that aesthetic experiences are more pronounced in childhood and youth (Tsuchiya & Gyobu, 2025). In this context, it appears

that developmental periods contribute differently to the relationship between aesthetic sensitivity and creativity. Furthermore, the fact that cognitive flexibility and emotional intensity peak in young adulthood supports the psychological explanations for this finding (Sacheli et al., 2022). This result highlights the importance of differentiated approaches for different age groups in the context of art education. The difference that emerged among age groups is an important finding that reveals the contextual aspect of aesthetic sensitivity and creativity.

The literature suggests that developmental stages are not merely background variables but a contextual platform where pedagogical and cultural mediators are concentrated (Yeh et al., 2021; Tsuchiya & Gyobu, 2025). When viewed holistically, the pattern differences observed among age groups imply that the transfer mechanisms between aesthetic sensitivity and creativity are sensitive to developmental tasks and community structures (Nouwligbeto, 2024).

The study showed that creativity type acts as a moderator of the relationship between aesthetic sensitivity and artistic creativity. The findings revealed that aesthetic sensitivity has a significant effect on artistic creativity, especially within the domain of product-based creativity. In contrast, the effect was found to be at a lower level for artistic creativity, a medium level for design creativity, and a medium-to-large level for general creativity. This result indicates that aesthetic sensitivity can show effects of different intensities across different creativity types. It is important that creativity has different dimensions depending on the type of creativity and that aesthetic processes provide stronger contributions, especially in the contexts of product development and problem-solving (Consoli, 2015). The relatively lower effect of aesthetic sensitivity in artistic creativity suggests that normative aesthetic criteria in artistic expression processes may limit creative flexibility. In contrast, the strong effect of aesthetic sensitivity in product-based creativity indicates that aesthetic perception assumes a decisive role in functional innovation and production processes. Previous studies have also reported that aesthetic sensitivity is more strongly reflected in creativity, especially in design, engineering, and applied arts (de Farias et al., 2015; Jeffries et al., 2018; Yeh et al., 2021). This finding also shows that educational programs for different creativity types should be supported with aesthetic components. In the digital age, aesthetic sensitivity further accentuates the differences among creativity types in AI-supported design and product development processes (Smith & Southerton, 2025).

In digital art, fashion, and interface design, multimodality and rapid iteration allow sensitivity signals to permeate both production and evaluation phases, and this proliferation facilitates creative expansion (Lam et al., 2021; Savaş et al., 2021). It is emphasized that in general creative tasks, the sensitivity relationship acts like a background regulator, and its visibility can fluctuate according to the task language, context, and the expectations of the evaluating community (Jeffries et al., 2018). In user-experience-focused design contexts, the intensity of feedback loops can create an acceleration effect where sensitivity signals bypass longer circuits and transfer directly to creative selection (Lam et al., 2021). In contrast, in

product evaluations with closed rubrics, the transfer of sensitivity can weaken when tension arises between innovation and normative aesthetics (Fryer, 2010; Bilton, 2009). This picture suggests that the moderation of creativity type is not just a difference in measurement, but also in the functioning of the production ecosystem (Consoli, 2015).

Finally, the study reveals that participant type, such as experts, practitioners, and students, does not act as a moderator in the relationship between aesthetic sensitivity and creativity. The findings showed that the effect of aesthetic sensitivity on artistic creativity was significant in the group of expert participant and similarly at a signifant in undergraduate students. This indicates that the relationship between aesthetic sensitivity and creativity is consistent, even though the participants differ in academic or professional levels. The literature has suggested that experts might evaluate aesthetic processes more consciously and therefore their creative performance might be stronger (Jeffries et al., 2018). However, the meta-analysis findings did not confirm this expectation, revealing similar levels of effect in both groups. This finding suggests that aesthetic sensitivity contributes to the creative process regardless of an individual's level of experience. Studies have reported that aesthetic sensitivity can trigger the creative process in both experienced and less experienced individuals (Consoli, 2015).

Mentoring, studio-matching, and mixed-workshop settings can make the expert-student distinction more permeable within horizontal learning communities, accelerating the circulation of sensitivity signals (Pavlou, 2013; Jorgensen, 2018; Gürkan & Dolapcıoğlu, 2020). In applied arts and design environments, customer-user feedback, stakeholder expectations, and ethical-aesthetic discussions can assume a more powerful regulatory role than profile differences (Poldner et al., 2017). Cultural studies suggest that social norms shape the evaluation horizons for both students and professionals, and that profile differences are therefore often overshadowed by a common cultural context (Ni, 2021; Sobande & Osei, 2020; Snow & Leach, 1996). In this context, the consistency of the relationship indicates that the measurement language and task design can produce an overarching effect that suppresses profile differences

CONCLUSION LIMITATIONS AND RECOMONDATIONS

Conclusion

In every scholarly endeavor, it's essential to candidly address the boundaries that might have affected the study's scope or outcomes. This section sheds light on these limitations, offering a transparent view of the challenges faced, the choices made, and the potential biases inherent in the research methodology or the context in which the study was conducted.

The research findings show that the positive relationship between aesthetic sensitivity and artistic creativity has direct implications for educational programs and pedagogical practices. First, the strong support of creativity by aesthetic sensitivity reveals that programs

should focus not only on knowledge transfer but also on the development of aesthetic perception and sensitivity. Students can exhibit creative performance in artistic processes only if aesthetic dimensions are systematically integrated into learning environments (Dolapcıoğlu et al., 2019). The findings indicate that educational policies need to provide more space for aesthetic experiences and that defining aesthetic sensitivity as a learning outcome will increase students' creative potential. Enriching the curriculum with aesthetic dimensions also increases students' learning motivation and, in the long term, contributes to the development of social creativity (Gürkan & Dolapcıoğlu, 2020). Therefore, the research results reveal the necessity of holistically integrating aesthetic sensitivity into education systems from a pedagogical perspective.

Furthermore, these results offer direct contributions to the understanding of art and creativity in the digital age. The strong effect of aesthetic sensitivity on artistic creativity makes it necessary to discuss how digital environments and technological tools transform this relationship. Today, AI, augmented reality, and virtual reality-based art applications accelerate and diversify the reflection of aesthetic sensitivity on different creativity types (Utz & DiPaola, 2020; Smith & Southerton, 2025). In this context, the research findings show that aesthetic sensitivity is an important factor that determines the quality of creative products in digital art practices. The findings also confirm that the relationship between aesthetic sensitivity and creativity is not limited to traditional art forms but also appears strongly in the contexts of digital design, multimedia, and interactive art. Theoretically, this situation necessitates a re-evaluation of creativity theories to include an aesthetic component.

Limitations

The findings should be interpreted with caution due to the scope and methodological diversity of the included studies; therefore, limitations must be considered when making generalizations. Conceptual differences in the operationalization of aesthetic sensitivity and creativity, the psychometric maturity levels of measurement tools, and the limitations of self-report-based measurements can create sources of heterogeneity in the synthesis (Myszkowski et al., 2014). The reliance of the studies on correlational designs necessitates a cautious approach to directionality and causal inferences (Jorgensen, 2018). Possible language bias due to publication language and access channels, as well as the lack of access to gray literature, can lead to the relationship narrative being skewed towards certain subfields (Borenstein et al., 2009). The risk of publication bias can make the relationship pattern appear more consistent than it is, due to the increased visibility of positive results and the decreased likelihood of reporting null findings (Hedges & Olkin, 2014). Three retracted studies were found in the literature. The existence of these publications, even if excluded from the synthesis, may have indirectly influenced the general discourse on the topic; this possibility should be considered (Zhou, 2021). The fact that classifications related

to age, culture, and creativity type were not sufficiently distinct in some studies can create a degree of uncertainty in the moderator readings.

Recommendations

For future studies, the relationship between aesthetic sensitivity and artistic creativity should be examined not only with correlational methods but also with experimental and longitudinal research. This would allow the causal direction of the relationship to be more clearly established. In addition, databases such as ERIC and Taylor & Francis could be added to the search. The differences observed among creativity types reveal the need for more in-depth comparative research in this area. Future studies should address types such as product-based, design-focused, and artistic creativity separately to clarify the role of aesthetic sensitivity in more detail. In terms of participant types, larger samples that include not only experts and students but also artists, teachers, and different professional groups are recommended. Furthermore, new research focusing on digital art and AI-powered creative processes is important for understanding the function of aesthetic sensitivity in contemporary contexts. Future studies should also investigate how aesthetic sensitivity can be developed through pedagogical practices and the long-term effects of this development on creativity.

In light of these findings, future research could benefit from incorporating additional moderator analyses to further clarify the conditions under which aesthetic sensitivity most strongly influences artistic creativity. Examining factors such as educational background, artistic discipline, or exposure to diverse aesthetic environments could provide deeper insight into the variability of this relationship. Furthermore, translating these findings into educational practice would enhance the study's practical relevance. For instance, educators could design learning environments that intentionally cultivate aesthetic awareness—through activities emphasizing observation, reflection, and creative experimentation—to strengthen students' creative potential. Such pedagogical applications would not only bridge theoretical and empirical insights but also support the development of more holistic and creativity-oriented educational frameworks.

REFERENCES

Akca, F.,& Kavak, G. (2021). Scale of Visual Creativity in Art: A Study on Scale Development and Construct Validity. *International Journal on Social and Education Sciences, 3*(3), 439-456. https://doi.org/10.46328/ijonses.94

*Aparicio-Flores, M. del P., Vicent, M., Fernandez-Sogorb, A., & Gonzalvez, C. (2025). Spanish validation of the Kaufman domains of creativity scale (K-DOCS) and its link with attitude towards artistic expression and aesthetic experience. *Empirical Studies of the Arts*, *43*(1), 45-62. https://doi.org/10.1177/02762374251342492

Behan, A. (2022). Reading creativity forwards and backwards: Process and product revisited with Herbert von Karajan's legato aesthetic and hypermasculinity. *Music & Letters*, *103*(4), 708–728. https://doi.org/10.1093/ml/gcab107

Bektas, F., Çogaltay, N., Karadag, E., & Ay, Y. (2015). School culture and academic achievement of students: A meta-analysis study. *The Anthropologist*, *21*(3), 482-488. https://dx.doi.org/10.1080/09720073.2015.11891837

Bilton, C. (2009). Relocating creativity in advertising from aesthetic specialisation to strategic integration. In A. C. Pratt & P. Jeffcutt (Eds.), *Creativity, innovation and the cultural economy* (pp. 45-67). Routledge. https://dx.doi.org/10.4324/9780203880012-2a

Borenstein, M., Cooper, H., Hedges, L., & Valentine, J. (2009). Effect sizes for continuous data. *The handbook of research synthesis and meta-analysis*, *2*, 221-235. https://dx.doi.org/10.7758/9781610448864.14

*Burgart, H. J. (1961). *Art In Higher Education: The Relationship Of Art Experience To Personality, General Creativity, And Aesthetic Performance* (Order No. 6106776). Available from ProQuest Dissertations & Theses Global. (302081975). Retrieved from https://doi.org/10.2307/1319644

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Routledge.

Consoli, G. (2015). Creativity and aesthetic evaluation: Two proposals to improve the model of aesthetic dis/fluency. *Frontiers in Psychology*, *5*, Article 1520. https://doi.org/10.3389/fpsyg.2014.01520

Costantino, T. E. (2011). Contemporary aesthetic theory and models of creativity in visual arts education in the United States. In J. Sefton-Green, P. Thomson, K. Jones, & L. Bresler (Eds.), *The Routledge international handbook of creative learning* (pp. 78-89). Routledge. https://dx.doi.org/10.4324/9780203817568.ch17

*Currie, A., & Turner, D. (2023). Creativity without agency: Evolutionary flair & aesthetic engagement. *Ergo-An Open Access Journal of Philosophy*, *10*, 110–134. https://doi.org/10.3998/ergo.4633

de Farias, F. M., Keller, D., Lazzarini, V., & de Lima, M. H. (2015). Bringing aesthetic interaction into creativity-centered design: The second generation of mixDroid prototypes. *Journal of Cases on Information Technology*, *17*(4), 53–72. https://doi.org/10.4018/JCIT.2015100104

Dolapcıoğlu, S., Gurkan, B., & Karakus, M. (2019). Aesthetics and aesthetic creativity in social studies. *Pegem Journal of Education and Instruction*, *9*(3), 913–944. https://doi.org/10.14527/pegegog.2019.029

*Dou X, Zhang Y, Wang X, Zhang Y, Hou R (2025) The way aesthetic needs affects the relationship between aesthetic responsiveness and creativity. *PLoS One*, *20*(9), e0331067. https://doi.org/10.1371/journal.pone.0331067

Farinacci, E., & Stadler, N. (2024). How is space culturally transformed? Religious and aesthetic creativity in walled spaces. *Current Anthropology*, *65*(3), 415–437. https://doi.org/10.1086/730224

Freiberga, E. (2004). Creativity and aesthetic experience: The problem of the possibility of beauty and sensitiveness. In A. T. Tymieniecka (Ed.), *Phenomenology world-wide* (pp. 234-248). Springer. https://doi.org/10.1007/1-4020-2245-X

Fryer, N. (2010). From reproduction to creativity and the aesthetic: Towards an ontological approach to the assessment of devised performance. *RiDE: The Journal of Applied Theatre and Performance*, *15*(4), 547–562. https://doi.org/10.1080/13569783.2010.512189

*Han, J., Forbes, H., & Schaefer, D. (2021). An exploration of how creativity, functionality, and aesthetics are related in design. *Research in Engineering Design, 32*(3), 289-307. https://doi.org/10.1007/s00163-021-00366-9

*Han, J., Forbes, H., Schaefer, D. (2019). *An Exploration of the Relations between Functionality, Aesthetics and Creativity in Design'*, in Proceedings of the 22nd International Conference on Engineering Design (ICED19), Delft, The Netherlands, 5-8 August 2019. https://doi.org/10.1017/dsi.2019.29

Hanrahan, F., Field, A. P., Jones, F. W., & Davey, G. C. (2013). A meta-analysis of cognitive therapy for worry in generalized anxiety disorder. *Clinical psychology review*, *33*(1), 120-132. https://doi.org/10.1016/j.cpr.2012.10.008

Hedges, L. V., & Olkin, I. (2014). *Statistical methods for meta-analysis*. Academic press.

Hellstrom, T. G. (2011). Aesthetic creativity: Insights from classical literary theory on creative learning. *Educational Philosophy and Theory*, *43*(4), 321–335. https://doi.org/10.1111/j.1469-5812.2008.00502.x

*Horng, J. S., Chou, S. F., Liu, C. H., & Tsai, C. Y. (2013). Creativity, aesthetics and eco-friendliness: A physical dining environment design synthetic assessment model of innovative restaurants. *Tourism Management, 36*, 15-25. http://dx.doi.org/10.1016/j.tourman.2012.11.002

*Jeffries, K. K., Zamenopoulos, T., & Green, A. J. K. (2018). Design creativity, technical execution and aesthetic appeal: A CAT with caveats (Part 2). *International Journal of Design Creativity and Innovation*, *6*(1–2), 66–79. https://doi.org/10.1080/21650349.2017.1381043

Jorgensen, D. (2018). Creativity and aesthetic thinking: Toward an aesthetics of well-being. In K. T. Galvin (Ed.), *Aesthetic pedagogies* (pp. 45-67). Routledge. https://doi.org/10.4324/9781315724966

Kibici, V. (2022). An Analysis of the Relationships between Secondary School Students' Creativity, Music Achievement and Attitudes. I*nternational Journal on Social and Education Sciences*, *4*(1), 87-100. https://doi.org/10.46328/ijonses.304

Kılınçer, Ö. (2025). Investigation of Music Teacher Candidates' Technology Integration Self-Efficacy and Artificial Intelligence Literacy. *International Journal of Modern Education Studies, 9*(2), 356-384. https://doi.org/10.51383/ijonmes.2025.417

Kaufman, J. C. (2010). Further evidence of BVSR in the areas of aesthetic judgment and personality: Comment on 'Creative thought as blind-variation and selective-retention: Combinatorial models of exceptional creativity' by Prof. Simonton. *Physics of Life Reviews*, *7*(2), 180–181. https://doi.org/10.1016/j.plrev.2010.04.005

Kulinskaya, E., Morgenthaler, S., & Staudte, R. G. (2008). *Meta analysis: A guide to calibrating and combining statistical evidence*. John Wiley & Sons. https://dx.doi.org/10.1002/9780470985533

Laçinbay, A. (2020). The importance of artistic motivation in aesthetic perception and the artistic creation process. *Gazi University Journal of Education Faculty*, *40*(2), 829-849.

Lam, M. M.-L., Li, E. P. H., Lam, E. Y.-N., & Liu, W.-S. (2021). Aesthetic experiences and design creativity: An ethnographic study of a wool design workshop. *International Journal of Fashion Design, Technology and Education*, *14*(3), 375–386. https://doi.org/10.1080/17543266.2021.1968042

*Li, Z., Wen, S., & Lee, C. S. (2024). Dual mediating effect of aesthetic ability and self-worth between creative personality and creativity of Chinese college students. *Industry Promotion Research*, *9*(1), 275–282. https://doi.org/10.21186/IPR.2024.9.1.275

Littel, M., Euser, A. S., Munafò, M. R., & Franken, I. H. (2012). Electrophysiological indices of biased cognitive processing of substance-related cues: a meta-analysis. *Neuroscience & Biobehavioral Reviews*, *36*(8), 1803-1816. https://dx.doi.org/10.1016/j.neubiorev.2012.05.001

Littell, J. H., Corcoran, J., & Pillai, V. (2008). *Systematic reviews and meta-analysis*. Oxford University Press.

*Ma, Y.-X., & Huang, J.-H. (2024). Exploring the influence of college students' perceptions of teachers' ambidextrous leadership on creativity: The mediating role of aesthetic experience. *Eurasian Journal of Educational Research, 110,* 202–218. https://doi.org/10.14689/ejer.2024.110.12

Meades, J. (1979). Aesthetic control - strangling creativity. *Architects Journal*, *170*(51–52), 1315–1324.

Mei-Ju, C. (2014). In celebration of creativity play: An exploration on children's aesthetic sensibility and creativity in Waldorf early childhood education. *Revista de Cercetare si Interventie Sociala*, *47*, 165–179.

Mullen, C. A. (2017). Creativity frames and aesthetic study in Chinese environments. *International Journal of Education & the Arts*, *18*(12), 1-25.

*Myszkowski, N., Storme, M., Zenasni, F., & Lubart, T. (2014). Is visual aesthetic sensitivity independent from intelligence, personality and creativity? *Personality and Individual Differences*, *59*, 16–20. https://doi.org/10.1016/j.paid.2013.10.021

Ni, P. (2021). Life as aesthetic creativity and appreciation: The Confucian aim of learning. In P. D. Hershock & R. T. Ames (Eds.), *Cultivating creativity in methodology and practice* (pp. 123-145). University of Hawaii Press.

Nouwligbeto, F. (2024). Collective creativity in the lecture hall: Key issues, participant strategies and aesthetic challenges. *Journal of African Cultural Studies*, *36*(2), 186–201. https://doi.org/10.1080/13696815.2024.2321982

Onyeaghalaji, M. N. (2018). Ethics and aesthetic creativity: A critical reflection on the moral purpose of African art. In A. Adelakun & T. Falola (Eds.), *The Palgrave handbook of African philosophy* (pp. 567-589). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-91310-0

Ozkan, Z.C. (2022). The effect of STEAM applications on lesson outcomes and attitudes in secondary school visual arts lesson. *International Journal of Technology in Education (IJTE), 5*(4), 621-636. https://doi.org/10.46328/ijte.371

Özdemir, D. (2022). A Conceptual Framework on the Relationship of Digital Technology and Art. (2022). *International Journal on Social and Education Sciences, 4*(1), 121-134. https://doi.org/10.46328/ijonses.313

Pavlou, V. (2013). Investigating interrelations in visual arts education: Aesthetic enquiry, possibility thinking and creativity. *International Journal of Education Through Art*, *9*(1), 71–88. https://doi.org/10.1386/eta.9.1.71_1

Petitti, D. B. (2000). *Meta-analysis, decision analysis, and cost-effectiveness analysis: methods for quantitative synthesis in medicine* (No. 31). OUP USA.

Poldner, K., Dentoni, D., & Ivanova, O. (2017). Aesthetic mediation of creativity, sustainability and the organization. *Journal of Cleaner Production*, *140*, 1936–1947. https://doi.org/10.1016/j.jclepro.2016.08.121

Sacheli, L. M., Tomasetig, G., Musco, M. A., Pizzi, S., Bottini, G., Pizzamiglio, L., & Paulesu, E. (2022). The unexplored link between aesthetic perception and creativity: A theory-driven meta-analysis of fMRI studies in the visual domain. *Neuroscience and Biobehavioral Reviews*, *140*, Article 104768. https://doi.org/10.1016/j.neubiorev.2022.104768

*Savaş, E. B., Verwijmeren, T., & van Lier, R. (2021). Aesthetic experience and creativity in interactive art. *Art & Perception*, *9*(2), 167–198. https://doi.org/10.1163/22134913-bja10024

Schyns, B., & Schilling, J. (2013). How bad are the effects of bad leaders? A meta-analysis of destructive leadership and its outcomes. *The leadership quarterly*, *24*(1), 138-158. https://doi.org/10.1016/j.leaqua.2012.09.001

*Smith, N., & Southerton, C. (2025). AI and aesthetic alienation: The image and creativity in contemporary culture. *Social Science Computer Review*, Advance online publication. https://doi.org/10.1177/08944393251361449

Snow, R. M., & Leach, E. (1996). The institutionalization of the aesthetic: Systemic contradiction in the organization of creativity. *Systems Research*, *13*(1), 25–33.

Sobande, F., & Osei, K. (2020). An African city: Black women's creativity, pleasure, diasporic (dis)connections and resistance through aesthetic and media practices and scholarship. *Communication, Culture & Critique*, *13*(2), 204–221. https://doi.org/10.1093/ccc/tcaa016

*Stojilovic, I. (2017). Effects of creativity on aesthetic experience. *Psihologija*, *50*(3), 319–339. https://doi.org/10.2298/PSI1703319S

Tsuchiya, K., & Gyobu, I. (2025). Activating STEAM learning in young children through aha-experiences: Supporting creativity and aesthetic sensitivity in infants and toddlers. *Education Sciences*, *15*(2), Article 117. https://doi.org/10.3390/educsci15020117

Utz, V., & DiPaola, S. (2020). Using an AI creativity system to explore how aesthetic experiences are processed along the brain's perceptual neural pathways. *Cognitive Systems Research*, *59*, 63–72. https://doi.org/10.1016/j.cogsys.2019.09.012

*Ward, L. M., & Kapoula, Z. (2022). Creativity, eye-movement abnormalities, and aesthetic appreciation of Magritte's paintings. *Brain Sciences*, *12*(8), Article 1028. https://doi.org/10.3390/brainsci12081028

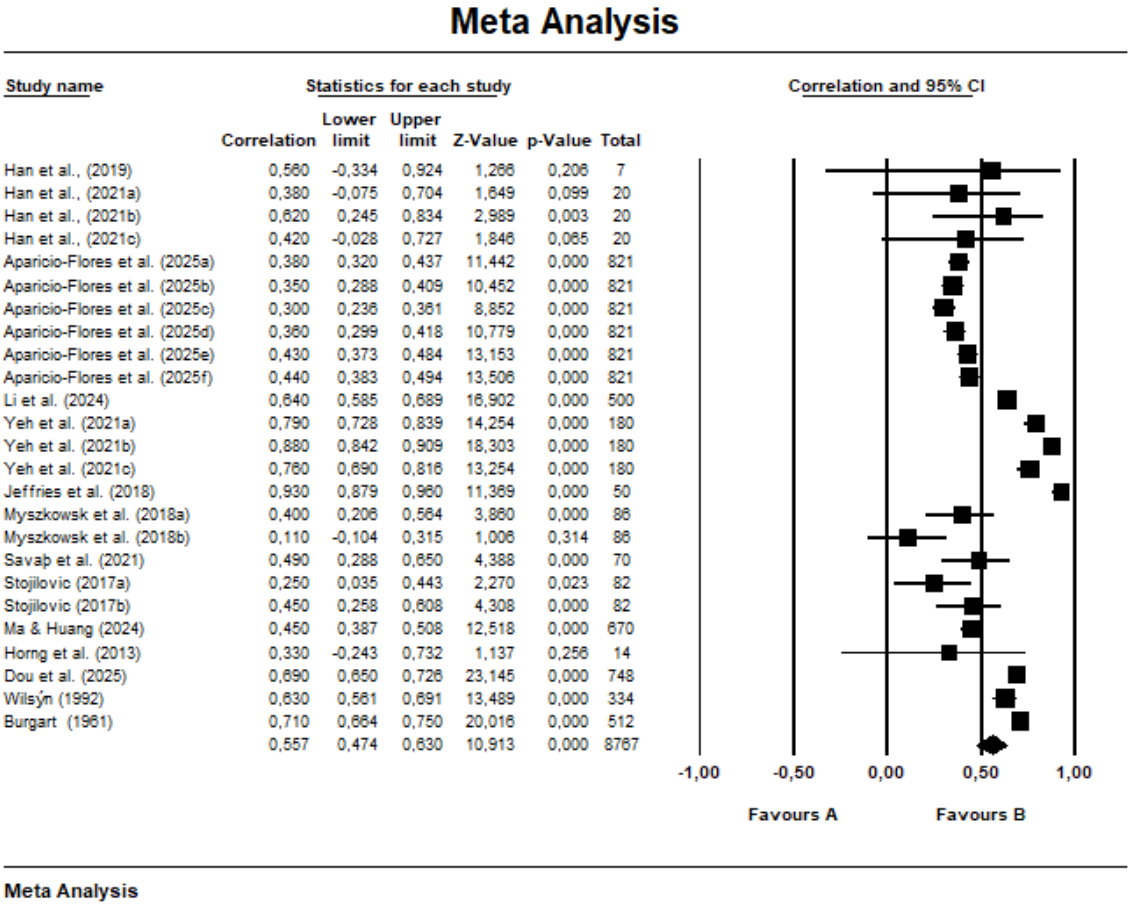
*Wilson, L. M. (1992). *The effect of temperament on the individual's selection of scientific or aesthetic arts creativity* (Order No. 9238885). Available from ProQuest Dissertations & Theses Global. (304023764). Retrieved from https://www.proquest.com/dissertations-theses/effect-temperament-on-individuals-selection/docview/304023764/se-2

*Yeh, Y.-C., Hsu, W.-C., & Yastrubinskiy, E. (2021). Decomposing the influences of aesthetic experience processes on creativity learning through various consciousness interventions. *Thinking Skills and Creativity*, *39*, Article 100756. https://doi.org/10.1016/j.tsc.2020.100756

Zhou, Q. (2021). Development of creative thinking skills through aesthetic creativity in middle school educational music course [Retracted article]. *Thinking Skills and Creativity*, *40*, Article 100825. https://doi.org/10.1016/j.tsc.2021.100825

Zuo, L. (1998). Creativity and aesthetic sense. *Creativity Research Journal*, *11*(4), 309–313. https://doi.org/10.1207/s15326934crj1104_4

Appendix 1.



Data Availability Declaration

No Primary Data Utilized:

All data supporting the findings of this meta-analysis were derived from previously published studies available in publicly accessible academic databases.

Author Contributions

The sole author of this research, Selma Ceran, was responsible for the conceptualization, methodology formulation, data collection, analysis, and interpretation.

Author(s)' statements on ethics and conflict of interest

Ethics statement: I hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. I take full responsibility for the content of the paper in case of dispute.

Statement of interest: The author declares no potential conflicts of interest concerning the research, authorship, and/or publication of this article. The study was conducted solely for

academic and scientific purposes, with no commercial or financial relationships that could be construed as a possible conflict of interest.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. All research-related expenses were personally covered by the author.

Acknowledgements: The author wishes to thank the editorial board of the International Journal of Modern Education Studies for their guidance during the peer-review process and acknowledges the valuable insights provided by anonymous reviewers, which contributed to improving the quality of this manuscript. Appreciation is also extended to colleagues who offered constructive comments during the preparation of the meta-analysis.

Biographical notes:

Dr. Selma CERAN: Ph.D., Necmettin Erbakan University.

Scopus Author Identifier Number: N/A

Web of Science Researcher ID: N/A

Google Scholar Researcher ID: N/A

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Investigation of Teachers' Beliefs About Classroom Assessment[1]

Hasan Şahin[2] **Cihad Şentürk**[3]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 610-650
http://www.ijonmes.net

Article Info:

Received 19.09.2025
Revision 19.11.2025
Accepted 01.12.2025

Abstract:

This study examined teachers' beliefs about classroom assessment using a mixed-methods sequential explanatory design. Participants were primary, middle, and high school teachers in public schools in Karaman, Türkiye, during the 2024–2025 academic year. Data were collected through the Classroom Assessment Beliefs Scale and semi-structured interviews. The findings indicated that teachers were undecided about traditional assessment but strongly supported alternative, student-centered approaches. No significant differences were observed with respect to gender or subject taught. However, undergraduate teachers and those with 16–20 years of experience reported stronger traditional beliefs, while graduate teachers and those with 1–5 years of experience reported stronger alternative beliefs. Middle school teachers reported stronger traditional beliefs than did primary and high school teachers. Qualitative results indicated that while teachers valued alternative assessment, implementation was hindered by time limitations, large classes, curriculum intensity, lack of materials, student-related challenges, and the dominance of centralized exams. It is recommended that curricula and national examinations be revised to better align with alternative assessment approaches.

Keywords: Assessment, traditional assessment, alternative assessment, classroom assessment beliefs, teachers

Citation:
Şahin, H., & Şentürk, C. (2025). Investigation of teachers' beliefs about classroom assessment. *International Journal of Modern Education Studies, 9*(2), 610-650. https://doi.org/10.51383/ijonmes.2025.441

[1] This article is based on the master's thesis prepared by the first author under the supervision of the second author.

[2] Teacher, Ministry of National Education, Karaman, Türkiye. hasansahin3570@gmail.com
https://orcid.org/0009-0000-7674-6747

[3] Assoc. Prof. Dr., Karamanoğlu Mehmetbey University, Education Faculty, Karaman, Türkiye.
cihadsenturk@gmail.com https://orcid.org/0000-0002-1276-8653

INTRODUCTION

Determining students' levels of competence and determination, analyzing the causes of any deficiencies or delays that arise during the acquisition of these outcomes, and taking necessary corrective measures play a critical role in the effectiveness and quality of the teaching process (Özçelik, 2016). In this context, assessments in education are integral components of the teaching process; they play a critical role in monitoring the quality of learning, guiding the learning process, and evaluating the effectiveness of teaching activities. It is also of great importance for monitoring, managing, and evaluating students' learning processes and their academic achievement. Teachers' approaches to classroom assessment and their perceptions of this process directly affect the quality of instruction. In this context, the extent to which teachers value the assessment process, the methods they prefer, and their perceptions of these methods are critical research areas for improving educational quality.

Assessments are among the fundamental components of learning, as they provide teachers and students with opportunities to reflect meaningfully on how learning can occur more effectively and to receive constructive feedback (Brookhart & Durkin, 2003; McMillan & Nash, 2000; Wormeli, 2006). For teachers to plan and implement instruction effectively, they need to develop a deep understanding and knowledge of students' learning processes. At this point, teachers' beliefs directly shape not only the teaching–learning process but also the assessment process (Chan & Elliott, 2004; Lyon, 2011). In recent years, beliefs have been emphasized as a key factor in understanding teachers' classroom practices. Educational researchers have attributed special importance to teachers' beliefs in order to better understand how they think about teaching, learning, and other school-related issues (Seferoğlu et al., 2009). Indeed, one of the underlying factors influencing teachers' classroom behaviors is their beliefs (Marland, 1998). Such beliefs function as a filter through which classroom practices are interpreted and enacted, thereby shaping teachers' instructional behaviors (Richardson, 2003). Numerous studies have revealed strong relationships between teachers' beliefs and their classroom practices (Kagan, 1992; Pajares, 1992).

Beliefs about assessment express teachers' preferences regarding assessment and evaluation practices, as well as their understanding of the roles of students and teachers in these practices (McMillan & Nash, 2000; Thomas, 2012). In line with these beliefs, teachers may adopt different approaches to assessment (McMillan, 2008; Popham, 2000). For example, teachers with traditional beliefs about assessment prefer methods based on paper-and-pencil tests, in which students are assessed by recognition rather than by reproduction of knowledge (Windschitl, 1999). This approach focuses on identifying and developing the cognitive aspects of teaching (Segers & Dochy, 2001) and aims to measure the extent to which students have acquired the basic knowledge and skills outlined in the curriculum (Nitko & Brookhart, 2011). In contrast, teachers who hold alternative beliefs about assessment and evaluation tend to use performance-based tools such as portfolios, peer and

group assessment, performance tasks, and projects more frequently (Anderson, 1998). These teachers argue that performance- and process-oriented assessments are more effective for measuring complex mental skills such as analytical, reflective, and critical thinking, and problem-solving (Haladyna et al., 2002).

Research conducted in Türkiye reveals that the majority of teachers hold traditional perspectives on assessment, preferring exam-focused methods that measure success through numerical data (Evin Gencel & Özbaşı, 2013; Kılıç, 2020; Özenç & Çakır, 2015; Özeren & Akpınar, 2020). Similarly, a study of teaching staff reported that they adopted contemporary assessment approaches only to a moderate extent (Şad & Göktaş, 2013). In addition, several studies have shown that teacher candidates often display negative or moderate attitudes toward assessment courses and that their assessment-related self-efficacy is also moderate (Çardak, 2018; Şahin & Uysal, 2013; Yaşar, 2014). Other studies have indicated that teachers hold misconceptions about assessment (Üztemur & Metin, 2015). Furthermore, it has been found that teachers' beliefs about assessment are not aligned with the principles of assessment and evaluation embedded in teaching programs based on contemporary educational approaches (Öztürk Çetinkaya & Saka, 2022). These findings contradict the student-centered, process-oriented assessment approaches required by contemporary teaching and alternative assessment practices (Özdemir, 2010). The widespread use of traditional methods, such as multiple-choice tests and conventional exams, in teachers' classroom practices may be insufficient to measure students' higher-order thinking skills or to discover and develop their talents (Ornstein & Lasley, 2004; Thompson et al., 2001).

The studies conducted in the Turkish context, as noted above, reveal limitations in teachers' assessment competencies, frequent implementation errors, a persistent reliance on traditional approaches, and significant challenges in the classroom application of contemporary assessment methods. Existing research has largely remained confined to descriptive analyses of the current situation and problem identification; however, studies that offer structured professional development models, pedagogically grounded processes for integrating alternative assessment tools, or evidence supporting the development of assessment literacy among preservice teachers are remarkably scarce. This imbalance between problem-focused descriptive studies and research offering practical solutions highlights a notable gap in the literature. Such a gap presents challenges for policymakers and teacher educators seeking to design evidence-based strategies to improve assessment practices. Within this context, the present study provides concrete, feasible, and context-sensitive recommendations aimed at enhancing teachers' assessment literacy, integrating alternative and process-oriented assessment tools into classroom practice, and transforming the existing assessment culture. By emphasizing the problems, gaps, implementation errors, and misalignments between curriculum approaches and assessment practices identified in the findings, and by giving particular attention to those discussed in the Discussion section, this study is expected to make meaningful contributions to the literature.

The Purpose of the Study

The purpose of this study is to determine the beliefs of teachers in elementary, middle, and high schools regarding assessment and to reveal their views on the assessment process. In this context, teachers' tendencies toward traditional and alternative assessment approaches, the factors influencing these beliefs, and how they are reflected in professional practices are analyzed. The data obtained from the research are expected to provide insights that can be used to update the content of teacher education programs, plan in-service training, and improve assessment processes. In this context, the study seeks to answer the following questions:

RQ1: What are teachers' beliefs about classroom assessment?

RQ2: Are there any significant differences in teachers' beliefs about classroom assessment based on variables such as gender, subject taught, educational background, teaching experience and the level of education (primary, middle or high school) at which they teach?

RQ3: What are teachers' views on the classroom assessment process?

METHOD

In this part of the study, the research model, the procedure, the data collection tools, and the analysis of the data are presented.

Research Model

This research was conducted using a mixed-methods design. Mixed-methods research is defined as an approach in which both quantitative and qualitative data are collected, integrated, and used to better understand research problems and to draw conclusions from the resulting data set (Creswell, 2009). This method is widely used, particularly in the health, social, and behavioral sciences. In this study, the mixed-methods approach was chosen to leverage the strengths of both quantitative and qualitative methods while minimizing the limitations of each (Ayden & Gündoğdu, 2022). Specifically, the sequential explanatory design, one of the mixed-methods designs, was employed. The explanatory design is a type of mixed-methods approach in which qualitative data are collected after the quantitative data have been gathered and analyzed, with the aim of providing a deeper understanding of the results. In this design, the researcher first identifies general trends from numerical data and then conducts a detailed qualitative analysis to understand the reasons for, or processes underlying, these trends. In this regard, the explanatory design is highly effective at revealing the deeper structures underlying quantitative findings (Creswell & Plano Clark, 2018).

Participants

In line with the mixed-methods research model, the study group included participants in both the quantitative and qualitative phases. The study group comprised 461 teachers

working in state primary, middle, and high schools in the central district of Karaman, Türkiye, during the 2024–2025 academic year. The distribution of the demographic characteristics of the teachers who participated in the quantitative phase of the research is presented in Table 1. The qualitative phase of the study comprised 32 teachers who volunteered from among those included in the quantitative phase. To ensure the diversity and representativeness of the qualitative data, participants' educational levels were considered, with attention to achieving balanced participation among teachers at the primary, middle, and high school levels. Information about the participants in the qualitative phase of the study is provided again in Table 1.

Table 1

Demographic Characteristics of Teachers in the Quantitative and Qualitative Phases of the Study

Variable		**Participants in the Quantitative Phase**		**Participants in the Qualitative Phase**	
		n	**%**	***n***	**%**
Gender	Female	221	47,9	17	53,1
	Male	240	52,1	15	46,9
Subject Taught	Primary Education Teacher	156	33,8	10	31,2
	Subject Teacher	305	66,2	22	68,8
Educational Background	Undergraduate	312	67,7	18	56,2
	Graduate	149	32,3	14	43,8
Teaching Experience	1–5 Years	39	8,5	6	18,7
	6–10 Years	74	16,1	4	12,5
	11–15 Years	119	25,8	7	21,9
	16–20 Years	83	18,0	4	12,5
	21–25 Years	99	21,5	7	21,9
	26 Years and Above	47	10,2	4	12,5
Educational (School) Level	Primary School	156	33,8	10	31,2
	Middle School	176	38,2	11	34,4
	High School	129	28,0	11	34,4
Total		461	100	32	100

Data Collection Instruments

Both quantitative and qualitative data collection tools were used in the study. The data collection tools used in the study are presented below.

Classroom Assessment Beliefs Scale

In the study, the "Classroom Assessment Beliefs Scale" developed by Şentürk and Baş (2023) was used to determine teachers' beliefs about assessment. The scale was developed in Turkish. The scale consists of 22 items and is a five-point Likert scale with the following response options: "strongly disagree," "disagree," "undecided," "agree," and "strongly agree." The scale is two-dimensional: the first dimension reflects "traditional assessment beliefs" (e.g., classroom assessment should primarily be used for grading students), and the second reflects "alternative assessment beliefs" (e.g., classroom assessment should consider various authentic and alternative assessment techniques). The Cronbach's alpha reliability coefficient of the scale was 0.92 for the first dimension and 0.91 for the second dimension. According to the confirmatory factor analysis (CFA) results, the model's fit indices are as follows: $\chi 2/df = 1.85$; RMSEA = 0.06 (90% CI: [2.37–2.99]); IFI = 0.91; CFI = 0.91; TLI = 0.91. These values indicate that the scale demonstrates an acceptable fit with respect to construct validity. In this study, Cronbach's alpha for the scale was found to be 0.83 for the first dimension and 0.87 for the second dimension. Based on these values, the scale used in this study is valid and reliable.

Semi-Structured Interview Form

The researcher prepared a semi-structured interview form to examine teachers' beliefs about assessment, to explore their views on the classroom assessment process, and to gain an in-depth understanding of teachers' thoughts on this subject, and to identify their opinions and suggestions. The semi-structured interview form, used as a qualitative data collection tool in this study, was designed in line with the main objective of the research and structured to allow participants to express their thoughts in depth. Compared with structured interviews, the semi-structured interview offers greater flexibility; it allows the researcher to guide the interview with prepared questions and enables participants to express their perspectives and original ideas comfortably (Barbour & Schostak, 2005).

To ensure content validity, the interview form was developed based on a literature review in the relevant field and aligned with the main objective of the research. Subsequently, opinions were sought from three academic experts in educational programs and teaching to evaluate the form's content validity. Necessary corrections and improvements were made based on feedback from academic experts, and the form was finalized. In addition, the interview form was reviewed by a language expert to ensure its linguistic accuracy. Pilot interviews were conducted with three participants to improve the form's comprehensibility, functionality, and measurement properties. Based on the feedback obtained during this preliminary application process, expressions that participants did not understand or found inadequate were revised to increase the validity and reliability of the data collection tool.

Data Collection Process

The study was conducted in accordance with legal permissions, and participation was voluntary. Prior to the study, participants were informed about its purpose, scope, and procedures. In line with ethical principles, the identities of the participants were kept confidential, and pseudonyms were used when presenting the data. Participants were explicitly informed that they had the right to withdraw from the study at any time. During the quantitative data collection phase, the researcher adopted an objective stance in administering measurement instruments, entering data, and conducting analyses, taking care to ensure that the data were collected in accordance with the principles of scientific validity and reliability. During the qualitative phase of the research, the researcher aimed to gain an in-depth understanding of participants' experiences and perceptions through semi-structured interviews. To that end, the researcher provided a neutral, transparent, and reassuring environment to encourage data collection that was as natural and sincere as possible. During the interviews, the researcher refrained from being directive, allowing participants to express their thoughts in their own words.

Data Analysis

The research data were analyzed and interpreted in two dimensions. First, quantitative data were analyzed using Jamovi 2.6; then qualitative data were interpreted in line with the research objectives to validate and support the quantitative findings.

Quantitative Data Analysis

In the first stage of data analysis, normality tests were conducted to determine whether the dataset followed a normal distribution; the results confirmed normality. Accordingly, parametric tests were employed in the analysis. Descriptive statistics, including frequency (*f*), percentage (%), arithmetic mean ($\bar{x}$), and standard deviation (*SD*), were used to examine the data. Independent-samples *t*-tests and one-way analyses of variance (ANOVA) were used to examine group differences on various variables. When a significant difference was identified in the ANOVA results, the *LSD* post hoc test was used to determine which groups differed.

Qualitative Data Analysis

After collecting quantitative data, the researcher transferred the written notes from interviews with teachers to a computer. All recorded qualitative data were classified for each participant. Each file was assigned a separate code number during classification. This dataset was subsequently analyzed using content analysis methods. Content analysis is a systematic and repeatable technique that enables the analysis of specific expressions in texts by reducing them to smaller content categories through coding based on specific rules (Büyüköztürk et al., 2019). In this study, the content analysis method, which is widely used in qualitative research and allows data to be classified according to codes and themes and to be interpreted in ways understandable to readers, was preferred (Patton, 2014). The

researcher first read the obtained data multiple times to establish overall coherence and then coded the data and grouped these codes under themes (Yıldırım & Şimşek, 2016).

The researcher repeatedly reviewed the qualitative dataset and preliminary coding conducted iteratively. The resulting draft codes were compared to ensure consistency. Following this stage, the main coding process was initiated, during which themes were identified by grouping codes into meaningful patterns (Auerbach & Silverstein, 2003; Yin, 2017). To enhance reliability, support was also sought from two teachers and two academics specializing in educational sciences to determine how codes should be grouped into themes. In addition, coding consistency was examined to minimize errors in the analysis of the interview data. For this purpose, three randomly selected interview forms were independently coded by another expert, and inter-coder agreement was calculated using Miles and Huberman's (2021) reliability formula. $Reliability = \left(\frac{Agreement}{Agreement + Disagreement}\right) \times 100)$ As a result, the agreement coefficient between the two coders was found to be 125 / (129 + 6) × 100 = 92.6% (0.926). The themes generated in the study were compared with coding performed by subject-matter experts to ensure consistency and reliability, resulting in the final determination of themes, subthemes, and codes. To support the research findings, direct quotations from participants were also included. In these quotations, participant codes [T1, T2, T3, …] were used instead of personal information, in accordance with ethical principles.

In qualitative research, the primary aim is to examine phenomena in depth. Reporting theme and subtheme frequencies in the findings can help clarify patterns and emphases within the data. In this study, frequencies were presented to demonstrate the intensity of relationships among themes and subthemes and to support a more systematic interpretation of the findings. The literature also emphasizes that frequencies may be used in a supportive manner within qualitative content analysis to enhance the clarity and transparency of data reporting (Schreier, 2012; Vaismoradi et al., 2013). Accordingly, the frequencies (*f*) used in the present research represent repeated instances of the codes and provide an additional layer of evidence that strengthens the analytic rigor of the study.

Ethical Considerations

In the course of this research, we paid scrupulous attention to ethical guidelines, ensuring that the integrity and reliability of the study were never compromised. For the quantitative phase, data were collected meticulously, face-to-face, ensuring respondents' privacy and anonymity. The absence of demographic data collection further cemented this confidentiality. Moving on to the qualitative portion, every interviewee was formally apprised of the research objectives, methodologies, and potential implications. Importantly, they were reassured in writing about their right to withdraw from the study without any repercussions. All acquired data, including the interview tools and participants' consent forms, were securely stored on the researcher's personal computer and protected by stringent password measures.

Aligned with the overarching commitment to ethics, this study strictly adhered to all provisions delineated in the "Higher Education Institutions Scientific Research and

Publication Ethics Directive." No instances of activities that might infringe the provisions set forth in "Actions Against Scientific Research and Publication Ethics" were identified.

Ethical Review Board: [Karamanoğlu Mehmetbey University Ethics Committee for Social and Human Sciences Research and Publications]

Date of Ethics Review Decision: [21/05/2024]

Ethics Assessment Document Issue Number: [08-2024/204]

FINDINGS

This section presents the analysis of the data collected to address both the quantitative and qualitative research questions, together with the findings and interpretations derived from these analyses.

Findings Related to the Quantitative Phase of the Research

In this section, teachers' assessment beliefs were examined in the order of the quantitative research questions and compared across selected variables.

Findings Regarding Teachers' Beliefs About Classroom Assessment

The first research question of the study is: *"What are teachers' beliefs about classroom assessment?"* To address this question, teachers' beliefs about classroom assessment were analyzed, and the results are presented in Table 2.

Table 2

Teachers' Beliefs About Classroom Assessment

Classroom Assessment Beliefs	***n***	$\bar{x}$	***SD***	***The Meaning***
Traditional Classroom Assessment Belief	461	3,25	,640	Undecided
Alternative Classroom Assessment Belief	461	4,37	,630	Totally Agree

Table 2 shows that teachers' beliefs about traditional assessment are "neutral" meaning teachers express neither a clear positive nor a clear negative opinion. Their beliefs regarding alternative assessment, however, are at the "strongly agree" level, indicating that teachers' levels of belief about alternative assessment are relatively high. Based on these findings, it can be concluded that teachers hold beliefs favoring alternative assessment over traditional assessment.

Findings on Teachers' Beliefs About Classroom Assessment Across Variables

The study's second research question is: *"Are there significant differences in teachers' classroom assessment beliefs across gender, subject taught, educational background, teaching experience, and educational level (primary, middle, or high school)?"* To address this research question, teachers' classroom assessment beliefs were analyzed across these variables.

Findings Regarding Teachers' Beliefs About Classroom Assessment According to the Gender

Table 3 presents the *t*-test results for teachers' beliefs about classroom assessment by *"gender"*.

Table 3

Teachers' Beliefs About Classroom Assessment According to the Gender

Classroom Assessment Beliefs	***Gender***	***n***	$\bar{x}$	***SD***	***t***	***p***
Traditional Classroom Assessment Belief	Female	221	3.21	.039	-1.310	.191
	Male	240	3.28	.044		
Alternative Classroom Assessment Belief	Female	221	4.42	.040	1.656	.098
	Male	240	4.33	.042		

Table 3 indicates that no statistically significant gender differences were found in teachers' beliefs regarding either traditional assessment approaches [$t_{(459)} = -1.310$, $p > .05$] or alternative assessment approaches [$t_{(459)} = 1.656$, $p > .05$]. These findings indicate that teachers' beliefs about classroom assessment approaches do not differ significantly by gender, suggesting that male and female teachers hold similar beliefs regarding both traditional and alternative assessment approaches. These findings indicate that gender is not a determining factor in shaping teachers' assessment beliefs and that both female and male teachers develop their orientations toward traditional and alternative assessment approaches in similar ways.

Findings Regarding Teachers' Beliefs About Classroom Assessment According to Subject Taught

The *t*-test results examining teachers' beliefs about classroom assessment across the *"subject taught"* variable are presented in Table 4.

Table 4

Teachers' Beliefs About Classroom Assessment According to Subject Taught

Classroom Assessment Beliefs	***Subject Taught***	***n***	$\bar{x}$	***SD***	***t***	***p***
Traditional Classroom Assessment Belief	Primary Education Teacher	156	3.21	.641	-.788	.431
	Subject Teacher	305	3.26	.640		
Alternative Classroom Assessment Belief	Primary Education Teacher	156	4.38	.553	.193	.847
	Subject Teacher	305	4.37	.667		

Table 4 indicates that no statistically significant differences were found between classroom and subject teachers in their beliefs about either traditional [$t_{(459)}$ = -0.788, p > .05] or alternative assessment approaches [$t_{(459)}$ = 0.193, p > .05]. This suggests that teachers' assessment beliefs are consistent regardless of the subject they teach. These findings indicate that teachers' beliefs about classroom assessment approaches do not differ significantly by subject taught; both groups hold similar beliefs regarding traditional and alternative assessment approaches.

Findings Regarding Teachers' Beliefs About Classroom Assessment According to Educational Background

Results of *t*-tests examining teachers' beliefs about classroom assessment by *"educational background"* are presented in Table 5.

Table 5

Teachers' Beliefs About Classroom Assessment According to Educational Background

Classroom Assessment Beliefs	***Educational Background***	***n***	$\bar{x}$	***SD***	***t***	***p***
Traditional Classroom Assessment Belief	Undergraduate	312	3.30	.649	2.541	.011*
	Graduate	149	3.14	.609		
Alternative Classroom Assessment Belief	Undergraduate	312	4.33	.634	-2.375	.018*
	Graduate	149	4.47	.612		

*$p<.05$

Table 5 shows statistically significant differences in teachers' assessment beliefs across educational backgrounds. Teachers with undergraduate degrees reported stronger traditional assessment beliefs [$t_{(459)}$ = 2.541, p < .05], whereas those with graduate degrees reported stronger alternative assessment beliefs [$t_{(459)}$ = -2.375, p < .05]. These findings indicate that teachers' beliefs about assessment approaches differ according to their educational background. These findings indicate that as teachers' educational level increases, they tend to favor alternative assessment approaches over traditional ones.

Findings Regarding Teachers' Beliefs About Classroom Assessment According to Teaching Experience

The results of the ANOVA examining teachers' beliefs about classroom assessment across the *"teaching experience"* variable are presented in Table 6.

Table 6

Teachers' Beliefs About Classroom Assessment According to Teaching Experience

Classroom Assessment Beliefs	*Teaching Experience*	*n*	$\bar{x}$	*SD*	*F*	*p*	*LSD*
Traditional Classroom Assessment Belief	1–5 Years	39	3.30	.501	3.316	.006*	6-10 years < 16-20 years 11-15 years < 16-20 years 16-20 years > 21-25 years
	6–10 Years	74	3.11	.589			
	11–15 Years	119	3.14	.657			
	16–20 Years	83	3.46	.612			
	21–25 Years	99	3.27	.705			
	26 Years and Above	47	3.25	.603			
Alternative Classroom Assessment Belief	1–5 Years	39	4.74	.470	3.941	.002*	1-5 years > 6-10, 11-15, 16-20, 21-25, 26 years and above 16-20 years > 26 years and above
	6–10 Years	74	4.39	.558			
	11–15 Years	119	4.31	.625			
	16–20 Years	83	4.43	.459			
	21–25 Years	99	4.32	.755			
	26 Years and Above	47	4.20	.731			

*$p<.05$

Table 6 indicates statistically significant differences in teachers' assessment beliefs across levels of teaching experience. For traditional assessment, ANOVA results showed significant variation across experience groups [$F_{(5, 455)} = 3.316$, $p < .05$]. Similarly, regarding alternative assessment, teachers' beliefs differed significantly according to years of teaching experience [$F_{(5, 455)} = 3.941$, $p <. 05$]. The LSD post-hoc test was subsequently applied to identify the groups in which these significant differences emerged for both traditional and alternative assessment beliefs. According to the LSD results, significant differences in traditional assessment beliefs were observed between teachers with 6–10, 11–15, and 21–25 years of teaching experience and those with 16–20 years. In each case, the difference favored teachers with 16–20 years of teaching experience who demonstrated a more traditional understanding of assessment than other groups. Significant differences in alternative assessment beliefs were found between teachers with 1–5 years of teaching experience and those with 6–10, 11–15, 16–20, 21–25, and 26+ years, and between teachers with 16–20 years and those with 26+ years of teaching experience. These differences indicated that teachers with 1–5 years of teaching experience held stronger beliefs in alternative (contemporary) assessment approaches than their more experienced counterparts, while teachers with 16–20 years of experience demonstrated a greater preference for alternative (contemporary) assessment approaches than those with 26 or more years of experience.

Findings Regarding Teachers' Beliefs About Classroom Assessment According to Educational (School) Level

The results of the one-way ANOVA examining teachers' beliefs about classroom assessment across the *"educational (school) levels"* at which they work are presented in Table 7.

Table 7

Teachers' Beliefs About Classroom Assessment According to Educational Level

Classroom Assessment Beliefs	***Educational (School) Level***	***n***	$\bar{x}$	***SS***	***F***	***p***	***LSD***
Traditional Classroom Assessment Belief	Primary School	156	3.21	.641	5.395	.005*	Middle school > Primary school, high school
	Middle School	176	3.36	.630			
	High School	129	3.13	.632			
Alternative Classroom Assessment Belief	Primary School	156	4.38	.553	.767	.465	-
	Middle School	176	4.41	.569			
	High School	129	4.32	.780			

*$p<.05$

Table 7 shows that teachers' beliefs about traditional assessment differed significantly according to the level of education at which they worked (elementary school, middle school, high school) [$F_{(2, 458)} = 5.395$, $p < .05$]. However, no significant differences in their alternative assessment beliefs were found across school levels [$F_{(2, 458)} = 0.767$, $p > .05$]. The *LSD* post-hoc test was then applied to identify the groups in which significant differences in traditional assessment beliefs emerged. The results indicated a significant difference between teachers working in middle schools and those working in primary and high schools. Based on this finding, it can be concluded that middle school teachers hold stronger beliefs about traditional assessment than their counterparts in primary and high schools.

Findings Related to the Qualitative Phase of the Research

In this section of the study, teachers' views on the assessment process were examined in line with the qualitative research questions. The findings from the analyses are presented.

Findings Regarding Teachers' Views on Classroom Assessment Processes and Practices

The third research question of this study is: *"What are teachers' perspectives on classroom assessment processes and practices?"* To address this question, items on the interview form were administered to participants, and their responses were systematically analyzed. In this section, the questions posed to teachers are presented and examined sequentially, together with the insights derived from their responses.

Question 1: What are teachers' perspectives on the assessment approaches and practices they employ in the classroom?

The findings related to this research question provide a detailed examination of teachers' perspectives on the conceptions they adopt, the approaches they prefer, and the methods they employ in classroom assessment processes. Within this framework, both their theoretical orientations and their practical applications were evaluated to provide a comprehensive understanding of how teachers conceptualize assessment in the teaching process. The results concerning teachers' assessment approaches, beliefs, and classroom practices were systematically categorized into themes, sub-themes, and codes and are presented in Table 8.

Table 8

Teachers' Views on Assessment Approaches and Practices Employed in the Classroom

Theme	Sub-Theme	Codes	*f*
Assessment Approaches	Alternative / Student-Centered Approaches	Project, performance, portfolio, self/peer assessment, process-based assessment, rubric, concept map, drama, observation, digital tools, product file	21
	Traditional / Teacher-Centered Approaches	Written exam, multiple-choice test, classical exam, fill-in-the-blank, true-false, short-answer, matching	11
Challenges Encountered in the Process of Alternative Assessment	Time/Process/Participation-Related Issues	Lack of time, crowded classrooms, curriculum intensity, shortage of materials	17
	Student-Related Issues	Lack of motivation, distraction, insufficient interest and readiness	21

Table 8 shows that a considerable number of teachers employ student-centered and alternative assessment approaches in the classroom assessment process (f = 21). This indicates a clear tendency toward alternative assessment approaches. Process-oriented and multidimensional assessment tools are generally preferred. Accordingly, a significant proportion of teachers endorse alternative assessment. In this regard, some teachers expressed the following views:

> *"Classroom assessment approaches are essential for understanding students' learning processes, monitoring their development, and guiding instruction. An effective assessment process should take both quantitative and qualitative data into account, be student-centered, and be carried out in a way that helps shape the teaching process." [T1]*

> *"To understand students' learning levels and guide the teaching process, assessment approaches should be varied, provide process-oriented feedback, and, most importantly, be student-centered." [T17]*

"Assessing students solely through written and oral exams prevents assessments from being distributed throughout the term. Students should not be evaluated solely on their performance in a single class session. Therefore, continuous assessment throughout the process should be included." [T31]

Although more than half of the teachers adopted an alternative understanding of assessment and evaluation, some continued to prefer traditional approaches and tools (f = 11). This finding also supports the study's quantitative results, indicating that a proportion of teachers continue to hold beliefs aligned with traditional assessment and evaluation. Representative excerpts from teachers' statements are presented below to illustrate this finding:

"Because of limitations, I must focus on result-oriented assessment." [T20]

"Alternative assessment takes time and effort, so I stick with traditional assessment." [T27]

"Since students encounter multiple-choice questions on exams, such as LGS and scholarship tests, I use that type of assessment." [T16]

Teachers who implemented the alternative assessment approach in their classrooms also reported encountering certain challenges during this process. They emphasized that issues such as time constraints, overcrowded classrooms, and an intensive curriculum posed significant barriers, making it difficult to effectively apply alternative assessment practices. Representative excerpts from teachers' statements regarding this issue are provided below:

"I try to diversify the assessment approaches I use in the classroom as much as possible, but I find it difficult to implement multiple methods because of time constraints." [T8]

"The process should be more student-centered; however, due to limited resources, we're forced to focus on results-oriented assessment, which creates problems for learning." [T20]

In addition to the challenges arising from the process itself, teachers highlighted certain student-related issues. They noted that problems such as low motivation, lack of attention, limited interest, and insufficient readiness negatively affect the implementation of alternative assessment practices. Representative excerpts from teachers' statements on this issue are presented below:

"Students have difficulty understanding the process of alternative assessment, and I always feel the need to explain it to them. Although I try to adapt to their level, I still find it challenging." [T4]

"Students' lack of interest in the lesson and their unwillingness to read negatively affect the learning process." [T7]

"Students' lack of motivation negatively impacts the process." [T13]

The findings of this research reveal that teachers predominantly adopt alternative and student-centered approaches to classroom assessment. This demonstrates that teachers tend to embrace an assessment orientation that is not solely outcome-based but also process-oriented, taking individual differences into account and aiming to monitor students' development. These results are consistent with the findings from the quantitative phase of the study regarding teachers' classroom assessment beliefs.

Teachers' views indicated that the alternative assessment process encompasses a wide range of multidimensional tools, including projects, portfolios, self- and peer assessment, process-based assessment, rubrics, concept maps, drama, observation, product files, and digital tools. Teachers who adopted this approach described alternative assessment as a structure that supports learning, guides instruction, and provides high-quality feedback. Nevertheless, teachers who adopted student-centered and process-centered alternative assessment approaches reported encountering implementation-related challenges.

Factors such as time constraints, overcrowded classrooms, and intensive curriculum content were identified as barriers to the effective implementation of alternative assessment practices. In addition, teachers highlighted student-related problems that negatively affected the process. Low motivation, lack of attention, insufficient interest, and inadequate readiness were identified as significant factors reducing the effectiveness of the assessment process.

Question 2: What are teachers' views regarding the assessment approach of the current curriculum?

Within the scope of this research question, teachers' perceptions and evaluations of the assessment approaches embedded in the current curriculum were systematically examined. Particular attention was given to their positive and negative evaluations of assessment processes, the challenges they encounter in classroom practice, and their views on the extent to which the curriculum effectively supports student-centered, performance-based, and process-oriented assessment. In this regard, the study aimed not only to identify the strengths of the existing curriculum but also to highlight its limitations from the perspective of practitioners who implement assessment practices.

Furthermore, teachers' feedback regarding the implementation of assessment practices was explored in depth, providing insight into both structural and pedagogical issues that influence the feasibility of these approaches in real classroom settings. The qualitative data were analyzed using content analysis, through which themes, sub-themes, and codes were generated based on recurring patterns and commonalities in teachers' responses. This thematic categorization enabled a multidimensional understanding of teachers' perspectives, offering a more nuanced picture of how assessment approaches are interpreted, experienced, and operationalized in practice.

The findings derived from this analysis were systematically organized and are presented in Table 9, thereby clearly demonstrating the thematic structure and its alignment with the broader aims of the study.

Table 9

Teachers' Views on the Assessment Approach of the Current Curriculum

Theme	Sub-Theme	Codes	*f*
Assessment Approaches	Alternative / Process-Oriented Approaches	Projects, performance tasks, portfolios, self/peer assessment, process-based assessment, rubrics, concept maps, drama, observation, digital tools, product files	20
	Traditional Approaches	Written/oral quizzes, tests	12
Implementation Methods	In-Class Practices	Written/oral quizzes, classroom observations, short written/oral assessments, quizzes, peer assessment	18
	Standardized Practices	Ministry of National Education (MoNE) centralized exams, national standardized tests	8
	Individual Practices	Portfolios, self-assessment, peer assessment	6
Challenges Encountered	System-Related Challenges	Lack of time, overloaded curriculum, insufficient materials	22
	Student-Related Challenges	Lack of interest, low motivation, insufficient readiness, diverse needs, inadequate higher-order skills	20
	Challenges During the Assessment Process	Lack of objectivity in evaluating open-ended questions, overcrowded classrooms, increased teacher workload	14
	Challenges Stemming from Inadequate	Inadequate assessment tools, implementation constraints, limited applicability, insufficient in assessing higher-order skills	7
	No Challenges	No difficulties encountered	1
Suggestions and Areas for Improvement	Flexibility and Diversity	Use of different methods, individualized assessment	10
	Technological and Resource Support	Utilization of digital tools, provision of materials, training opportunities	7
	Ease of Implementation	Reducing teacher workload, practical assessment tools	5

Table 9 shows that the majority of teachers (f = 20) believe that the assessment approach in teaching programs is grounded in alternative, process-oriented practices. This finding suggests that teaching programs have adopted a contemporary perspective on assessment, emphasizing the learning process and employing tools such as projects, performance tasks, portfolios, self-assessment, rubrics, concept maps, and mind maps. Nevertheless, it is evident that traditional assessment approaches and instruments (e.g., written and oral quizzes and tests) remain important in the teaching process and widely practiced (f = 12). According to teachers' views, this indicates that although teaching

programs emphasize alternative or contemporary approaches, they continue to incorporate traditional practices as well. At this point, some teachers expressed the following opinions:

"I think that with the most recent curriculum change in Turkish Language and Literature, assessment has become more inclusive and process-oriented." [T14]

"The program has adopted a skill-based assessment approach." [T8]

"Recently, there has been increased adoption of student-centered, process-oriented, and multidimensional assessment approaches." [T18]

According to teachers, the most commonly employed form is classroom-based assessment (f = 18). In this approach, tools such as written and oral tests, classroom observations, quizzes, and peer assessment are particularly prominent. Teachers also noted that some assessments are administered via common or centralized examinations. In contrast, individual assessment tools (e.g., self-assessment, portfolios) appear to be used less frequently. Some teachers' views on this issue are presented below:

"I use a variety of assessment tools." [T3]

"After teacher-centered instruction has been delivered, students are assessed orally or in writing to prompt them to reflect on what they have learned." [T21]

"When exam dates in the annual plans are taken into account, common exams are administered on the same date to all students at the same grade level." [T28]

"As a second-grade teacher, I try to do more individual assessments, like portfolios." [T25]

Teachers also reported encountering numerous challenges in implementing the assessment processes of the current curriculum. At this point, multidimensional problems were identified, including system-, student-, and process-related issues. System-related challenges (f = 22) were identified as a lack of time, curriculum overload, and shortages of instructional materials. Student-related challenges (f = 20) included a lack of motivation, limited interest, and low readiness. Process-related challenges (f = 14) were described as difficulties in ensuring objectivity when evaluating open-ended questions, time pressures in overcrowded classrooms, and increased teacher workload. Based on these difficulties, some teachers (f = 7) expressed the view that the assessment approaches and practices within the current curriculum are inadequate and should be improved. Conversely, one teacher (f = 1) reported that they did not experience any problems in practice. Teachers' views on this issue are presented below:

"I experience problems, such as a lack of materials and time constraints." [T8]

"Because of students' lack of interest and unwillingness to participate, they do not take the process seriously and, as a result, we cannot carry out assessment and evaluation as intended." [T5]

"Conducting fair assessments of open-ended exam questions is difficult; therefore, achieving reliable assessment is challenging." [T3]

"I consider it is inadequate. It should be conducted more frequently and more holistically." [T4]

"I don't encounter many problems." [T26]

Teachers also offered several recommendations, in line with the curriculum, regarding the challenges encountered in the assessment process. In this regard, they emphasized the need for assessment and evaluation practices to be more flexible, diverse, technology-supported, and easier to implement. Suggestions such as the integration of diverse methods, the expansion of opportunities for individualized assessment, and the use of digital tools reflect teachers' expectations for innovation in enhancing the implementation process. Some teachers' views on this issue are presented below:

> *"The general framework is sufficient, but there should be more flexibility in practice." [T13]*
>
> *"Digital tools should be integrated into the assessment and evaluation process." [T22]*
>
> *"Solutions should be sought to reduce the teacher's workload in assessment and evaluation practices." [T30]*

These findings indicate that while teachers are generally open to employing alternative assessment tools, they encounter substantial challenges in practice due to various contextual and systemic factors. Such difficulties highlight a critical misalignment between the intentions of contemporary, student-centered assessment frameworks and the realities of classroom implementation. At this point, it is essential both to strengthen the system with adequate resources and support for teachers and to promote the adoption of student- and process-oriented, alternative or contemporary assessment practices.

Question 3: What are teachers' views on the impact of national examinations on classroom assessment practices?

In the qualitative phase of the study, the researchers specifically investigated teachers' perspectives on the influence of national examinations on classroom assessment processes. In this context, the study sought to capture not only teachers' general evaluations but also the ways in which these high-stakes examinations shape their instructional decisions, assessment strategies, and classroom practices. The analysis aimed to reveal how teachers perceive the alignment, or misalignment, between national assessment policies and the pedagogical demands of student-centered, formative, and process-oriented classroom evaluation.

The qualitative data were systematically analyzed through content analysis, allowing for the identification of recurring patterns and critical insights embedded in teachers' responses. Emerging perspectives were then organized into overarching themes, sub-themes, and codes, providing a structured framework to interpret the complexities of teachers' views. This thematic structuring facilitated a deeper understanding of the extent to which national examinations serve as either supportive or constraining forces in the implementation of classroom assessment practices. The findings from this analysis were categorized and are presented in Table 10, which offers a comprehensive overview of how teachers evaluate the role of national examinations in shaping classroom assessment approaches.

Table 10

Teachers' Views on the Impact of National Examinations on Classroom Assessment Practices

Theme	Sub-Theme	Codes	*f*
Positive Effects	Standardization and Objectivity	Ensuring standardized assessment; conducting objective measurement	9
	Motivation and Discipline	Enhancing students' motivation; fostering self-discipline	7
Negative Effects	Orientation Toward Rote Learning	Encouraging rote memorization; weakening creativity, critical and reflective thinking; undermining written and oral expression skills	17
	Causing Stress and Anxiety	Increased test anxiety; heightened stress levels	11
	Limitations and Misalignment	Restricting classroom-based assessment; ignoring individual differences; misalignment between classroom assessment and centralized exam questions	15
Challenges Encountered	Lack of Feedback	Inadequacy of feedback, Lack of feedback	9
	Traditional Nature of Assessment Tools	Dominance of multiple-choice questions; neglect of open-ended items; reliance on traditional assessment tools	7
	Reduction of Teacher Autonomy	Limiting teachers' roles and decision-making in assessment processes	5
	Deficiencies	Inadequacy of assessment tools; limitations in application; insufficient evaluation of higher-order thinking skills	6
	Adaptation Problems	Students' difficulties adapting to centralized exams; misalignment between curriculum assessment approaches and exam requirements; neglect of untested subjects	15
	No Problems	No issues encountered	2

Table 10 shows that teachers evaluated the effects of centralized exams on the classroom assessment process as both positive and negative, and highlighted problems associated with these exams. Teachers indicated that centralized exams contribute to fairness and consistency in assessment, because they are administered to all students under equal conditions, ensure objectivity, and provide a standardized evaluation. Furthermore, they noted that such exams foster work motivation and self-discipline among students (*f* = 22). Some illustrative teacher statements on this issue are presented below:

"Centralized exams ensure objective, reliable assessment results." [T3]

"Since the same questions and assessments are administered in all schools through centralized exams, they have a positive effect on objectivity." [T21]

"Students who will take centralized exams show greater willingness and attentiveness during classroom assessment activities." [T5]

Several participating teachers also highlighted the negative effects of centralized examinations. Teachers who expressed critical perspectives emphasized that such exams tend to encourage rote learning among students (f = 17), increase test-related stress and anxiety (f = 11), and have inherent limitations that hinder comprehensive assessment. Furthermore, they noted a misalignment between classroom-based assessment practices and the structure of centralized examinations (f = 15). Below are some illustrative comments from teachers on this issue:

"It makes us turn teaching into a test-focused process, pushing important skills like critical thinking and creativity into the background." [T23]

"In centralized examinations, alternative assessment tools are marginalized. Students experience test anxiety, and their focus shifts toward surface-level and rote learning." [T17]

"Overall, it has a negative effect. Even though the curriculum requires us to adopt a skill-based assessment approach, the centralized exams still rely on multiple-choice questions." [T8]

A content analysis of teachers' views indicates centralized examinations pose several challenges to classroom assessment processes. One of the most frequently emphasized issues is the misalignment between the assessment orientation of the current curriculum and that of centralized exams, which creates adaptation problems, such as students' difficulties aligning with exam expectations and a lack of interest in subjects not included in centralized assessments (f = 15). In addition, the lack of feedback (f = 9) emerged as a significant problem; teachers reported that students do not receive sufficient or high-quality feedback within assessment processes. The traditional nature of assessment tools (f = 7) was also frequently highlighted, with teachers noting that the reliance on multiple-choice tests in centralized exams limits the use of diverse assessment methods. Under the theme of inadequacies (f = 6), teachers pointed to shortcomings in the quality of assessment tools, difficulties in implementation, and insufficient evaluation of higher-order skills. Furthermore, under the theme "reduced teacher autonomy" (f = 5), teachers expressed concerns that their decision-making authority in the assessment process is being restricted. Finally, although a small number of teachers (f = 2) reported no issues in this regard, this proportion of teachers was notably low. Overall, these findings demonstrate that teachers articulate the challenges that centralized examinations pose to classroom assessment processes across multiple dimensions. Selected teachers' statements reflecting these concerns are presented below:

"Centralized exams usually delay the provision of feedback. This makes it more difficult for students to understand their results quickly and to make improvements." [T1]

"They influence the teacher's instruction and limit the use of classroom assessment tools." [T13]

"In centralized exams, learning outcomes are often overlooked, assessment tools are standardized, and summative evaluations are used instead of developmental evaluations." [T23]

"They cause students to prioritize exam-focused topics and neglect subjects not assessed by the exam. Students also want the exams to be administered mainly in multiple-choice format." [T10]

The findings reveal that teachers face various challenges related to the impact of centralized examinations on classroom assessment. According to participating teachers, the most frequently emphasized issues include the dominance of standardized exam structures that do not allow monitoring of students' individual development, the insufficient incorporation of process-oriented assessment approaches, and the consequent inadequacy of feedback practices. Teachers reported that due to the decisive influence of centralized examinations, they are often compelled to use traditional assessment tools that measure short-term success. In this context, the widespread use of methods that assess limited levels of knowledge —such as multiple-choice tests and true–false questions— has been reported to have a negative effect on teachers' motivation to employ alternative assessment tools. Furthermore, the exam-driven system was frequently noted to restrict teacher autonomy, making it difficult for teachers to design assessment strategies consistent with their pedagogical orientations. This reflects a misalignment between curriculum objectives and exam-focused practices, leaving teachers caught between the two. In particular, teachers emphasized that their attempts to assess students' higher-order thinking skills and creativity are undermined by the rigid structure of the examination system.

Question 4: What are teachers' views regarding the assessment and evaluation practices implemented by The Ministry of National Education (MoNE) of Türkiye starting from the 2023–2024 academic year?

Regarding this research question, teachers' views on the new assessment and evaluation practices introduced by the Ministry of National Education (MoNE) of Türkiye, effective in the 2023–2024 academic year, were systematically examined. In this regard, the study aimed to capture teachers' perceptions of both the intended pedagogical objectives of these practices and the practical challenges encountered during their classroom implementation. Particular attention was given to how these reforms were interpreted in relation to student-centered, process-oriented, and competency-based assessment approaches.

The qualitative data obtained from participating teachers underwent in-depth content analysis, through which recurring patterns were identified and systematically organized into overarching themes, sub-themes, and codes, as presented in Table 11. This analytical framework provided a structured lens through which teachers' perceptions, classroom experiences, and critical evaluations regarding these new practices could be explored multidimensionally. In doing so, the analysis not only highlights teachers' positive and negative evaluations but also offers insights into the broader implications of MoNE's reforms for classroom practice and assessment culture.

Table 11

Teachers' Views on the Assessment Practices Implemented by the Ministry of National Education Starting from the 2023–2024 Academic Year

Theme	Sub-Theme	Codes	*f*
Advantages	Development of Thinking Skills	Critical thinking, creative thinking, analysis-synthesis, interpretation, independent thinking, original thinking	18
	Development of Expressive Skills	Self-expression, written expression, language skills, imagination development	15
	Development of Self-confidence and Motivation	Increased self-confidence, generating original ideas, motivation to learn	8
	Contribution to the Learning Process	Moving away from rote learning, meaningful learning, deep learning, reinforcement of knowledge	12
Disadvantages	Assessment Challenges	Lack of objectivity, inconsistency in scoring, time-consuming practices	22
	Process-related Problems	Lack of gradual transition, misalignment with centralized exams, lack of rubrics	17
	Student Adaptation Problems	Lack of writing skills, difficulty in self-expression, anxiety, unfairness, challenges for disadvantaged students, students' readiness levels, misalignment with centralized exams	10
Proposed Solutions	Mixed Question Types	Combining open-ended and multiple-choice questions, ensuring variety in item types	7
	Gradual Transition	Preparation process starting from primary school, beginning from grade 5	5
	Training Support	Rubric guidance, sample applications, in-service training	4
	No Problems	No problems encountered	5

Table 11 shows that teachers evaluated the new assessment and evaluation practices introduced by the MoNE in the 2023–2024 academic year in terms of advantages and disadvantages and offered solution-oriented suggestions for identified drawbacks. Teachers reported that these practices contributed to the development of students' thinking skills (*f* = 18), expressive skills (*f* = 15), self-confidence and motivation (*f* = 8), and overall learning processes (*f* = 12). In particular, teachers emphasized that open-ended examinations enhanced students' critical thinking, creativity, analytical-synthetic reasoning, and interpretive abilities. Furthermore, they noted that open-ended questions strengthened students' written expression, self-expression, and language skills. Beyond these cognitive and linguistic benefits, teachers also highlighted that the practices fostered students' self-

confidence and learning motivation. Additionally, teachers emphasized that these practices, particularly common examinations, encouraged meaningful learning and reinforced knowledge retention. Selected teacher statements related to this issue are presented below:

> *"Overall, it's positive. I think it substantially helps students develop their thinking skills." [T13]*
>
> *"This practice improves not only students' knowledge but also their thinking skills, analytical skills, and expressive skills. It enhances their ability to articulate their thoughts." [T17]*
>
> *"In written exams, it helps students distinguish, classify, and clearly define knowledge, and this also boosts their confidence in social interactions." [T14]*
>
> *"It encourages understanding-based learning, develops higher-order thinking skills, improves writing and language abilities, and fosters creativity and original thinking." [T23]*

The participating teachers also highlighted several disadvantages of the assessment and evaluation practices implemented by the MoNE beginning in the 2023–2024 academic year. Teachers who reported disadvantages emphasized that these practices involved notable challenges in the assessment process (f = 22), in implementation (f = 17), and in student adaptation (f = 10). One of the most frequently mentioned problems was the lack of objectivity and the time-consuming nature of the scoring process. Additional concerns included students' inadequate writing skills, lack of familiarity with such practices, difficulties among disadvantaged students, and insufficient readiness. Furthermore, teachers pointed to the neglect of individual differences and the misalignment between classroom-based practices and centralized examinations as important drawbacks. Selected teacher statements reflecting these concerns are presented below:

> *"The use of open-ended written exams makes it difficult to ensure objectivity and to achieve consistent, valid assessment." [T3]*
>
> *"There is insufficient time for practical examinations. Additionally, issues such as the lack of rubrics and sample assessments—even when alternative assessment tools are used— have arisen." [T8]*
>
> *"Students who struggle with writing sometimes submit illegible answers, which makes it difficult to grade them objectively." [T30]*
>
> *"It pushes anxiety levels substantially higher than they should be." [T2]*

Teachers also provided several suggestions to address limitations in the assessment and evaluation practices introduced by the MoNE in the 2023–2024 academic year. These recommendations included use of mixed question types (f = 7), gradual transition to the new system (f = 5), and professional development opportunities to support teachers through targeted training (f = 4). Teachers particularly emphasized the integration of open-ended and multiple-choice questions as a combined approach. Five participants reported no suggestions (f = 5). Teachers noted that implementing these proposals would not only allow for more effective measurement of higher-order thinking skills but also ease the assessment process for educators. Furthermore, they suggested that the gradual introduction of these practices, beginning in the early grades of primary school, would help students adapt more smoothly to the system, with a stronger emphasis recommended from grade 5 onward. Additional suggestions highlighted the need for guidance in rubric development and use,

the provision of sample applications, and continuous support through in-service training programs. A small number of teachers refrained from providing opinions or recommendations, which may indicate either a neutral stance toward the implementation or limited knowledge of the practice. Selected teacher statements regarding these recommendations are presented below:

> *"It's not right to be limited like this. There should be mixed assessments (open-ended and multiple-choice), not just open-ended ones." [T9]*
>
> *"I think it should be implemented gradually. It should not be applied to all grade levels at once. It should have started in the fifth grade." [T18]*
>
> *"Teachers should be given in-service training on this issue." [T31]*
>
> *"Problems such as the lack of rubrics and sample assessments have emerged. Teachers should receive guidance on this." [T22]*

According to participating teachers, the assessment practices introduced by the Ministry of National Education in the 2023–2024 academic year offer significant pedagogical benefits, particularly by contributing to the development of students' higher-order thinking skills. However, the challenges encountered during the implementation process, most notably the ambiguity in scoring practices and students' lack of readiness, are noteworthy. These findings underscore the importance of providing teachers with training, rubric support, implementation guidelines, and sustained guidance services.

DISCUSSION AND CONCLUSION

In this study, teachers' beliefs about classroom assessment and their perspectives on the assessment process were examined through a holistic approach that integrated quantitative and qualitative data analyses. The findings revealed that teachers generally hold positive beliefs toward alternative, student-centered, and learning-oriented assessment approaches. However, the results also indicated that various individual, institutional, and systemic factors hinder the transformation of these beliefs into actual classroom practices.

The findings of this study indicate that teachers predominantly adopt student-centered, process-oriented, and learning-supportive assessment approaches, highlighting the role of alternative assessment tools in fostering students' holistic development. This is consistent with research that frames assessment as a means to guide and enhance learning (Black & Wiliam, 1998; Stiggins, 2005). However, practical barriers such as time constraints and low student engagement often hinder effective implementation. Similar challenges were reported by Önel et al. (2020) and Ghania and Mokhtar (2018), who found that teachers frequently felt unprepared to implement alternative methods. The relatively high adoption observed in this study may reflect the complex and multidimensional nature of alternative assessment (Warman et al., 2021). Likewise, low assessment literacy among preservice teachers (Gül, 2011) and the limited use of alternative methods by practicing teachers (Göğebakan, 2025) point to a continuing need for professional training.

The findings indicate that teachers' beliefs about assessment do not differ significantly by gender. This result is consistent with studies in Türkiye and internationally, which report no gender-based differences in classroom assessment beliefs or practices (Kılıç, 2020; Oppong et al., 2023; Özdemir, 2010; Uysal & Yumuşak, 2018). These studies emphasize that assessment practices are shaped primarily by professional development rather than demographic characteristics. Supporting this finding, Göğebakan (2025) found no gender-related differences in the use of alternative methods among physical education teachers. Collectively, the literature suggests that assessment beliefs are more strongly influenced by educational and structural factors than by gender. However, contradictory evidence exists. Some studies report that gender significantly affects teachers' assessment beliefs (Avan et al., 2019; Barçin, 2019; Hursen & Birkollu, 2019; İzci & Caliskan, 2017; Şimşek, 2022). Such inconsistencies may stem from contextual variables, including sample characteristics, institutional settings, professional experience, and the extent of in-service training, which likely account for divergent outcomes across studies.

The findings indicate that teachers' beliefs about assessment do not differ significantly across subject areas, suggesting that classroom and subject teachers share similar pedagogical orientations. This result aligns with earlier studies reporting no substantial disciplinary differences (Avan et al., 2019; Nazlıçiçek & Akarsu, 2008; Özdemir, 2010). Some research, however, reports limited variation in specific dimensions or measures. For instance, Avan et al. (2019) found differences in the affective dimension favoring science teachers; Bayram (2011) reported subject-related differences in competencies; and Özdemir (2010) noted that classroom teachers considered themselves more competent in portfolios and in self- and peer-assessment, whereas subject teachers emphasized projects and performance tasks. Yet, these differences were not statistically significant across all tools, indicating that a broadly shared belief system prevails. This convergence may stem from the standardized structure of teacher education programs in Türkiye and national curriculum regulations, which, together with centralized examinations, appear to foster a common approach to assessment across disciplines.

The findings reveal significant differences in teachers' assessment beliefs based on educational background. Teachers with graduate-level education were more receptive to alternative approaches, whereas those with only undergraduate degrees relied more on traditional tools. This suggests that advanced academic training, by fostering theoretical knowledge, critical thinking, and exposure to contemporary techniques, can diversify assessment perspectives. These results align with previous studies reporting that teachers with higher qualifications not only employ alternative assessment tools more frequently but also demonstrate stronger self-efficacy in their use (Aksoy, 2018; Baş & Beyhan, 2016; Kılıç, 2020). However, contradictory evidence exists. For example, Bağrıaçık (2025) found no significant differences in assessment literacy among ICT teachers across education levels. Such inconsistencies imply that the relationship between educational background and

assessment beliefs may be influenced by contextual factors, including specialization, institutional culture, and opportunities for professional development.

Teachers with graduate-level education are generally more receptive to alternative assessment approaches, a tendency that is linked to their advanced pedagogical knowledge, exposure to contemporary educational paradigms, and stronger critical thinking skills (Brookhart, 2011; Stiggins, 2007). Higher academic attainment thus fosters the adoption of more constructivist and student-centered assessment practices. Research further shows that graduate-trained teachers are more inclined toward critical thinking, problem solving, and innovative evaluation methods (Popham, 2011; Kahl et al., 2013). They are also more likely to employ alternative tools, such as portfolios, self- and peer assessment, and project-based evaluations, which facilitate monitoring students' development and aligning instruction accordingly (Nitko & Brookhart, 2011). By contrast, teachers with only undergraduate-level training tend to rely on traditional assessment tools such as multiple-choice and short-answer tests. As McMillan (2008) emphasizes, without sufficient theoretical and practical preparation, teachers often default to familiar practices and reduce assessment to grading rather than using it to support learning.

The findings revealed significant differences in teachers' beliefs about traditional and alternative assessment approaches based on teaching experience. Experienced teachers tended to emphasize traditional tools, while less experienced teachers were more open to process-oriented and student-centered alternatives. Aksoy (2018), Kılıç (2020), and Duran (2017) reported similar results, finding that veteran teachers relied more on traditional practices. Bayram (2011) also identified differences in the frequency of using alternative methods, and Göğebakan (2025) observed variations among physical education teachers according to length of service. Conversely, Bağrıaçık (2025) found no significant relationship between ICT teachers' seniority and assessment literacy. International evidence mirrors these patterns: Al-Nouh et al. (2014) reported that less experienced teachers in Kuwait were more receptive to innovative assessment practices and felt more competent in applying them. Overall, these findings suggest that seniority shapes assessment beliefs through accumulated experience, exposure to instructional approaches, and systemic changes. Sustaining alternative practices requires engaging teachers at all career stages in ongoing professional development and supporting their adoption of contemporary strategies.

The findings indicate no significant differences in teachers' beliefs regarding alternative assessment across educational levels. This contrasts with Kılıç (2020), who reported greater competence among primary school teachers, and with Baş and Beyhan (2016), who found stronger self-efficacy at the primary level. In this study, variation emerged only in traditional assessment beliefs: middle-school teachers expressed stronger traditional assessment orientations than primary- or high-school teachers. Such differences may reflect curriculum structures, student profiles, institutional expectations, and assessment cultures specific to each level. The dominance of exam-oriented practices and high-stakes testing pressures at the middle school level likely reinforces reliance on

traditional methods. Supporting this, Alnıaçık (2025) reported widespread negative views among teachers toward the "High School Placement Exam" (LGS), underscoring its influence on assessment practices. Overall, the results suggest that educational level shapes teachers' traditional beliefs more than their alternative beliefs. Future research should examine school-level pedagogical contexts in greater depth to clarify their role in shaping assessment orientations.

The qualitative findings reveal that although teachers hold positive attitudes toward process-oriented and multidimensional alternative assessment, they face structural, organizational, and student-related barriers in practice. Commonly reported challenges, including time constraints, large class sizes, a lack of materials, and low student engagement, are consistent with earlier studies (Bayat & Şentürk, 2015; Demir & Akyürek, 2025; Eker & Yıldırım, 2025; Yıldız & Genç, 2016). These barriers highlight the need for supportive resources, such as guidance materials and digital tools. Similar difficulties have been reported internationally: Nasri et al. (2010) found that teachers in Malaysia and Brunei valued alternative assessment but considered it burdensome due to paperwork and workload, while Janisch et al. (2007) noted that U.S. teachers struggled with limited time, resources, and student motivation. In the Turkish context, Deniz (2023) emphasized comparable challenges and recommended aligning national examinations with alternative practices, strengthening ministerial support, and promoting graduate-level training to enhance teachers' expertise.

The findings indicate that although most teachers express favorable views toward alternative assessment, they encounter structural and student-related barriers in practice. Strengthening teacher support and fostering student motivation may enhance the effectiveness of these practices. Accordingly, policy adjustments, institutional support, and greater resource allocation are needed to enable teachers to integrate alternative assessment more effectively. Such measures would promote fairer, more multidimensional, and higher-quality evaluations of learning. Despite curricular emphasis on student-centered, process-oriented assessment, traditional tools —particularly written exams— continue to dominate classroom practice. This misalignment creates tensions in teachers' pedagogical beliefs and discourages the use of innovative approaches. Similar findings in prior research highlight that while curricula theoretically promote alternative assessment, traditional methods remain prevalent in practice (Baş & Beyhan, 2016; Korkmaz & Kaptan, 2003). Overall, these results suggest that teachers' practices are strongly constrained by exam-oriented systems.

Within the "Türkiye Century Education Model" [Türkiye Yüzyılı Maarif Modeli (TYMM)], multiple assessment methods are embedded for each learning outcome to evaluate the teaching and learning processes. Although teachers are encouraged to adapt these methods to their instructional practices, implementing an assessment at the end of each instructional process is mandatory. The aim is to ensure active student participation, to identify learning gaps promptly, and to support remediation (MoNE, 2024). To achieve a holistic evaluation of student performance, teachers are expected to use diverse tools, such

as portfolios, projects, performance tasks, presentations, checklists, examinations, observations, interviews, surveys, role-playing, group work, and reflective writing, as well as self-, peer-, and group assessments (MoNE, 2025). Expanding the use of alternative approaches, particularly self- and peer-assessment, can strengthen program effectiveness by fostering students' individual development. However, teachers' limited competence in applying these methods may constrain the implementation of these methods. Thus, enhancing professional development opportunities is essential for supporting the effective integration of alternative assessment strategies (Güneş & Alıcı, 2025).

In conclusion, while teachers generally endorse the contemporary assessment orientation of the curriculum, they emphasize that it is not fully reflected in classroom practice (Deniz, 2023; Yıldırım, 2024). Structural, pedagogical, and time-related constraints limit the effective use of student-centered, process-oriented approaches, thereby contradicting the role of assessment as both a measure of achievement and a tool to enhance learning (Cauley & McMillan, 2010). Strengthening teachers' competencies and integrating alternative assessment methods into instruction are therefore essential, alongside the restructuring of processes to promote student participation and foster a sustainable assessment culture. Teachers also highlighted the dual impact of centralized examinations. Positively, they were observed to promote fairness through objectivity, standardization, and equality, and to foster student motivation and self-discipline. However, teachers emphasized negative consequences, including reinforcement of rote learning, test anxiety, limited feedback, misalignment with curriculum goals, and reduced teacher autonomy. The dominance of multiple-choice formats was also reported to discourage the use of alternative, multidimensional tools.

At the national level, assessment for classification and ranking is primarily conducted through centralized examinations. Designed by central authorities and operating outside teacher–student interactions, these standardized tests often overlook individual differences and serve functions such as rewarding, penalizing, labeling, and allocating educational resources (Blake, 2012). Their standardized structure grants them considerable influence on students' academic and social lives, positioning them as key instruments in shaping education policy and reform. However, this traditional format tends to reinforce conventional practices and to discourage teachers from adopting alternative process-oriented approaches. Empirical studies highlight both benefits and drawbacks. Teachers in Acar and Buldur's (2020) research emphasized that centralized exams ensure objectivity, equality, and parental awareness, but criticized them for fostering rote preparation, discouraging innovative pedagogy, limiting extracurricular learning, and privileging memorization over inquiry. Similarly, Çetin and Ünal (2019) found that teachers aligned objectives, content, and methods with exam demands, relying heavily on expository teaching, test practice, and multiple-choice formats. Such findings echo the broader literature acknowledging both advantages and critiques of centralized exams (Azili & Tutkun, 2021; Buldur & Acar, 2019). Ultimately, the dominance of centralized testing

narrows classroom practices toward exam success at the expense of meaningful learning, problem-solving, and life skills (Kızkapan & Nacaroğlu, 2019). To address this structural misalignment, scholars advocate integrating student-centered, process-oriented, and holistic evaluation practices into centralized systems, thereby enhancing pedagogical flexibility and supporting students' multidimensional development (Altan, 2017; Özdaş, 2019).

In September 2023, the MoNE introduced the Regulation on Measurement and Evaluation (MoNE, 2023a), authorizing common written examinations at the district, provincial, or national levels under the supervision of local education directorates. *The Directive on Written and Practical Examinations (MoNE, 2023b) further required that school-based assessments be administered as written exams consisting of open-ended and short-answer questions.* Qualitative interviews revealed that teachers perceived both benefits and challenges in this new assessment approach. Positively, open-ended examinations have been reported to foster critical and creative thinking, improve expressive skills and self-confidence, and encourage meaningful learning beyond rote memorization. At the same time, teachers highlighted difficulties in ensuring objectivity, time constraints when grading, inconsistencies with centralized multiple-choice exams, the absence of rubrics, and students' limited writing skills and difficulties adapting. To address these issues, they recommended diversifying question types, implementing a gradual transition, and providing stronger professional development opportunities. A minority of teachers, however, reported no substantial difficulties with the system.

Bakırcı et al. (2024) found that teachers viewed MoNE's open-ended questions as effective in fostering higher-order thinking, reading comprehension, and written expression, but raised concerns about students' lack of preparedness, scoring objectivity, and limited response time, which are also reflected in the present study. Similarly, Tozluoğlu and Güven (2025) noted the potential of open-ended items to promote critical and creative thinking, yet criticized their low difficulty and limited discriminative power, which undermine scoring reliability. They recommended developing school-specific item banks, integrating AI-based scoring systems, and expanding in-service training. Teachers in this study also raised concerns about objectivity, suggesting detailed scoring rubrics as a solution. In contrast, Arduç (2024) reported that most teachers opposed using common open-ended exams, a finding that contradicts both this study and earlier research.

In conclusion, this study found that teachers identified the advantages and disadvantages of the open-ended written exam practice introduced by the Ministry of National Education (MoNE) in the 2023–2024 academic year and offered suggestions to address these challenges. While acknowledging its pedagogical benefits, teachers consistently emphasized a fundamental misalignment between open-ended assessments and the multiple-choice format of centralized examinations, underscoring the contradictions this creates. Therefore, it is essential that centralized exams be aligned with both the

assessment philosophy of the national curriculum and the provisions of MoNE's Regulation on Measurement and Evaluation (2023).

The findings also underscore several ethical implications associated with teachers' assessment beliefs, particularly in relation to fairness, student rights, bias, and transparency. Traditional assessment beliefs raise critical concerns regarding justice and equity because test-oriented, uniform evaluation procedures often overlook individual performance differences and may inadvertently disadvantage certain student groups (Brookhart, 2013; Stobart, 2005). Although alternative assessment is generally perceived as more equitable, inconsistent implementation due to contextual constraints can create new ethical challenges, limiting equal access to authentic evaluation opportunities and thereby affecting students' developmental rights (Black & Wiliam, 2009). Inaccurate or inappropriate assessment choices may also influence students' self-confidence, academic progression, and future educational opportunities, highlighting the ethical responsibility teachers have to ensure that their beliefs do not lead to unfair judgments (Popham, 2017). Furthermore, both traditional and alternative approaches entail risks of bias: test-based assessments may reduce students to single-score labels, whereas performance-based assessments can be influenced by subjective teacher judgments unless safeguards are in place (McMillan, 2013). Ethical assessment also requires transparency, as students have the right to understand the criteria on which they are evaluated, but the limited use of alternative assessments in practice restricts students' access to meaningful feedback, essential for learning (Green et al., 2007). These considerations demonstrate that integrating ethical awareness into assessment literacy is vital for promoting fair, unbiased, and learner-centered evaluation practices that align with teachers' pedagogical intentions.

RECOMMENDATIONS

When considered as a whole, the study demonstrates that teachers exhibit highly positive attitudes toward alternative assessment approaches; however, these approaches are not sufficiently implemented in classroom practice due to a range of barriers. This situation highlights the need to reconsider teacher education, curriculum design, school climate, and centralized examinations in a more coordinated manner. Within this framework, both strengthening teachers' professional competencies and addressing systemic contradictions are crucial to ensure the effective use of alternative assessment tools.

Improving teachers' attitudes toward alternative assessment requires a multifaceted strategy, including enhancing individual competencies, providing adequate institutional support, and improving systemic conditions. Consistent with the findings, teachers' assessment practices should be supported not only through in-service training but also through graduate-level programs. Particularly, advanced studies in educational sciences can enrich teachers' theoretical foundations and practical skills, thereby enhancing the quality of classroom assessment processes.

It has been demonstrated that when teachers share their knowledge, instructional experiences, and learning challenges with colleagues and engage in collaborative work, they are likely to improve their teaching practices and thereby facilitate student learning (Atasoy & Yalçın, 2023). Collaboration among teachers in the domain of assessment is likewise crucial for enhancing the consistency, validity, and fairness of assessment practices. Through joint planning, shared reflection, and collective examination of student work, teachers can develop a common understanding of assessment criteria and reduce individual biases. Such collaboration also supports professional learning by enabling teachers to exchange effective strategies, align assessment practices with curricular goals, and foster a more coherent and equitable assessment culture within schools.

LIMITATIONS

The present research is not without its limitations, and these should be taken into account when interpreting the findings. First, the study was conducted with a relatively small sample of teachers, which inherently reduces statistical power and limits the extent to which the results can be generalized to broader teacher populations. Accordingly, the conclusions should be viewed as context-specific rather than universally applicable. Second, the participants were drawn from a single geographical region and shared similar cultural and educational backgrounds. This regional and contextual homogeneity may have shaped participants' perceptions and responses, making it difficult to determine whether the relationships identified in this study would hold across more diverse cultural, institutional, or educational environments. Such factors limit the ability to draw firm conclusions about the stability and validity of the observed patterns in different contexts.

Future research would benefit from employing larger, more heterogeneous, and geographically varied samples, which would allow for cross-cultural comparisons and more robust testing of the relationships examined. Studies conducted in multiple educational systems and cultural settings could provide deeper insights into the generalizability of the findings and contribute to a more comprehensive understanding of the phenomena under investigation.

REFERENCES

Acar, M., & Buldur, S. (2021). High stakes tests through the eyes of science teachers: Positive and negative impacts. *Anadolu Journal of Educational Sciences International, 11*(1), 390-414. https://doi.org/10.18039/ajesi.758369

Aksoy, A. G. (2018). *İlkokul ve ortaokul öğretmenlerinin alternatif ölçme araçları öz yeterliklerinin incelenmesi [Examination of primary and secondary school teachers' self-efficacy about altenative measurement tools]* [Unpublished master's thesis]. Süleyman Demirel University.

Aksu Dünya, B. (2021). Tamamlayıcı/alternatif ölçme ve değerlendirme araç ve yöntemleri [Complementary/alternative assessment tools and methods]. In A. Taşgın (ed.), *Eğitimde ölçme ve değerlendirme [Assessment in education]* (pp. 95-122). Vizetek Publications.

Alnıaçık, S. (2025). *Ortaokul öğretmenlerinin ölçme değerlendirme ve liseye geçiş sistemine yönelik görüşleri [Secondary school teachers's on the assessment and evaluation and high school transition system]* [Unpublished master's thesis]. Atatürk University.

Al-Nouh, N. A., Taqi, H. A., & Abdul-Kareem, M. M. (2014). EFL primary school teachers' attitudes, knowledge and skills in alternative assessment. *International Education Studies, 7*(5), 68-84. https://doi.org/10.5539/ies.v7n5p68

Altan, M. Z. (2017). Standartlaştıran, tek tipleştiren, zarar veren ve mutsuzluğa açılan kapı: TEOG [Standardizing, homogenizing, harmful, and a gateway to unhappiness: TEOG]. *Eğitime Bakış: Eğitim-Öğretim ve Bilim Araştırma Dergisi, 13*(40), 4-14.

Anderson, R. S. (1998). Why Talk About Different Ways to Grade? The Shift from Traditional Assessment to Alternative Assessment. *New directions for Teaching and Learning, 74*, 5-16. https://doi.org/10.1002/tl.7401

Arduç, M. A. (2024). Comparison of the Ministry of National Education common written exam and the teacher written exam and teacher opinions. *EKEV Academy Journal, 99*, 234-249. https://doi.org/10.17753/sosekev.1483026

Atasoy, R., & Yalçın, M. T. (2023). Team innovativeness, teachers' professional practices, and teachers' instructional practices: testing a mediation model. *Türk Akademik Yayınlar Dergisi (TAY Journal), 7*(3), 972-997. https://doi.org/10.29329/tayjournal.2023.610.11

Auerbach, C. F., & Silverstein, L. B. (2003). *Qualitative data: An introduction to coding and analysis.* New York University Press.

Avan, Ç., Akbaş, V., & Gülgün, C. (2019). The attitudes of the teachers towards assessment and evaluation: Kastamonu sample. *Gazi Journal of Education Sciences, 5*(3), 20-31. https://doi.org/10.30855/gjes.2019.05.03.002

Ayden, C., & Gündoğdu, G. (2022). Social e-health readiness measurement tool: An exploratory sequential mixed methods study. *Hacettepe Journal of Health Administration, 25*(3), 533-548.

Azili, E., & Tutkun, Ö. F. (2021). Advantages and limitations of the secondary education center exam (SECE) according to the opinions of middle school teachers. *Journal of Social Research and Behavioral Sciences, 7*(13), 123-146.

Bağrıaçık, G. (2025). *Bilişim teknolojileri öğretmenlerinin ölçme değerlendirme okuryazarlık durumlarının çeşitli değişkenler açısından incelenmesi [Investigation of information technologies teachers' measurement assessment literacy status in terms of various variables]* [Unpublished master's thesis]. Gazi University.

Bakırcı, H., Şevgin Uçar, E., & Genel, Y. (2024). Teachers' opinions on the application of open-ended questions in science lesson evaluations. *International Journal of the Pursuit of Excellence in Education (IJPEE), 4*(1), 1-12.

Barbour, R., & Schostak, J. (2005). Interviewing and focus groups. In B. Somekh & C. Lewin (Eds.), *Research methods in the social sciences* (pp. 41–48). Sage Publications.

Barçin, İ. (2019). *Türkçe öğretmenlerinin ölçme ve değerlendirme sürecini uygulama ve önemseme düzeyleri üzerine bir araştırma (Bitlis ili örneği) [A study on the levels of implementation and assessment of measurement assessment process of turkish teachers the case of Bitlis province].* [Unpublished master's thesis] Yüzüncü Yıl University.

Baş, G., & Beyhan, Ö. (2016). Examination of teachers' self-efficacy perceptions on educational measurement and evaluation in terms of some variables. *Journal of Measurement and Evaluation in Education and Psychology, 7*(1), 18-32.

Bayat, S., & Şentürk, Ş. (2015). Physics, chemistry, biology teachers' views on alternative assessment and evaluation techniques in secondary school. *Amasya Education Journal, 4*(1), 118-135.

Bayram, E. (2011). *The examination of qualifications of teachers for assessment and evaluation* [Unpublished master's thesis]. Hacettepe University.

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability, 21,* 5–31. https://doi.org/10.1007/s11092-008-9068-5

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan 80*(2), 139-144. https://doi.org/10.1177/003172171009200119

Blake, J. E. (2012). High-Stakes testing: A (mis)construed, normalizing gaze. *International Journal of Educational Policies, 6*(1), 5-23.

Brookhart, S. M. (2013). *Grading and group work: How do I assess individual learning?* Association for Supervision and Curriculum Development.

Brookhart, S. M. (2011). *Educational assessment: Principles and practices for effective standards-based instruction* (6th ed.). Pearson.

Brookhart, S. M., & Durkin, D. T. (2003). Classroom assessment, student motivation, and achievement in high school social studies classes. *Applied Measurement in Education,16,* 27-5. https://doi.org/10.1207/S15324818AME1601_2

Buldur, S., & Acar, M. (2019). Middle school teachers' views about high-stakes tests. *Kastamonu Education Journal, 27*(1), 319-330. https://doi.org/10.24106kefdergi.2543

Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2019). *Bilimsel araştırma yöntemleri [Scientific research methods].* Pegem Akademi Publications.

Cauley, K. M., & McMillan, J. H. (2010). Formative assessment techniques to support student motivation and achievement. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 83*(1), 1-6. https://www.doi.org/10.1080/00098650903267784

Chan, K. W., & Elliott, R. G. (2004). Relational analysis of personal epistemology and conceptions about teaching and learning. *Teaching and Teacher Education, 20*(8), 817-831. https://doi.org/10.1016/j.tate.2004.09.002

Creswell, J. W. (2009). *Research design: Qualitative, quantitative and mixed methods approaches* (3rd ed.). Sage Publications.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.

Çardak, Ç. S. (2018). Attitudes of prospective teachers towards measurement and assessment course: Anadolu University example. *Adiyaman University Journal of Social Sciences, 10*(29), 401-453.

Çetin, A., & Ünsal, S. (2019). Social, psychological effects of central examinations on teachers and their reflections on teachers' curriculum implementations. *Hacettepe University Journal of Education, 34*(2), 304-323. https://www.doi.org/10.16986/HUJE.2018040672

Demir, G., & Akyürek, S. (2025). The use of alternative measurement tools by Imam Hatip high school vocational course teachers and the problems they face. *Journal of Erciyes Academy, 39*(2), 499-523.

Deniz, B. F. (2023). *12. sınıf matematik öğretmenlerinin yapılandırmacı ölçme-değerlendirme tekniklerini kullanabilme yeterliklerinin Metfessel-Michael program değerlendirme modeline göre değerlendirilmesi [The evaluation of the qualifications of 12th grade mathematics teachers to use constructive assessment and assessment techniques according to Metfessel-Michael program evaluation model]* [Unpublished master's thesis]. Niğde Ömer Halisdemir University.

Duran, U. (2017). *Sınıf öğretmenlerinin alternatif ölçme değerlendirme yöntemlerinin kullanımına ilişkin öz yeterlik algılarının incelenmesi [The reviev of self-efficacy perceptions of classroom teachers regarding using alternative assessment methods]* [Unpublished master's thesis]. Gaziantep University.

Eker, G., & Yıldırım, Y. (2025). Developmental assessment practices in early childhood education: An analysis of teacher approaches and strategies. *International Journal of Modern Education Studies, 9*(1), 249-271. https://doi.org/10.51383/ijonmes.2025.423

Evin Gencel, İ., & Özbaşı, D. (2013). Investigating prospective teachers' perceived levels of competence towards measurement and evaluation. *Elementary Education Online, 12*(1), 190-201.

Ghania, O., & Mokhtar, K. (2018). Teachers' perceptions of classroom assessment practices in the Algerian primary school. *Journal of Translation and Languages, 17*(1), 93-102. https://doi.org/10.52919/translang.v17i1.550

Green, S. K., Johnson, R. L., Kim, D. H., & Pope, N. S. (2007). Ethics in classroom assessment practices: Issues and attitudes. *Teaching and Teacher Education, 23*(7), 999-1011. https://doi.org/10.1016/j.tate.2006.04.042

Göğebakan, A. (2025). *Beden eğitimi ve spor öğretmenlerinin alternatif ölçme değerlendirme yöntem ve araçlarını kullanma düzeyleri ve karşılaştıkları problemler [The levels of physical education and sports teachers' use of alternative assessment and evaluation methods & tools and the problems encountered during the implementation].* [Unpublished master's thesis]. Necmettin Erbakan University.

Gül, E. (2011). *İlköğretim öğretmen adaylarının ölçme-değerlendirme okuryazarlığı ve ölçme-değerlendirmeye ilişkin tutumlarının belirlenmesi [Preservice elementary teachers assessment literacy and attitude towards assessment].* [Unpublished master's thesis]. Fırat University.

Gunes, I., Dursun, F., & Alci, B. (2025). Analysis of the assessment and evaluation approach in the Türkiye Century Education Model secondary school mathematics curriculum. *Istanbul Education Journal, (2),* 132-159. https://doi.org/10.71270/istanbulegitim.istj.1648231

Haladyna, T. M., Downing, S. M., & Rodriguez, M. C. (2002). A review of multiple-choice item writing guidelines for classroom assessment. *Applied Measurement in Education, 15*(3), 309-334. https://doi.org/10.1207/s15324818ame1503_5

Hursen, Ç., & Birkollu, S. (2019). Determining the relationship between teachers' attitudes towards the use of process-oriented measurement tools and self-efficacy perceptions. *The Folklore/Literature Journal, 25*(97), 440-454.

İzci, K., & Caliskan, G. (2017). Development of prospective teachers' conceptions of assessment and choices of assessment tasks. *International Journal of Research in Education and Science, 3*(2), 464-474. https://doi.org/10.21890/ijres.327906

Janisch, C., Liu, X., & Akrofie, T. (2007). Implementing alternative assessment: Opportunities and obstacles. *The Educational Forum, 71*(3), 221–230. https://doi.org/10.1080/00131720709335007

Kagan, D. M. (1992). Implication of research on teacher belief. *Educational Psychologist, 27*(1), 65-90.

Kahl, S. R., Hofman, P., & Bryant, S. (2013). *Assessment literacy for the 21st century educator.* Assessment Training Institute.

Kılıç, M. Y. (2020). Investigation of teachers' opinions on alternative assessment and evaluation techniques. *International Journal of Current Approaches in Language, Education and Social Sciences, 2*(2), 483-508. https://doi.org/10.35452/caless.2020.26

Kızkapan, O., & Nacaroğlu, O. (2019). Science teachers' opinions about central exams (LGS). *Nevşehir Hacı Bektaş Veli University Journal of ISS, 9*(2), 701-719.

Korkmaz, H., & Kaptan, F. (2005). An investigation on using electronic portfolio for assessing students' development in science education. *The Turkish Online Journal of Educational Technology-TOJET, 4*(1), 101-106.

Lyon, E. G. (2011). Beliefs, practices, and reflection: Exploring a science teacher's classroom assessment through the assessment triangle model. *Journal of Science Teacher Education, 22*(5), 417-435. https://doi.org/10.1007/s10972-011-9241-4

Marland, P. (1998). Teachers' practical theories: implications for preservice teacher education. *Asia-Pacific Journal of Teacher Education & Development, 1*(2), 15-23.

McMillan, J. H. (2013). *Classroom assessment: Principles and practice for effective standards-based instruction* (6th ed.). Pearson.

McMillan, J. H. (2008). *Assessment essentials for standards-based education* (2nd ed.). Corwin Press.

McMillan, J. H., & Nash, S. (2000, April). *Teacher classroom assessment and grading practices decision making.* Paper presented at the annual meeting of the National Council on Measurement in Education, New Orleans, LA.

MoNE [Ministry of National Education]. (2025). *Türkiye Yüzyılı Maarif Modeli öğretim programları ortak metni [The common curriculum framework of the Türkiye Century Education Model].* Ministry of National Education.

MoNE [Ministry of National Education]. (2024). *Türkiye Yüzyılı Maarif Modeli öğretim programları ortak metni [The common curriculum framework of the Türkiye Century Education Model].* Ministry of National Education.

MoNE [Ministry of National Education]. (2023). *Millî Eğitim Bakanlığı Ölçme ve Değerlendirme Yönetmeliği [Ministry of National Education Regulation on Measurement and Evaluation].* Official Gazette, 09/09/2023, Number: 32304.

Nasri, N., Roslan, S. N., Sekuan, M. I., Bakar, K. A., & Puteh, S. N. (2010). Teachers' perception on alternative assessment. *Procedia-Social and Behavioral Sciences, 7*, 37-42. https://doi.org/10.1016/j.sbspro.2010.10.006

Nazlıçiçek, N., & Akarsu, F. (2008). Physics, chemistry and mathematics techers' approaches to assessment tools and their assessment practices. *Education and Science, 33*(149), 18-29.

Nitko, A. J., & Brookhart, S. M. (2011). *Educational assessment of students* (6th ed.). Pearson.

Oppong, S., Nugba, R. M., Asamoah, E., Quansah, N., & Ankoma-Sey, V. R. (2023). Teachers confidence of classroom assessment practices: a case of basic schools in upper denkyira west district, Ghana. *European Journal of Education Studies, 10*(11), 148-159. http://dx.doi.org/10.46827/ejes.v10i11.5063

Ornstein, A. C., & Lasley, T. J. (2004). *Strategies for effective teaching* (4th ed.). The Mcgraw-Hill Companies Inc.

Önel, F., Dalkılınç, F., Özel, N., Deniz, G., Balkaya, T., & Birel, G. K. (2020). How middle school mathematics teachers do measurement and assessment? A case study. *Kastamonu Education Journal, 18*(3), 1448-1459. https://doi.org/10.24106/kefdergi.4113

Özçelik, D. A. (2016). *Ölçme ve değerlendirme [Measurement and evaluation]* (5th ed.). Pegem Akademi Publications.

Özdaş, F. (2019). The evaluation of the teacher and student views on the central placement examination system. *Mukaddime, 10*(2), 688-707. https://doi.org/10.19059/mukaddime.509244

Özdemir, S. M. (2010). Elementary teacher competencies and inservice training needs in alternative measurement and assessment tools. *The Journal of Turkish Educational Sciences, 8*(4), 787-816.

Özenç, M., & Çakır, M. (2015). Exploring primary school teachers' competencies of alternative assessment and evaluation. *Elementary Education Online, 14*(3), 914-933. http://dx.doi.org/10.17051/io.2015.22900

Özeren, E., & Akpınar, B. (2020). Investigation of teachers' epistemological beliefs and measurementevaluation practices in the context of Turkish education system. *Journal of History School, 48,* 3175-3200. http://dx.doi.org/10.29228/Joh.45810

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*(3), 307-332. https://doi.org/10.3102/00346543062003307

Patton, M. (2014) *Qualitative research and evaluation methods* (4th ed.). Sage Publications.

Popham, W. J. (2017). *Classroom assessment: What teachers need to know* (8th ed.). Pearson.

Popham, W. J. (2011). *Transformative assessment in action: An inside look at applying the process.* Association for Supervision and Curriculum Development.

Popham, W. J. (2000). *Modern educational measurement: Practical guidelines for educational leaders*. Allyn & Bacon.

Richardson, V. (2003). Preservice teachers' beliefs. In J. Raths & A. C. McAninch (Eds.), *Teacher beliefs and classroom performance: The impact of teacher education* (pp. 1-22). Information Age Publishing.

Schreier, M. (2012). *Qualitative Content Analysis in Practice.* Sage Publications.

Seferoğlu, G., Korkmazgil, S., & Ölçü, Z. (2009). Gaining insights into teachers' ways of thinking via metaphors. *Educational Studies, 35*(3), 323-335. https://doi.org/10.1080/03055690802648135

Segers, M., & Dochy, F. (2001). New assessment forms in problem-based learning: The value-added of the students' perspective. *Studies in Higher Education, 26*(3), 327-343. https://doi.org/10.1080/03075070120076291

Stiggins, R. J. (2007). Conquering the formative assessment frontier. In J. H. McMillan (Ed.), *Formative classroom assessment: Theory into practice* (pp. 8-28). Teachers College, Columbia University.

Stiggins, R. J. (2005). From formative assessment to assessment for learning: A path to success in standards-based schools. *Phi Delta Kappan, 87*(4), 324–328. https://doi.org/10.1177/003172170508700414

Stobart, G. (2005). Fairness in multicultural assessment systems. Assessment in Education: Principles, Policy & Practice, 12(3), 275–287. https://doi.org/10.1080/09695940500337249

Şad, S. N., & Göktaş, Ö. (2013). Investigation of traditional and alternative measurement and evaluation approaches among teaching staff at higher education. *Ege Journal of Education, 14*(2), 79-105.

Şahin, M., & Uysal, İ. (2013). Analysis of pre-service teachers' self-efficacy perceptions on measurement and evaluation. *Bartın University Journal of Faculty of Education, 2*(2), 190-207. https://doi.org/10.14686/201321987

Şentürk, C., & Baş, G. (2023). Classroom assessment beliefs of teachers: scale validity and reliability study. *Educational Research for Policy and Practice, 22*(2), 301-323. https://doi.org/10.1007/s10671-023-09339-2

Şimşek, V. (2022). Determining the attitudes of RCE teachers towards assessment and evaluation according to different variables. *The Journal of Religious Studies, 25*(63), 553-578. https://doi.org/10.15745/da.1183068

Thomas, M. (2012). Teachers' beliefs about classroom assessment and their selection of classroomassessment strategies. *Journal of Research and Reflections in Education, 6*(2), 103-112.

Thompson, S. J., Benson, S. N. K., Pachnowski L. M., & Salzman, J. A. (2001). *Decision-making in planning and teaching.* Addision-Wesley Educational Publishers Inc.

Tozluoğlu, E., & Güven, S. (2025). Evaluation of country and province-wide exams at secondary level comprising of open-ended questions based on teachers' opinions. *The Journal of International Lingual Social and Educational Sciences, 11*(1), 51-70. https://10.0.133.89/jilses.1679832

Uysal, H., & Yumuşak, G. (2018). Self-efficacy of mathematics teachers' for using alternative assessment approaches. *Electronic Turkish Studies, 13*(11), 1421-1436. http://dx.doi.org/10.7827/TurkishStudies.13348

Üztemur, S. S., & Çetin, M. (2015). Examining social studies teachers' misconceptions in assessment and evaluation and their self-efficacy beliefs. *Anatolian Journal of Educational Leadership and Instruction, 3*(2), 41-67.

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences, 15*(3), 398-405. https://doi.org/10.1111/nhs.12048

Warman, W., Suryaningsi, S., & Mulawarman, W. G. (2021). Overcoming obstacles in implementing 2013 curriculum policy. *Cypriot Journal of Educational Science. 16*(3), 967-980. https://doi.org/10.18844/cjes.v16i3.5770

Windschitl, M. (1999). The challenges of sustaining a constructivist classroom culture. *Phi Delta Kappan, 80*(10), 751-754.

Wormeli, R. (2006). Accountability: Teaching through assessment and feedback, not grading. *American Secondary Education, 34*(3), 14-27.

Yaşar, M. (2014). An investigation of candidate teachers' attitude towards "measurement and evaluation in education" course in terms of some variables. *Trakya University Journal of Education, 4*(2), 64-83.

Yıldız, M., & Genç, M. (2016). Secondary school religious culture and ethic teachers' level of using alternative techniques of measurement and evaluation and the problems which they have encountered. *Journal of Ilahiyat Researches, 45,* 45-80. https://doi.org/10.29288/ilted.304761

Yıldırım, L. (2024). *Din kültürü ve ahlak bilgisi öğretmenlerinin ölçme değerlendirme anlayışları ve dersin merkezî sınavlara dâhil edilmesi hakkındaki görüşleri [Religious Culture and Ethics teachers' understanding of measurement and evaluation and their views on the inclusion of the course in central examinations]* [Unpublished master's thesis]. Ankara University.

Yıldırım, A., & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences].* Seçkin Publications.

Yin, R. K. (2017). *Case study research and applications: Design and methods.* Sage Publications.

Data Availability Declaration

Data Availability Upon Formal Request:

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

All authors, Hasan Şahin and Cihad Şentürk, contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. All authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors declare that there is no conflict of interest regarding the publication of this paper.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements: This article is based on the master's thesis prepared by the first author under the supervision of the second author. The authors would like to express their gratitude to the school administrators who facilitated the data collection process, the teachers who voluntarily participated in the study, and all stakeholders who contributed to the research.

Biographical notes:

Hasan Şahin[4] *:* He is a Religious Culture and Ethics Education teacher at the Turkish Ministry of National Education. He graduated from the Faculty of Divinity at Dokuz Eylül University and earned his master's degree from Karamanoğlu Mehmetbey University. He currently works as a Religious Culture and Ethics Education teacher at a middle school in Karaman, Türkiye.

Cihad Şentürk : He is an associate professor of curriculum and instruction at the Faculty of Education, Karamanoğlu Mehmetbey University, Karaman, Türkiye. He holds a PhD in curriculum and instruction from Necmettin Erbakan University. His research interests include curriculum and instruction, the teaching-learning process, primary education curriculum, learning styles, STEM education and educational research.

Scopus Author Identifier Number: 57193017700

Web of Science Researcher ID: P-6408-2018

Google Scholar Researcher ID: _PW-oqoAAAAJ&hl=tr

[4] Corresponding Author

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Learning Management System Satisfaction and Transactional Distance: Insights from Open and Distance Learners[1]

Havva Buhan[2] **Erhan Ünal** [3]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 651-672
http://www.ijonmes.net

Article Info:

Received 06.08.2025
Revision 01.12.2025
Accepted 08.12.2025

Abstract:

It is crucial to examine learners' perceptions of interaction and their satisfaction with the Learning Management System (LMS), given the inconsistent literature on this relationship. This study aimed to assess open and distance learners' LMS satisfaction, their perceptions of transactional distance, and the association between them. Using a correlational design, data were analyzed from 1,003 learners who completed the Anadolum eCampus System Satisfaction Questionnaire and the Transactional Distance Scale. Results indicated that "read-explore-learn" materials were the most satisfying, while "listen-learn" materials were the least preferred. Although students reported high LMS satisfaction, their perception of transactional distance was moderate. Notably, overall satisfaction was strongly predicted by Learner–Content, Learner–Interface, Learner–Learning Environment, and Learner–Teacher interactions, whereas peer-to-peer interaction did not contribute significantly. These findings suggest that instructional design in distance education should prioritize content and interface accessibility over social interaction to enhance learner satisfaction.

Keywords:
Open and distance education, e-learning materials, interaction, transactional distance, learner satisfaction.

Citation:
Buhan, H., Ünal, E. (2025). Learning Management System Satisfaction and Transactional Distance: Insights from Open and Distance Learners. *International Journal of Modern Education Studies, 9*(2), 651-672. https://doi.org/10.51383/ijonmes.2025.429

[1] This article was produced from the master thesis prepared by the first author under the supervision of the second author.

[2] Master of Science degree, Anadolu University, Open Education Faculty, Eskişehir, Turkey. hbuhan@anadolu.edu.tr, https://orcid.org/0009-0002-3117-2852

[3] Assoc Prof. Dr., Afyon Kocatepe University, Faculty of Education, Afyonkarahisar, Turkey. eunal@aku.edu.tr, https://orcid.org/0000-0002-5349-4193

INTRODUCTION

In contrast to traditional education, distance education allows students to access course materials at any time and from any location (Keegan, 1996; Moore, 1993). However, educational quality can be significantly affected by the structural and interactional challenges faced by distance learners (Bernard et al., 2009; Moore, 1993). Moore (1993) asserts that the main factor influencing psychological and communicative distance in distance education is the alignment between the curriculum's structural arrangements and the learner-teacher dialogue. The Transactional Distance Theory, in this context, emphasises the importance of learner-instructor and learner-content interactions. Additionally, learner-to-learner interactions are crucial for minimising the distance (Moore, 1989a, 1993). Learning management systems (LMS) play a vital role in enhancing the learning experience by facilitating learner-instructor and learner-learner interactions as well as the flexible delivery of content in distance education (Jung et al., 2002; Kurucay & Inan, 2017). Over time, the concept of interaction has evolved alongside advancements in distance education technologies. New dimensions, such as learner-interface interaction (usability and design features of the platform) and learner-learning-environment interaction (technical infrastructure, connection speed, and physical working conditions), have been included in the literature as variables that directly affect both the learning experience and learner satisfaction (Bernard et al., 2009; Hillman et al., 1994; Moore, 1989a, 1993). Students' perceptions of transactional distance can be reduced through all these types of interactions, leading to better learning outcomes in e-courses (Bolliger & Halupa, 2018).

Johnson et al. (2008) stated that learner satisfaction is essential for evaluating e-learning effectiveness. Moreover, factors such as course interactions and perceptions of social presence play a significant role in overall satisfaction. Therefore, learner satisfaction is closely related to the content's quality and the user-friendly design and usability features of the platform delivering that content (Hillman et al., 1994; Jung et al., 2002). Additionally, learners' interactions with each other and with the instructor are important (Kuo et al., 2014). As a result, open and distance learners' learning experiences and perceptions of interaction with the LMS influence their satisfaction with the LMS (Fulford & Zhang, 1993). In particular, learner-instructor interaction enhances learners' experiences. Similarly, learner-content interaction increases learners' satisfaction by facilitating their achievement of learning goals (Zhang, 2003).

In similar studies, Sun et al. (2008) highlighted that dimensions such as learner characteristics, instructor effectiveness, course quality, technology, design, and the learning environment all influence learner satisfaction in e-learning. Gavrilis et al. (2020) conducted a quantitative study examining the relationship between Moore's three dimensions of transactional distance and student satisfaction within a postgraduate distance learning program at the Hellenic Open University. The study confirmed that all three dimensions of transactional distance—student-teacher, student-student, and student-content—were

significantly correlated with student satisfaction, emphasising the utility of Transactional Distance Theory in evaluating distance-education programs. Karaoglan-Yilmaz et al. (2024) found that satisfaction and participation increased, especially when learner-instructor, learner-content, and learner-learner interactions were high. Singh et al. (2024) reported in their study that learner interaction with their peers and instructors are significant predictors of student satisfaction Bolliger and Martindale (2004) state that learner satisfaction in e-learning environments is shaped by several factors, including the instructor, communication (interaction resources), technology, course management, course site, interaction, and general issues. From this point of view, it is important to examine distance learners' perceptions of interaction and satisfaction with the LMS.

Problem Statement

Various institutions, including Anadolu University Open Education System, provide open and distance education. This higher education model has expanded the provision of distance education in Turkey since 1982 by offering undergraduate and associate-degree programs. The rapid growth of online education and the emphasis on continuous learning draw individuals from diverse backgrounds into online courses, resulting in a more complex online learning environment (Yu, 2022). In this context, the "Anadolum eCampus" LMS is the primary platform for course content, exam and homework tracking, and interactive activities. As of December 2, 2024, Anadolu University reported that 988,377 students were enrolled in the Open Education System for the fall 2024–2025 academic year (Anadolu University, 2024). Learners on the Anadolum eCampus LMS have access to various learning resources. This platform enables learners to interact with one another, instructors, the environment, the interface, and the content.

Satisfaction is one of the significant factors affecting the effectiveness and quality of online learning programs (Yukselturk & Yildirim, 2008). Accordingly, it would be beneficial to investigate how students with varying readiness levels in the open education system perceive the e-course materials offered on the platform. Additionally, interaction plays a crucial role in enhancing students' learning experiences (Lin & Wang, 2024). According to Transactional Distance Theory, students who interact with different elements of the learning environment are more likely to engage in effective educational transactions and, consequently, derive greater benefit from online learning (Lin & Wang, 2024). Therefore, the platform's effectiveness is shaped by learners' perceptions and experiences.

In distance education research, transactional distance and satisfaction are inherently examined together . Transactional distance captures the core challenge of the field—the psychological and communicative gap between learners and instructors—while satisfaction represents a key measurable outcome used to evaluate the quality and effectiveness of online instructional environments (Alqurashi, 2019; Gavrilis et al., 2020). The selection of these variables enables researchers to empirically test a central assumption: that reductions in perceived transactional distance—which reflect higher quality and frequency of

interaction—are directly associated with increased satisfaction. This research addresses a critical gap: contradictory findings in the literature regarding which interaction type most strongly predicts satisfaction (e.g., Alqurashi, 2019; Cho, 2011; Tuan & Lan, 2025). This variance suggests that the relationship between different forms of interaction and student satisfaction is multifaceted and context-dependent. Specifically, depending on the nature of the course and the specific characteristics of the learner group, one form of interaction may play a more significant role in predicting satisfaction. Understanding these dynamics is crucial for designing effective distance learning programs, creating course materials, and developing tutor training initiatives. Therefore, it is valuable to examine how open and distance learners' level of satisfaction with the LMS they use relates to their perceptions of transactional distance.

Research conducted at Anadolu University, which holds a prominent position in Turkey and is classified as a Giga university (Bozkurt, 2019), can make significant contributions in several areas. First, given that course materials and LMS facilities have changed since the system's inception (Aydın et al., 2023), examining open and distance learners' satisfaction with the current system warrants investigation. Thus, the research results may contribute to the development of strategies for more effective use of the Anadolum eCampus platform. Second, this research can assist instructional designers in developing various tools and content for learners. Third, it can aid system experts in enhancing the content and user interface of the platform. Ultimately, this research will significantly contribute to the theoretical underpinnings of transactional distance theory and improve open and distance learners' satisfaction with their LMS.

Research Objective

This study aims to assess the satisfaction levels of open and distance learners with the LMS, their perceptions of transactional distance, and the relationship between them. Thus, the following research questions were formulated:

- What are the satisfaction levels of open and distance learners with Anadolum eCampus LMS?
- What are the transactional distance perceptions of open and distance learners?
- Which dimensions of transactional distance significantly predict the satisfaction levels of open and distance learners with Anadolum eCampus LMS?

Conceptual Framework

Transactional Distance Theory

According to Moore (1993), transactional distance refers to the interactional distance between the learner and the teacher. This distance is not merely physical but may also create psychological and communicative gaps between teachers and students. Moore's

Transactional Distance Theory aims to enhance the effectiveness of distance learning designs by exploring how these distances impact the learning process.

Moore (1989) examined interaction across three essential dimensions: learner-content interaction, learner-teacher interaction, and learner-learner interaction. He emphasised the importance of interaction in enhancing the quality and efficiency of the learning process. Thus, interaction is not limited to online learning environments; it also occurs in face-to-face educational settings.

Zhang (2003) provides a more comprehensive evaluation of the learning process by integrating the aspects of interaction identified in Moore's study into Transactional Distance Theory. Zhang divides interaction into five main categories: Learner-Content, Learner-Teacher, Learner-Learner, Learner-Interface, and Learner-Learning Environment. This classification offers a comprehensive approach to interaction, emphasising interpersonal communication, the learning environment, and protocols for technology usage. In this respect, learners' interactions with course content, instructors, other learners, and the learning environment play a critical role in reducing transactional distance.

Learner-Teacher Interaction: This term describes the communication between students and teachers. Guidance, feedback, and motivation are essential elements of this interaction (Moore, 1989a, 1993). Teachers' encouragement of students greatly increases their involvement in online learning. Students can communicate with their teachers using the Anadolum eCampus LMS, which offers tools such as live lectures, emails, and messages.

Learner-Learner Interaction refers to the communication and collaboration that students establish with one another. Discussion boards, group projects, and virtual classroom apps help encourage this interaction (Moore, 1989b). Virtual classrooms and live chat facilitate this interaction in synchronous learning settings. For instance, during live lectures on the Anadolum eCampus LMS, students interact with their classmates and teachers via chat channels. Such an atmosphere enables students to build social relationships, to encourage the development of others' meaning structures, and to create a shared learning experience (Moore, 1989b).

Learner-Content Interaction the learner's interaction with educational materials. It covers their processes of understanding, evaluating, and applying the material (Moore, 1989b). In digital learning settings, a learner's motivation and success can be significantly influenced by their level of engagement with the content. Anadolum eCampus LMS offers a comprehensive range of materials, including eBooks (PDF, HTML5, EPUB), PDF and audio summaries of units, lecture videos, infographics, microanimations, interactive module designs, live lecture recordings, exam questions, question sets, midterm and end-of-semester practice exams, as well as interactive videos and exercises to increase learners' interaction with the content. This wide variety of resources enables learners to access information through different sensory channels, including reading, listening, watching, and

practising, and promotes active engagement with the material and deeper comprehension (Bonk & Zhank, 2006; Moore 1989b).

Learner-Interface Interaction: It refers to the learner's interaction with the e-learning platform or technological tools. The interface consists of components such as menus, buttons, links, icons, and other interactive elements that are visible on the screen. (Çakmak, 2007). The interface includes all the functional and visual elements that allow students to interact directly with the e-learning platform. (Hamutoğlu et al., 2019). This interaction comprises components such as a home page, course menus, buttons providing access to e-learning materials, navigation tools, and feedback mechanisms. To enhance learner-interface interaction, Anadolum eCampus LMS offers a user-friendly platform that is constantly improved based on learner feedback. In this context, the Anadolum eCampus LMS is intended to be user-friendly and is regularly updated to reflect user feedback.

Learner-Learning Environment Interaction: It refers to the learner's interaction with the digital or physical environment. This interaction encompasses the learner's feelings of belonging, harmony, and commitment within e-learning environments (Burnham & Walden, 1997). Anadolum eCampus LMS strengthens this interaction by providing learners with a rich learning environment. This platform provides learners with a wide array of educational materials and interaction tools.

Satisfaction with the LMS

Learner satisfaction, as defined by Astin (1993), refers to the perceived value of the learner's experiences in an educational environment. Paechter et al. (2010) highlight that flexibility in learning processes and the exchange of information among peers positively affect satisfaction. Moreover, learners' e-learning experiences and expectations influence their achievements and course satisfaction. Thus, learner satisfaction influences learning outcomes in online learning (Lin & Wang, 2024) and is a key determinant of the process's success.

The literature reports mixed findings regarding the relationship between learner satisfaction and interaction dimensions. Sher (2009) found that students' satisfaction levels with web-based learning were influenced by their interactions with one another and with their instructors. In another study, Cho (2011) determined that, in an online university program, learner-interface did not affect student satisfaction, whereas learner-content, learner-teacher, and learner-learner did affect student satisfaction. Alqurashi (2019) and Kuo et al. (2013, 2014) also showed that learner-content and learner-teacher interactions were predictors of satisfaction, with the learner-content interaction accounting for the highest percentage of satisfaction. Additionally, a study by Bashir (2019) indicated that students' satisfaction levels with e-learning were correlated with their interactions with the interface. Kara (2021) found that EFL students' perceptions of their satisfaction with online learning were influenced by learner-teacher, learner-learner, learner-interface, and learner-

content interactions. According to Bağrıacık Yılmaz (2023), learner-content and learner-teacher interactions predict satisfaction at a moderate level, while learner-learner interactions predict satisfaction to a lesser extent in online learning environments. In their study on online English courses, Amoush and Mizher (2023) discovered that while learner-learner and learner-content interactions were not significant indicators of satisfaction, learner-technology interaction and learner-teacher contact were significant indicators of satisfaction. Karaoglan-Yilmaz et al. (2024) found a positive relationship between transactional distance and both satisfaction and engagement in a blended learning environment. Lysitsa and Mavroeidis (2024) employed logistic regression and identified self-regulated learning and learner-tutor interaction as the main predictors of student satisfaction in the distance education environment. Tuan and Lan (2025) found that whereas learner-interface and learner-content interactions had no significant impact on student satisfaction, learner-teacher and learner-learner interactions had a significant impact. The literature indicates no consensus regarding the link between types of interaction and satisfaction in online learning environments. Consequently, the current study aims to further explore the relationship between interaction types and student satisfaction in an online learning context.

METHOD

Research Research Model

Correlational research, one of the quantitative research methods, was used in this study. First, the research model was developed to statistically examine learners' satisfaction with the Anadolum eCampus platform in the open and distance education system and their perceptions of transactional distance. Second, the model was designed to investigate the relationships between different interaction types and learners' satisfaction with the Anadolum eCampus platform and to identify which interaction types are most closely associated with satisfaction.

Participants

Based on data published by Anadolu University on December 2, 2024 (Anadolu University, 2024), The study population comprises 988,377 active learners enrolled in Anadolu University's Open Education System during the fall semester of the 2024-2025 academic year. A total of 1059 learners participated in the study using a convenience sampling method. However, as a result of normality analyses performed on the dataset, outliers were removed, and a total of 1003 learner data were included in the analysis. Table 1 presents participants' demographic characteristics, including age, gender, and program type.

Table 1

Demographic Information of Participants

Demographic	Group	n	%
Gender	Male	316	3.5
	Female	687	68.5
	Total	1003	100
Age	18-24 years	292	29.1
	25-34 years	247	24.6
	35-44 years	212	21.1
	45-54 years	167	16.7
	55 years and over	85	8.5
	Total	1003	100
Type of Program Enrolled	Undergraduate	396	39.5
	Associate degree	607	60.5
	Total	1003	100

The participants' gender distribution was 31.5% male and 68.5% female. An examination of the participants' age distribution revealed that the largest group, comprising 29.1% of the total, falls within the 18-24 age range. The other age groups are 25–34 (24.6%), 35–44 (21.1%), 45–54 (16.7%), and 55 and older (8.5%). This distribution indicates that a substantial proportion of the participants are young or adult learners. Additionally, when examining participants' programs of enrollment, 60.5% are enrolled in associate degree programs and 39.5% in undergraduate programs. Therefore, the majority of the study participants are enrolled in associate-degree programs.

Data Collection Tools

The survey consisted of three sections: the Demographic Information Form, the Anadolum eCampus System Satisfaction Questionnaire, and the Transactional Distance Scale. The researcher prepared a Demographic Information Form to collect information on the participants' gender, age, and program type.

The Anadolum eCampus System Satisfaction Survey was developed by the Learning Technologies Department at Anadolu University, and its validity and reliability were tested (Aydın et al., 2023). The survey items consist of statements that reflect learners' views of the system, their evaluations of the course, and their perceptions of the system's contributions. Participants rated each item based on a five-point Likert-type scale. The second section of the survey aimed to measure respondents' frequency of use of the course materials provided

through the Anadolum eCampus System, as well as their satisfaction with these materials. These materials were categorised under four main groups: “Read, Explore, Learn”; “Watch, Learn”; “Try, Learn”; and “Listen, Learn”. Cronbach’s alpha coefficient (α) was computed to assess the survey’s reliability; the total scale yielded a value 0.977. This value shows that the scale has a high level of internal consistency (Büyüköztürk, 2017).

The scale was developed by Zhang (2003) to measure the level of transactional distance and was later adapted into Turkish by Yılmaz and Keser (2015). The scale is a five-point Likert-type instrument consisting of 38 items. The Transactional Distance Scale comprises five subdimensions that evaluate learners' perceived interaction levels in open and distance learning environments. These sub-dimensions are: learner-interface interaction, learner-content interaction, learner-instructor interaction, learner-learner interaction, and learner-learning-environment interaction. The scale’s reliability was evaluated using Cronbach’s alpha coefficients (α): 0.789 for the learner-interface, 0.794 for the learner-content, 0.848 for the learner-teacher, 0.963 for the learner-learner, 0.850 for the learner-learning environment, and 0.939 for the overall scale. These values demonstrate a sufficient degree of reliability (Büyüköztürk, 2017).

Data Collection and Analysis

Students who were actively enrolled in the Anadolu University Open Education System during the autumn semester of the 2024–2025 academic year could access the survey via Google Forms. In accordance with ethical standards, all participants provided written informed consent, and participant privacy was carefully protected. Descriptive and predictive statistical tests were used to analyse the data. In this context, descriptive statistics were used to address the first and second research question, correlation analyses and multiple regression analyses were conducted to answer the third research question.

Ethical considerations

Ethics committee approval to conduct the study was obtained from the Afyon Kocatepe University Scientific Research and Publication Ethics Committee.

Ethical Review Board: Afyon Kocatepe University Scientific Research and Publication Ethics Committee

Date of Ethics Review Decision: November 11, 2024

Ethics Assessment Document Issue Number: 2024/50

RESULTS

A frequency analysis was carried out to identify the preferred e-learning materials in the LMS among open and distance learners. The findings are presented in Table 2.

Table 2

Distribution of Open and Distance Learners' Use of e-Learning Materials in the LMS

e-Learning Material	1st Preference	2nd Preference	3rd Preference	4th Preference
Listen Learn	78	104	193	628
Try Learn	152	361	368	122
Read Explore Learn	409	202	216	176
Watch Learn	364	336	226	77

Table 2 shows that Read-Explore-Learn materials are the most preferred first-choice materials (f = 409). Watch-Learn materials closely follow as the first choice and are also frequently selected as the second choice. Moreover, Try-Learn materials are preferred as the second choice (f = 361) and the third choice (f = 368). Lastly, Listen-Learn materials are the fourth most preferred choice (f = 628).

A Frequency analysis was conducted to determine open and distance learners' satisfaction levels with e-learning materials. The findings are demonstrated in Table 3.

Table 3

Distribution of Open and Distance Learners' Satisfaction Regarding e-Learning Materials

e-Learning Material	1st Preference	2nd Preference	3rd Preference	4th Preference
Listen Learn	79	120	202	602
Try Learn	194	336	343	130
Read Explore Learn	404	212	200	187
Watch Learn	326	335	258	84

Read-Explore-Learn materials (f = 404) were the most preferred and the most satisfying, as indicated in Table 3. The Try-Learn materials ranked second and third in satisfaction (f = 336 and f = 343, respectively), while the Listen-Learn materials ranked fourth (f = 602).

Descriptive statistics were used to assess open and distance learners' satisfaction with the Anadolum eCampus LMS and their perceptions of transactional distance. The results of the analysis are presented in Table 4.

Table 4

Descriptive Statistics of Open and Distance Learners' Satisfaction with Anadolum eCampus LMS and Their Perceptions of Transactional Distance

Scale	Factor	$\overline{X}$	*SD*
Satisfaction scale	Satisfaction	4.24	.92
Transactional Distance Scale	Transactional Distance	3.47	.70
	Learner-Interface	3.99	.74
	Learner-Content	3.61	.76
	Learner-Teacher	3.57	.91
	Learner- Learner	2.91	1.14
	Learner-Learning Environment	3.27	.94

Table 4 shows that open and distance learners are generally satisfied with the Anadolu University eCampus LMS. This favourable perception may be due to the system's contributions to their learning experience.

Learners' perceptions of transactional distance in online learning are generally moderate, with a mean value of 3.47. Among the sub-factors, the Learner-Interface factor had the highest score, indicating that students find the operation of the technical infrastructure in online courses sufficient and are able to utilise it effectively. The Learner-Teacher factor, with a mean of 3.57, suggests that teachers help and support students. The mean value of 3.61 for the Learner-Content factor indicates that learners' perceptions of the academic worth of the course material are moderate. Additionally, the mean score of 3.27 for the Learner–Learning Environment can be interpreted to indicate that learners somewhat enjoy online learning. The mean score for the lowest dimension, the Learner-Learner factor, was 2.91, suggesting that learners' interaction and communication remain quite limited. Overall, the findings indicate that perceptions of interface and instructor support are strong, perceptions of the online learning environment and content are moderate, and perceptions of learner interaction are relatively low.

A Pearson correlation analysis was conducted to determine the relationship between open and distance learners' satisfaction with the Anadolum eCampus LMS and their transactional distance. The findings are presented in Table 5.

Table 5

Pearson Correlation Analysis Results

Factors	1	2	3	4	5	6
1. Learner-Interface	1					
2. Learner-Content	.532**	1				
3. Learner-Teacher	.460**	.506**	1			
4. Learner- Learner	.292**	.426**	.529**	1		
5. Learner-Learning Environment	.472**	.541**	.609**	.962**	1	
6. Satisfaction scale	.570**	.612**	.481**	.365**	.528**	1

**$p<.01$.

The analysis indicates significant, positive relationships between learners' satisfaction and all dimensions of transactional distance (interface, content, teacher, student, and environment). All relationships were statistically significant and of moderate strength, indicating an association between higher satisfaction levels and greater interaction in these areas. A multiple regression analysis was conducted to identify the factors that predict learners' satisfaction with the Anadolum eCampus LMS. To assess multicollinearity, correlations among the independent variables (all < 0.80), variance inflation factors (VIF values < 10), and tolerance values (> 0.20) were examined. All these metrics were within acceptable ranges (Büyüköztürk, 2017).The analysis results are depicted in Table 6.

Table 6.

Multiple Regression Analysis Results

Factor	*B*	*Standard Error*	*β*	*t*	*p*
Constant	.592	.124		4.763	.000
Learner-Interface	.338	.035	.273	9.651	.000

Learner-Content	.405	.036	.335	11.294	.000
Learner-Teacher	.090	.031	.090	2.937	.003
Learner-Learner	-.027	.026	-.034	-1.054	.292
Learner-Learning Environment	.182	.035	.187	5.154	.000

Significant relationships exist between some dimensions of transactional distance perception and satisfaction ($R = .700$, $R^2 = .49$, $p < .001$). These variables account for approximately 49% of the variance in satisfaction. According to the standardised regression coefficients (β), the order of importance of the predictors for satisfaction is: Learner-Content Interaction (β = 0.335), Learner-Interface Interaction (β = 0.273), Learner-Environment Interaction (β = 0.187), Learner-Teacher Interaction (β = 0.090), and Learner-Learner Interaction (β = -0.034). Regression coefficients indicated that Satisfaction was significantly predicted by all factors except Learner-Learner Interaction.

DISCUSSION

This study investigated open and distance learners' satisfaction with e-learning materials and the relationship between their satisfaction perceptions and transactional distance with respect to the Anadolum eCampus LMS. The study found that the most preferred and most satisfying e-learning materials for open and distance learners in the Anadolum eCampus LMS were e-books, unit summaries, infographics, and interactive content in the 'Read-Explore-Learn' category. These materials are likely to facilitate cognitive processing by allowing students to engage with the subject matter at their own pace. Additionally, the least preferred and least satisfying e-learning materials were the audiobooks and audio summaries in the Listen-Learn category. This finding suggests that passive auditory content may not suit this learner group's requirements or preferences. Overall, these results indicate that learners are more interested in text-based and visual materials than in audio materials.

Students' satisfaction with Anadolum eCampus was high, indicating that they found the system useful and that it effectively supported their educational experiences. This result is supported by previous research (Kara, 2021; Kuo et al., 2013). Moreover, this result aligns with the systematic monitoring studies conducted by Anadolu University. Findings from the Anadolum eCampus Satisfaction Survey, administered every semester since the 2015–2016 school year, indicate that students' satisfaction with the system has increased over time.

The reports showed that satisfaction levels were higher in the 2021-2022 academic year than in previous years. Additionally, the platform's updates and improvements have enhanced the learning experience for students, as user satisfaction is linked not only to content quality but also to the platform's technical functionality, interaction opportunities, and usability. Al-Fraihat et al. (2020) found that satisfaction with LMSs was significantly related to structural elements, such as system quality, service quality, and information quality. As a result, it can be inferred that students benefit from the system in their learning and have positive views of it.

The study results indicate that students perceived a moderate level of transactional distance. Learner-interface interaction had the highest mean score, while learner-learner interaction had the lowest mean score. Gökoğlu et al. (2024), Kara (2021), Özbey and Kayri (2023), and Murad et al. (2025) found that students had moderate perceptions of transactional distance. According to the Transactional Distance Theory (Moore, 1993), when students engage in positive interactions during learning, they benefit more from online learning. Thus, the online learning environment may offer students various interactive opportunities to positively enhance their perceptions of transactional distance. In this context, despite their limited peer interactions, students may find it easy to use, access, and study instructional resources; feel encouraged by their teachers; and participate in the learning environment.

Another study found a significant positive relationship between the students' satisfaction with Anadolum eCampus LMS and their perceptions of transactional distance. As students' satisfaction levels increase, they feel more engaged in the learning process. Thus, this result is consistent with Moore's (1993) Transactional Distance Theory. In other words, students' satisfaction tends to increase as they interact with the content, the interface, the learning environment, the teacher, and other students. According to research by Mbwesa (2014), factors such as access to content and teacher-student interactions improved the learning process by reducing psychological distance. Regarding these positive relationships, the multiple regression results indicated that the satisfaction levels of open and distance learners with the Anadolum eCampus LMS were significantly predicted by certain factors related to transactional distance.

Among the five interaction factors, learner-content interaction had the most substantial impact on students' satisfaction with the system, aligning with previous studies (Alqurashi, 2019; Bağrıacık Yılmaz, 2023). Anadolum eCampus LMS provides a wide range of educational materials. These materials improve engagement and promote active learning by providing students with access to knowledge via multiple sensory modalities, including reading, listening, watching, and practicing (Bonk & Zhang, 2006; Moore, 1989b). Accordingly, students' satisfaction levels may be affected by how they interact with the course material, including constructing their understanding, solving problems, and relating new information to what they already know (Chen, 2023).

Learner-interface interaction positively and significantly predicted students' satisfaction with the Anadolum eCampus LMS. Such studies, conducted by Amoush and Mizher (2023), Karaoglan-Yilmaz et al. (2024), and Kara (2021), confirm this result. Learner-interface interaction serves as a bridge, enabling students to access and engage with technology easily and effectively (Pandita & Kiran, 2023). In the current study, the platform's usability and design features, including the home page, course menus, buttons that provide access to e-learning materials, navigation tools, and feedback mechanisms, were identified as significant determinants of students' satisfaction with the platform.

Another significant positive predictor of students' satisfaction with the LMS was the interaction between the learner and the learning environment. A recent study by Karaoglan-Yilmaz et al. (2024) found that the interaction between the learner and the learning environment predicted course satisfaction in the flipped learning context. Students are more likely to have a positive perception of the platform and online learning when interacting effectively with their learning environment, which, in turn, increases their satisfaction with the LMS.

The learner-instructor interaction positively influenced students' satisfaction with the LMS, which supports the findings of Benli and Kara (2025), Amoush and Mizher (2023), Kuo et al. (2013), Kuo et al (2014), and Alqurashi (2019). Compared to other variables, the effect of learner-teacher interaction on satisfaction was relatively minor. In the current study context, instructors may provide feedback during live classes and utilise various tools, such as chat, email, and forums, to communicate and interact with students. Consequently, these interactional behaviours may influence their satisfaction levels with the LMS.

Learner-learner interaction did not predict students' satisfaction with the LMS. This result is consistent with previous research (Alqurashi, 2019; Kuo et al., 2013, 2014) but contradicts other studies (Bağrıaçık Yılmaz, 2023; Cho, 2011; Kara, 2021; Tuan & Lan, 2025). Students might engage in limited activities to communicate and interact with their classmates, such as group work or discussions. Thus, this interaction was not related to satisfaction with the LMS. The regression analysis suggests that developing learner satisfaction requires a supportive learning environment, a user-friendly interface, and high-quality content.

LIMITATIONS AND RECOMMENDATIONS

This study has several limitations. First, the study group is limited to a single institution and a single LMS, which may reduce generalizability. Future studies may compare users' perceptions of LMSs across institutions. Second, only self-reported measures were used to gather data, which may not accurately reflect students' real experiences. Thus, future studies can employ qualitative or mixed-methods approaches to gain deeper insights into the topic. Finally, data were gathered during a specific period, which may not capture changes in perceptions over time. Future research may employ a longitudinal approach to

further understand how perceptions of transactional distance influence satisfaction over time.

The study's results provide practical recommendations for open and distance learning settings to enhance student satisfaction and reduce perceived transactional distance. First, the accessibility of "Listen-Learn" content (audiobooks and audio summaries) that received lower satisfaction ratings needs to be improved. Additional features, such as word emphasis, modification of content speed, and relevant examples, may be included. Second, the visibility and accessibility of the most preferred learning materials (interactive content, exercises, and trials) in Anadolum eCampus can be improved, because students commonly use them. Third, because enhancing communication between teachers and students is crucial for reducing transactional distance, asynchronous messaging and frequent, personalised feedback may be beneficial. Fourth, it is recommended to incorporate instructional activities, such as discussion boards, cooperative group projects, and synchronous activities, into courses to foster student collaboration and communication. Moreover, avatar-based user profiles, brief introductory sessions, or on-campus digital events can help students feel more socially connected in online courses. Finally, to better serve students from diverse demographic backgrounds, the LMS interface can be enhanced with gamified elements, streamlined navigation, and visual feedback tools.

CONCLUSION

This study investigated how open and distance learners perceived transactional distance as well as their preferences for and levels of satisfaction with various e-learning resources and the Anadolum eCampus LMS. The findings indicate that students prefer more interactive and cognitively stimulating resources, such as Read-Explore-Learn and Try-Learn, to passive resources such as Listen-Learn. Students expressed high satisfaction with the LMS, whereas their perceptions of transactional distance were moderate. Satisfaction was strongly predicted by the Learner–Content, Learner–Interface, Learning Environment, and Learner–Teacher variables, whereas peer-to-peer interaction did not contribute significantly.

REFERENCES

Al-Fraihat, D., Joy, M., Masa'deh, R. E., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior*, *102*, 67-86. https://doi.org/10.1016/j.chb.2019.08.004

Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. *Distance Education*, *40*(1), 133-148. https://doi.org/10.1080/01587919.2018.1553562

Amoush, K. H., & Mizher, R. A. (2023). Interaction as a predictor for EFL undergraduate university students' satisfaction with online English language courses. *Theory and Practice in Language Studies, 13*(4), 927-937. https://doi.org/10.17507/tpls.1304.14

Anadolu University, 2024b. https://oidb.anadolu.edu.tr/ogrenci-islemleri/istatistikler/ogrenci-sayilari, Access date (02.12.2024)

Astin, A. W. (1997). *What matters in college?: Four critical years revisited*. John Wiley & Sons.

Aydın, S., Öztürk, Ö., Erorta, Ö., Güler, E., Uğurhan, Y. Z. C., Saykılı, A., and Öztürk, A., (2023). Anadolum eKampüs'le Öğrenen Memnuniyeti. [Learner Satisfaction with Anadolum eCampus] Aydın, Z. Ö., Çekerol, K., Koçdar, S., and Kayabaş, İ. (Ed.), *Açıköğretim ile 40 Yıl: Uygulamalar ve Araştırmalar [40 Years of Open Education: Practices and Research]* (s. 567–600), Anadolu Üniversitesi Yayınları.

Bağrıacık Yılmaz, A. (2023). The relationship between satisfaction, interaction, e-learning readiness, and academic achievement in online learning. *Open Praxis*, *15*(3), 199-213. https://doi.org/10.55982/openpraxis.15.3.578

Bashir, K. (2019). Modeling e-learning interactivity, learner satisfaction and continuance learning intention in Ugandan higher learning institutions. *International Journal of Education and Development Using Information and Communication Technology*, *15*(1), 14-34.

Benli, G., & Kara, M. (2025). Understanding the pathways to online learner engagement and satisfaction in higher education: the function of digital literacy and dialogue. *Journal of Computing in Higher Education*. https://doi.org/10.1007/s12528-025-09477-x

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, *79*(3), 1243-1289. https://doi.org/10.3102/0034654309333844

Bolliger, D. U., & Martindale, T. (2004). Key factors for determining student satisfaction in online courses. *International Journal on E-Learning*, 3(1), 61–67.

Bolliger, D. U., & Halupa, C. (2018). Online student perceptions of engagement, transactional distance, and outcomes. *Distance Education, 39*(3), 299–316. https://doi.org/10.1080/01587919.2018.1476845

Bonk, C. J., & Zhang, K. (2006). Introducing the R2D2 model: Online learning for the diverse learners of this world. *Distance education*, *27*(2), 249-264. https://doi.org/10.1080/01587910600789670

Bozkurt, A. (2019). The historical development and adaptation of open universities in Turkish Context: Case of Anadolu University as a giga university. *The International Review of Research in Open and Distributed Learning, 20*(4), 36-59. https://doi.org/10.19173/irrodl.v20i4.4086

Burnham, B. R., & Walden, B. (1997). Interactions in distance education: A report from the other side. In *Annual Adult Education Research Conference Proceedings* (pp. 49-54).

Büyüköztürk, Ş.(2017). *Sosyal Bilimler için veri analizi el kitabı [Data analysis handbook for social sciences]* Pegem A Yayıncılık.

Chen, L. (2023). Transactional distance and college students' learning engagement in online learning: the chain mediating role of social presence and autonomous motivation. *Psychology Research and Behavior Management, 16,* 2085–2101. https://doi.org/10.2147/PRBM.S409294

Cho, T.J. (2011). The impact of types of interaction on student satisfaction in online courses. *International Journal on E-Learning, 10*(2), 109-125.

Çakmak, E. K. (2007). A new approach in interface design: paralel instruction design. *Gazi University Gazi Faculty of Education Journal*, *27*(1), 1-22.

Fulford, C. P., & Zhang, S. (1993). Perceptions of interaction: The critical predictor in distance education. *American Journal of Distance Education*, *7*(3), 8-21. https://doi.org/10.1080/08923649309526830

Gavrılıs, V., Mavroıdıs, I., & Gıossos, Y. (2020). Transactional distance and student satisfaction in a postgraduate distance learning program. *Turkish Online Journal of Distance Education*, *21*(3), 48-62. https://doi.org/10.17718/tojde.762023

Gökoğlu, S., Karaoğlan Yılmaz, F. G., & Yılmaz, R. (2024). Student engagement, community of ınquiry, and transactional distance in online learning environments: a stepwise multiple linear regression analysis. *The International Review of Research in Open and Distributed Learning*, *25*(4), 107–127. https://doi.org/10.19173/irrodl.v25i4.7660

Hamutoğlu, N. B., Gültekin, G. S., & Savaşçı, M. (2019). The views of teacher candidates toward distance education: open education practices. *TÜBA Higher Education Research/Review*, *9*(1), 19-28. https://doi.org/10.2399/yod.18.023

Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American journal of distance education*, *8*(2), 30-42. https://doi.org/10.1080/08923649409526853

Johnson, S. D., Aragon, S. R., & Shaik, N. (2000). Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments. *Journal of interactive learning research*, *11*(1), 29-49.

Jung, I., Choi, S., Lim, C., & Leem, J. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction. *Innovations in Education and Teaching International*, *39*(2), 153–162. https://doi.org/10.1080/14703290252934603

Kara, M. (2021). Transactional distance and learner outcomes in an online EFL context. *Open Learning: The Journal of Open, Distance and e-Learning*, *36*(1), 45-60. https://doi.org/10.1080/02680513.2020.1717454

Kara, M., Kukul, V., & Çakır, R. (2021). Self-regulation in three types of online interaction: How does it predict online pre-service teachers' perceived learning and satisfaction?. *The Asia-Pacific Education Researcher*, *30*(1), 1-10. https://doi.org/10.1007/s40299-020-00509-x

Karaoglan-Yilmaz, F. G., Zhang, K., Ustun, A. B., & Yilmaz, R. (2024). Transactional distance perceptions, student engagement, and course satisfaction in flipped learning: a correlational study. *Interactive Learning Environments*, *32*(2), 447-462. https://doi.org/10.1080/10494820.2022.2091603

Keegan, D. (1996). Foundations of distance education. Routledge.

Kuo, Y.-C., Walker, A. E., Belland, B. R., & Schroder, K. E. E. (2013). A predictive study of student satisfaction in online education programs. *The International Review of Research in Open and Distributed Learning*, *14*(1), 16–39. https://doi.org/10.19173/irrodl.v14i1.1338

Kuo, Y. C., Walker, A. E., Schroder, K. E., & Belland, B. R. (2014). Interaction, Internet self-efficacy, andself-regulated learning as predictors of student satisfaction in online education courses. *The Internet and Higher Education, 20,* 35–50. https://doi.org/10.1016/j.iheduc.2013.10.001

Kurucay, M., & Inan, F. A. (2017). Examining the effects of learner-learner interactions on satisfaction and learning in an online undergraduate course. *Computers & Education*, *115*, 20-37. https://doi.org/10.1016/j.compedu.2017.06.010

Lin, J., & Wang, Y. (2024). Unpacking the mediating role of classroom interaction between student satisfaction and perceived online learning among Chinese EFL tertiary learners in the new normal of post-COVID-19. *Acta Psychologica*, *245*, 104233. https://doi.org/10.1016/j.actpsy.2024.104233

Lysitsa, E., & Mavroeidis, I. (2024). Critical factors affecting student satisfaction in a distance learning environment. *European Journal of Open, Distance & E-Learning*, *26*(1). https://doi.org/10.2478/eurodl-2023-0014

Mbwesa, J. K. (2014). Transactional distance as a predictor of perceived learner satisfaction in distance learning courses: A case study of Bachelor of Education Arts Program, University of Nairobi, Kenya. *Journal of Education and Training Studies*, *2*(2), 176-188. http://dx.doi.org/10.11114/jets.v2i2.291

Moore, M. G. (1989). Editorial: Three types of interactions. *American Journal of Distance Education*, *3*(2), 1-7. https://doi.org/10.1080/08923648909526659

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan, (Ed.), *Theoretical principles of distance education* (pp. 22-38). New York: Routledge.

Özbey, M., & Kayri, M. (2023). Investigation of factors affecting transactional distance in E-learning environment with artificial neural networks. *Education and Information Technologies*, *28*(4), 4399-4427. https://doi.org/10.1007/s10639-022-11346-4

Paechter, M., Maier, B., & Macher, D. (2010). Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction. *Computers & Education*, *54*(1), 222-229. https://doi.org/10.1016/j.compedu.2009.08.005

Pandita, A., & Kiran, R. (2023). The technology interface and student engagement are significant stimuli in sustainable student satisfaction. *Sustainability*, *15*(10), 7923. https://doi.org/10.3390/su15107923

Murad Abdu Saeed, Su Kia, L., Ahmed Ali Mahdi, & Almaamari, A. A. (2025). EFL students' experience in distance learning during covid-19 from a multidimensional transactional distance perspective . *Jurnal Arbitrer*, *12*(1), 1–13. https://doi.org/10.25077/ar.12.1.1-13.2025Sher, A. (2009). Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in web-based online learning environment. *Journal of Interactive Online Learning*, *8*(2), 102-120.

Singh, H., Singh, V. V., Gupta, A. K., & Kapur, P. K. (2024). Assessing e-learning platforms in higher education with reference to student satisfaction: a PLS-SEM approach. *International Journal of System Assurance Engineering and Management*, *15*(10), 4885-4896. https://doi.org/10.1007/s13198-024-02497-3

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, *50*(4), 1183-1202. https://doi.org/10.1016/j.compedu.2006.11.007

Tuan, D. M., & Lan, L. T. D. (2025). Modeling the nexus between students' interaction, satisfaction, and acceptance of online learning. *Turkish Online Journal of Distance Education*, *26*(1), 134-156. https://doi.org/10.17718/tojde.1430727

Yılmaz, R., & Keser, H. (2015). The Adaptation study of transactional distance scale. *Hacettepe University Journal of Education*, *30*(4), 91-105.

Yu, Q. (2022). Factors influencing online learning satisfaction. *Frontiers in psychology*, *13*, 852360. https://doi.org/10.3389/fpsyg.2022.852360

Yukselturk, E., & Yildirim, Z. (2008). Investigation of ınteraction, online support, course structure and flexibility as the contributing factors to students' satisfaction in an online certificate program. *Educational Technology & Society*, *11*(4), 51-65.

Zhang, A. M. (2003). *Transactional distance in web-based college learning environments: Toward measurement and theory construction*. (Publication No. 3082019) [Doctoral dissertation, Virginia Commonwealth University. ProQuest Dissertations and Theses Global.

Data Availability Declaration

While the primary datasets utilised in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasised maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

Havva Buhan was responsible for conceptualization, methodology, formal analysis, investigation, resources, data curation, and writing the original draft. Erhan Ünal contributed to conceptualization, writing the original draft, reviewing and editing the manuscript, and provided supervision.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: There is no conflict of interest in this study.

Funding: Not applicable

Acknowledgements: No funding or financial support of any kind was received by the authors for the study.

Biographical notes:

Havva Buhan: Havva Buhan received her master's degree in Internet and Information Technology Management from Afyon Kocatepe University, in Türkiye. She is currently working in the Open Education Faculty at Anadolu University. Her research interests focus on online learning and the design of instructional materials.

Scopus Author Identifier Number: N/A

Web of Science Researcher ID: N/A

Google Scholar Researcher ID: N/A

Erhan ÜNAL[4]**:** Erhan Ünal is an associate professor at the Department of Educational Sciences at Afyon Kocatepe University, Türkiye. He received his PhD degree in Computer Education and Instructional Technology from Gazi University in Turkey. His research interests are instructional design, collaborative technologies and constructivist teaching and learning methods.

Scopus Author Identifier Number : N/A

[4] Corresponding Author

Web of Science Researcher ID : JNR-1331-2023

Google Scholar Researcher ID:

https://scholar.google.com/citations?user=zIAcAkUAAAAJ&hl=tr&oi=ao

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research Article

Article Title: The Effect of Using a Program Enriched with Six Bricks Duplo Block Play-Based Technique on Pre-School Children's Visual Perception and Math Skills

Yasemin Yüzbaşıoğlu[1] **Banu Uslu**[2]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 673-695
http://www.ijonmes.net

Article Info:

Received 06.09.2025
Revision 02.11.2025
Accepted 01.12.2025

Abstract:

This study examined the effects of "Six Bricks (LEGO® Duplo)" play-based technique on preschoolers' early mathematics and visual perception skills. The study group consisted of children attending public kindergartens affiliated with the Ministry of National Education in the Meram district of Konya during the 2024–2025 academic year. A quasi-experimental design with experimental and control groups was employed. Data collection tools were "General Information Form," the "Test of Early Mathematics Ability–3 (TEMA–3)," and the "Frostig Visual Perception Test." 50 play-based "Six Bricks Duplo Block" activities was implemented with the experimental group over a 10-week period, while the control group continued with the current program. The posttest findings indicated a statistically significant improvement in favor of the experimental group on both measures. The results showed the effectiveness of integrating play-based approaches such as the "Six Bricks Duplo Block" into preschool curricula as a means of fostering early cognitive development.

Keywords: Six Brick Duplo Block, Math, Visual perceptual, Preschool.

Citation:
Yüzbaşıoğlu, Y. & Uslu, B. (2025). The Effect of Using a Program Enriched with Six Bricks Duplo Block Play-Based Technique on Pre-School Children's Visual Perception and Math Skills. *International Journal of Modern Education Studies, 9*(2), 673-695. https://doi.org/10.51383/ijonmes.2025.434

[1] Asst. Prof. Dr., KTO Karatay University, Konya, Türkiye. yasemin.yuzbasioglu@karatay.edu.tr,

https://orcid.org/0000-0002-2493-7784

[2] Assoc. Prof. Dr. Emeritus of Preschool Education, Antalya, Türkiye. banuuslu@gmail.com,

https://orcid.org/0000-0002-7283-8377

INTRODUCTION

Early childhood is a critical period as the fundamental building blocks are laid for an individual's cognitive, social, emotional, and physical development. It is one of the most rapid periods of mental and physical development. During this period, children rapidly develop the mathematical and visual perception skills they will need throughout their lives (Huntsinger, Jose, & Luo, 2016; Sarama & Clements, 2009). At the same time, their abilities to explore, learn, and interpret their environment also advance quickly. Visual perception and mathematical skills, in particular, form the foundation for children's problem-solving, analytical thinking, and adaptability to everyday situations. In this context, the educational approaches and material use implemented in early childhood play a significant role in children's development.

For children, play is one of the most effective ways to learn. It provides a natural learning environment that allows them to develop both cognitive and social-emotional skills. In recent years, play-based learning methods have been increasingly adopted to enable children to participate more actively in the learning process (Coşkun & Başgül, 2025). Among these methods, the "Six Bricks (LEGO® Duplo)" play-based tecnique developed by the LEGO Foundation, stands out as an innovative tool for supporting children's cognitive skills. It aims to equip children with new knowledge and skills using a play-based learning approach and implemented via using six different colors and sizes of LEGO Duplo bricks. It supports children's creativity, problem-solving skills, along with cognitive flexibility (Hutcheson, 2018). It is an easily applicable and flexible technique designed to develop children's cognitive and motor skills. Activities are generally short, fun, and interactive, allowing children to focus their attention and actively engage their cognitive processes. It supports children's development of a wide range of skills, from visual perception and spatial awareness to sequencing and basic math concepts (Zosh et al., 2017). Structured games like this help children achieve multifaceted outcomes such as creative thinking, problem-solving, increased attention span, and motor skill development. It also boosts children's social skills, such as cooperation, emotional regulation, and self-efficacy (Kaplan et al., 2022; Manessis, 2014; Petrovska et al., 2013).

Children's math skills encompass areas such as counting, basic arithmetic operations, shape recognition and ordering. During the preschool period, children learn abstract mathematical concepts through more concrete experiences. Games and daily activities help reinforce these skills. For instance, playing with blocks helps children understand shapes and sizes, while counting games facilitate number comprehension. Additionally, children gain direct experience by playing with concepts such as measurement, weight, and cubage. These types of activities develop problem-solving abilities and logical thinking skills (Björklund et al., 2020; Clements & Sarama, 2020; Mumcu & Aydoğan, 2020; Zippert & Rittle Johnson, 2020).

Research Problem and Its Importance

Visual perceptual skills in early childhood are associated with individuals' abilities to recognize and categorize objects, and organize information in their environment. Visual perception plays a critical role in the development of both cognitive and motor skills. When it is underdeveloped, children may experience difficulties in academic learning and social interactions. Math skills, on the other hand, encompass fundamental concepts such as number recognition, ordering, comparison, and calculation, and are a significant indicator of children's academic success. The close relationship between visual perception and mathematical skills is frequently emphasized in the literature, and the combined support of these skills contributes to children's overall cognitive development (Aladwan et al., 2023; Mix & Cheng, 2012; Pieters et al., 2012; van Veen et al., 2019). Furthermore, reinforcing these skills through play makes children's learning processes more fun and effective, making a crucial contribution to the development of their cognitive skills (Herzberg et al., 2022).

This study aims to examine the impact of the “Six Bricks Duplo Block” play-based technique on pre-school chilsren’s visual perception and mathematical skills. The study aims to determine the role of this innovative method in children's development and in which areas it is most effective as the use of innovative techniques in early childhood education not only enhances children's individual skills but also provides effective guidance for educators and parents. In this context, the findings of this study are expected to provide evidence-based recommendations for integrating Six Bricks technique into early childhood education curricula. Furthermore, supporting visual perception and math skills at an early age will positively impact children's future academic success and life skills.

Mathematical and visual perception skills acquired in early childhood prepare individuals for the academic and social situations they will encounter later in life. Parents and educators using various educational games, activities, and interactive materials to support the development of these skills will strengthen children's mathematical thinking and their ability to interact with their environment. The support provided during this period will play a decisive role in children's future. Ultimately, this research aims to contribute to the literature on early childhood education at both theoretical and practical levels. A detailed examination of the effects of the Six Bricks Technique on visual perception and mathematical skills will be an important step toward identifying and developing effective methods in early childhood education. In this context, the study sought answers to the following questions:

- Is there a significant difference between the mathematical skills of children in the experimental group using the "Six Brick Technique" and the control group using the current program?

- Is there a significant difference between the visual perception levels of children in the experimental group using the "Six Brick Technique" and the control group using the current program?

METHOD

The current study, which aimed to examine the effects of a play-based "Six Brick Technique" on pre-school children's visual perception and mathematical skills, was designed using quantitative research methods. It is conducted within the framework of a Pretest-Posttest Control Group Experimental Design, a true experimental design. Experimental designs are used to measure the effects of programs aimed at improving children's awareness, learning outcomes, perceptions, and social-emotional skills. In an experimental research design, the *independent variable*(s) is manipulated while its effect on the *dependent variable* is tested (Creswell, 2014; Johnson & Onwuegbuzie, 2004). In the preschool period, this might mean, for example, measuring the effects of an educational program (independent variable) on children's or parents' attitudes, behaviors, or awareness (dependent variable). The dependent variables of the present study were *children's mathematical and visual perception skills*, while the independent variable was *the educational program developed using the Six Brick Technique*. The design used in the experimental model application phase of the study is given below in Table 1.

Table 1

Experimental Design

	Pretest	**Experimental Procedures**	**PostTest**
Experimental Group	FVPT MST	Application of the Six Brick technique	FVPT MST
Control Group	FVPT MST	Current Curriculum	FVPT MST

Frostig Visual Perception Test (FGAT) Math Skills Test (MBT)

Participants

The research was conducted with 5-6-year-old children attending kindergarten classes at a school affiliated with the Ministry of National Education in the provincial center of Konya, in accordance with the opinions of the kindergarten administrators. A total of 46 children from two kindergarten classes participated in the study. Experimental and control groups were formed via simple random sampling method. A total of 24 children were included in the experimental group, and 22 children were included in the control group. 52.17% of the children were girls, and 47.82% were boys. The proportion of girls and boys in the experimental group was 50%, while in the control group 54.54% were

girls and 45.45% were boys. The average age of all participating children was 5.57. The average age in the experimental group was 5.58, and the control group was 5.55.

Data Collection Tools

In this study, the 'Frostig Developmental Visual Perception Test' and 'TEMA 3 Mathematics Ability Test' were used to measure preschool children's visual perception levels.

Frostig Developmental Visual Perception Test (FDVPT): This test was developed by Marianne Frostig in 1963 to determine the visual perception levels of children aged three to eight. It measures five perceptual skills: hand-eye coordination, figure-ground discrimination, shape constancy perception, perception of spatial relations, and perception of spatial relationships. The FDVPT is a performance test and can be administered in groups. There is no time limit and it lasts forty to fifty minutes (Wiederholt, 1971). (1994) conducted a reliability study of the Frostig Developmental Visual Perception Test (FDVPT) only for five-year-old children and found that the overall and subscale stability coefficients of the Frostig DVPT were all significant at the 0.01 level (Sökmen, 1994; Tuğrul et al., 2001). In Tepeli's (2013) study, reliability coefficients for children aged 54–59 months were calculated as .76 for the Visual-Motor Coordination subtest, .72 for the Figure-Ground Discrimination subtest, .78 for the Figure Constancy subtest, .79 for the Position in Space subtest, .69 for the Spatial Relations subtest, and .87 for the total test.

The Test of Early Mathematics Ability (TEMA-3): TEMA-3 was developed by Ginsburg and Baroody in 1983 to assess the mathematical abilities of children between the ages of three and eight years and eleven months. It was revised in 1990 and published as TEMA-2. The revised TEMA-2 test was later developed as TEMA-3 in 1993. Pictures, mathematical symbols, and small countable objects are used as materials in Forms A and B of TEMA-3. The test is administered children individually. Administration begins with the question corresponding to their age, calculating their chronological age. It is terminated when the child cannot answer five questions in a row. Each item is marked as correct or incorrect, and the number of correct answers provides the raw score (Ginsburg and Baroody 2003). The standardization and Turkish adaptation of TEMA-3 was conducted by Erdoğan (2006). As a result of the analyses, the test-retest Pearson correlation coefficient was found to be .90 for Form A and .86 for Form B. The internal consistency coefficient was also calculated regarding the reliability of the test in the study, and the KR-20 value was found to be .92 for Form A and .93 for Form B.

Data Analysis

In analyzing the data, the normal distribution assumptions of the scale applied to the experimental and control groups were first tested. The Shapiro-Wilk test analyses performed for this purpose revealed that the experimental and control groups did not meet the normal distribution assumptions in terms of visual perception and mathematical

skills. In this context, the Mann-Whitney U test was used to compare the visual perception and mathematical skill scores of the children in the experimental and control groups. The Wilcoxon test was used to compare the pretest and posttest scores within the experimental and control groups.

Experimental Procedures

Prior to the implementation, a seminar on the Six Brick Technique was given to the classroom teachers and families of the children in the experimental group. The researcher participated in various activities with the children and the classroom teacher before data collection. After the children had adjusted to the researcher, the researcher administered the Frostig Developmental Visual Perception Test and the TEMA 3 Mathematical Ability Tests as pretests between February 12th-17th 2024. The tests were administered individually by the researcher in a quiet, well-lit environment, independent of the children's educational environment. The test was evaluated considering the rules in the user manual. Visual Perception and Mathematical Skills test scores were obtained for each child. The same tests were also administered to the participants as posttests at the end of the program.

In this phase, the children in the experimental group received an educational program including the Six Bricks technique play-based activities while the current curriculum was applied to the control group. The activities included in the program were structured according to the principle of "Simple to Complex" and were selected from activities in Hutcheson's (2020) book, "Returning to Basic Skills with Six Bricks." The experimental interventions lasted 10 weeks. The program, which implemented one activity per day, consisted of a total of 50 sessions with 50 activities. This program was designed to develop both the children's visual perception and mathematical skills. To provide a fun learning environment, play-oriented and exploration-oriented activities were emphasized, as well as social interaction.

Preschoolers participating in the study had “Six Bricks technique” play-based activities, in addition to their existing curriculum. It is an educational set developed in 2012 by Brent Hutcheson, Director of Care for Education which is designed to encourage learning. Consisting of six LEGO® DUPLO® bricks in different colors. This set encourages children to build, explore, and transform ideas and concepts. The foundations of this approach were laid in 2009, when the LEGO Foundation sought partners for projects that support learning through play. Hands on Technologies, a LEGO® Education partner in South Africa, became involved, and a project called "Developing Talent through Creative Play" was launched in a South African township. As part of this project, teachers received support, training, and LEGO® Education materials. However, evaluations after five years of implementation revealed that teachers struggled to use some complex LEGO® materials. Consequently, the “Six Bricks Duplo Block” play-based technique emerged as a more practical and accessible alternative.

In 2012, the LEGO Foundation decided that collaborating with a nonprofit organization to support education would be more effective. Therefore, Care for Education was established and took over the partnership with the LEGO Foundation. The mission of Care for Education is to encourage educators and children to learn by interacting with concrete and physical materials. The organization advocates that learning should occur through active participation and construction rather than rote memorization, and therefore emphasizes integrating tactile learning tools into educational processes. It helps children understand concepts more quickly while supporting the development of creativity, curiosity, and innovation skills. In 2013, a group of Danish teachers visiting South Africa discovered the Six Bricks Technique and brought it to Denmark, enabling its global expansion. Today, Care for Education collaborates with international organizations such as IRC (Play Matters), SOS Children's Villages, and UNICEF to support play-based learning. Programs with “Six Bricks Duplo Block” play-based activities are held in many countries, including Kenya, Ethiopia, Tanzania, Uganda, Egypt, Jordan, and Türkiye, (Yöndem, 2024).

The activities in the "Six Bricks technique” were selected from the simple-to-difficult principle and from Hutcheson's (2020) book, "Returning to Basic Skills with Six Bricks." This resource book contains activities designed to support children's cognitive, affective, and motor skills. It offers a variety of play-based activities using six LEGO DUPLO bricks to make children's learning more effective. The activities can be implemented both individually and in groups. Group activities support children's social skills and teamwork, while individual activities allow children to learn at their own pace. They are generally unstructured, play-based, and do not require preparation. The experimental implementations last 10 weeks. The program, which includes one activity per day, consists of a total of 50 activities and 50 sessions. It is designed to develop both children's visual perception and mathematical skills to provide a fun learning environment. The emphasis is placed on social interactions as well as play and exploration-oriented activities.

Sample Activity 1: “Notice the change!”

- The teacher arranges her six bricks in a random order on a shelf/cabinet high enough for the children to see from their seats.
- When the children enter the classroom, they try to find where the six bricks are arranged.
- Then, the children go to their desks and try to create the same arrangement as the teacher's bricks by using their own.

Guiding Questions:

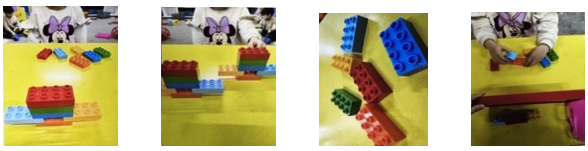
- What color is the first / second / third brick?
- Can you place your finger on the red / blue / green brick?

- Can you hold the first / third / fifth brick and show it to us?
- Can you lift your second brick and balance it on your right / left hand?
- The children leave their bricks on their desks in that order.
- The teacher changes their brick arrangement throughout the day without telling the children.
- The children notice the changes and try to adjust their arrangement accordingly.

Sample Activity 2: "Is there something missing?"

- The teacher arranges the six bricks as they wish. Children examine the arrangement for a few seconds.
- The teacher hides the arrangement or puts up a barrier.
- Asks the children to memorize the image and create the arrangement without seeing it.
- The barrier is removed, and they talk about the differences between the two images. How right it is? Which color is not right?

Guiding Question: The activity is evaluated by the child and the teacher with questions such as: How many correct bricks did you place? Which part did you have difficulty remembering?



Sample Activity Photos

Ethical Aspects

This study was conducted in strict accordance with the provisions of the "Higher Education Institutions Scientific Research and Publication Ethics Directive." No instances of actions that could be considered violations under the "Actions Against Scientific Research and Publication Ethics" were encountered during the research process. Necmettin Erbakan University Social and Human Sciences Scientific Research Ethics Board gave the present study 2024/601 as Ethics Assessment Document Issue Number on 26/07/2024.

FINDINGS

The pretest results of the math skills scales applied to experimental and control group children before the experimental procedures are presented below in Tables 2 and 3.

Table 2

Descriptive Analysis of Pretest Scores of Math Skills of Children in Experimental and Control Groups

	Experimental Group			Control Group		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Math skills PRETEST	24	18.67	2.53	22	18.14	1.75

Table 2 shows descriptive statistics for the pretest math skills scores of children in the experimental and control groups during the experimental procedures. According to the analyses, the mean math skills pretest score for children in the experimental group was 18.67, with a standard deviation of 2.53. The mean pretest score for children in the control group was 18.14, with a standard deviation of 1.75. The results of the Mann Whitney U Test conducted between the two groups are presented in Table 3.

Table 3

Analysis of Math Skills Pretest Scores of Children in the Experimental and Control Groups via Mann Whitney U Test

	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	P
Math Skills PRETEST	Experimental	24	24.42	586.00	242.00	-0.494	0.621
	Control	22	22.50	495.00			

Table 3 shows the mean rank of the pretest math-skill scores of the children in the experimental group was 24.42, while the mean rank of their peers in the control group was 22.50. The Mann Whitney U test Z value, calculated between the pretest score rankings of the groups, was found as 0.494. This value indicates that the pretest math skills of the children in both groups were equivalent before the experimental procedures. The pretest results of the visual perception scale administered to the children in the experimental and control groups before the experimental procedures are presented below in Tables 4 and 5.

Table 4

Descriptive Analysis of Visual Perception Scale Pretest Scores of Children in the Experimental and Control Groups

	Experimental Group			Control Group		
Visual Perception PRE-TEST	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Hand-Eye Coordination	24	15.83	1.86	22	15.59	1.68

Figure-Ground	24	4.83	0.70	22	4.91	0.92
Shape Constancy	24	5.96	1.00	22	5.95	1.00
Location in Space	24	5.08	0.88	22	5.27	0.83
Relationship of Shape to Space	24	4.96	0.95	22	5.05	1.13
Total	24	36.67	3.07	22	36.77	3.54

Table 4 shows the descriptive statistics for the experimental procedures performed on the pretest scores of the visual perception scale for children in the experimental and control groups. According to the analyses, the total mean pretest score on the visual perception scale for children in the experimental group was 36.67, with a standard deviation of 3.07. The mean pretest score for children in the control group was 36.77, with a standard deviation of 3.54. The results of the Mann Whitney U test conducted between the two groups are presented in Table 5.

Table 5

Analysis of Visual Perception Scale Pretest Scores of Children in the Experimental and Control Groups via Mann Whitney U Test

Visual Perception PRE-TEST	**Group**	**N**	**Mean Rank**	**Sum of Ranks**	**Mann-Whitney U**	**Z**	**P**
Hand-Eye Coordination	Experiment	24	24.21	581.00	247.00	-0.381	0.703
	Control	22	22.73	500.00			
Figure-Ground	Experiment	24	23.17	556.00	256.00	-0.195	0.846
	Control	22	23.86	525.00			
Shape Constancy	Experiment	24	23.52	564.50	263.50	-0.012	0.991
	Control	22	23.48	516.50			
Location in Space	Experiment	24	22.04	529.00	229.00	-0.838	0.402
	Control	22	25.09	552.00			
Relationship of Shape to Space	Experiment	24	23.25	558.00	258.00	-0.138	0.891
	Control	22	23.77	523.00			
Total	Experiment	24	23.71	569.00	259.00	-0.111	0.912
	Control	22	23.27	512.00			

According to Table 5, the mean rank of the experimental group children's pretest scores on the visual perception scale was 23.71, while the mean rank of their peers in the control group was 23.27. The Mann Whitney U test Z value, calculated between the groups' pretest score rankings, was 0.111. This value indicates that the visual perception levels of the children in both groups were equivalent before the experimental procedures. The results of the math skills posttests administered to the children in the experimental and control groups after the experimental procedures are presented below in Tables 6 and 7.

Table 6

Descriptive Analysis of Math Skills Posttest Scores of Children in the Experimental and Control Groups

	Experimental Group			Control Group		
	N	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Math Skills Posttest	24	21.46	1.89	22	18.73	1.75

Table 6 shows descriptive statistics performed on the posttest math skills scores of children in the experimental and control groups after the experimental procedures. According to the analyses, the total mean posttest mathematics skills score of children in the experimental group was 21.46, with a standard deviation of 1.89. The mean posttest score of children in the control group was 18.73, with a standard deviation of 1.75. The results of the Mann Whitney U Test conducted between the two groups are presented in Table 7.

Table 7

Analysis of Math Skills Posttest Scores of Children in the Experimental and Control Groups Using the Mann Whitney U Test

	Group	**N**	**Mean Rank**	**Sum of Ranks**	**Mann-Whitney U**	**Z**	**p**
Math Skills	Experimental	24	31.15	747.50	80.500	-4.083	0.000
FINESTEST	Control	22	15.16	333.50			

Table 7 shows the results of the Mann Whitney U Test calculated between the posttest math skills scores of the children in the experimental and control groups. The analysis revealed a Z value of 4.083 between the math skills scores of the two groups. This value indicates a significant difference in the posttest math skills of the children in both groups ($p<0.05$). As a result of the experimental procedures, children's math skills in the

experimental group were found to be significantly higher than their peers in the control group. The results of the posttest math skills administered to children in the experimental and control groups after the experimental procedures are presented below in Tables 8 and 9.

Table 8

Descriptive Analysis of Visual Perception Scale Posttest Scores of Children in the Experimental and Control Groups

	Experimental Group			Control Group		
Visual Perception (PostTest)	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Hand-Eye Coordination	24	25.29	2.63	22	16.18	1.62
Figure-Ground	24	6.63	0.92	22	5.82	0.96
Shape Constancy	24	8.42	1.35	22	7.27	1.28
Location in Space	24	6.63	0.92	22	6.14	0.77
Relationship of Shape to Space	24	6.88	0.95	22	5.82	1.05
TOTAL	24	53.83	4.24	22	41.23	3.53

Table 8 shows descriptive statistics based on the posttest visual perception scale scores of children in the experimental and control groups after the experimental procedures. The analyses show that the total mean posttest visual perception scale score of children in the experimental group was 53.83, with a standard deviation of 4.24. The mean posttest score of children in the control group was 41.23, with a standard deviation of 3.53. The results of the Mann Whitney U Test, conducted between the visual perception scores of the two groups, are presented in Table 9.

Table 9

Analysis of Visual Perception Scale Posttest Scores of Children in the Experimental and Control Groups via Mann Whitney U Test

Visual Perception (PostTest)	**Group**	**N**	**Mean Rank**	**Sum of Ranks**	**Mann-Whitney U**	**Z**	**p**
Hand-Eye Coordination	Experiment	24	34.42	826.00	2.000	-5.802	0.000
	Control	22	11.59	255.00			
Pattern-Background	Experiment	24	28.42	682.00	146.000	-2.707	0.007
	Control	22	18.14	399.00			
Pattern Constancy	Experiment	24	28.46	683.00	145.000	-2.689	0.007

	Control	22	18.09	398.00			
Position-in-Space	Experiment	24	26.75	642.00	186.000	-1.816	0.069
	Control	22	19.95	439.00			
Relationship of Pattern to Space	Experiment	24	29.29	703.00	125.000	-3.158	0.002
	Control	22	17.18	378.00			
TOTAL	Experiment	24	34.27	822.50	5.500	-5.697	0.000
	Control	22	11.75	258.50			

Table 9 shows Mann Whitney U Test results calculated between the posttest scores of the visual perception scale in the experimental and control groups. A Z value of 4.083 was calculated for the hand-eye coordination subscale, a Z value of 2.707 for the pattern background perception subscale, a Z value of 2.683 for the pattern constancy subscale, a Z value of 1.816 for the position in space subscale, a Z value of 3.158 for the relationship of pattern to space subscale, and a Z value of 5.500 for the overall scale. According to these values, it is understood that the posttest visual perception levels of the children in both groups differed significantly ($p<0.05$) in terms of hand-eye coordination, pattern background perception, pattern constancy, relationship of pattern to space, and the overall scale. In terms of the position in space subscale, although the experimental group had a higher mean rank value compared to the control group, this difference was not statistically significant ($p = 0.069> 0.05$). As a result of the experimental procedures, it was observed that the visual perception levels of the children in the experimental group were significantly higher than those in the control group. Table 10 presents the results of the Wilcoxon Test conducted between the pretest and posttest scores of the children in the experimental group on their math skills

Table 10

Analysis of Pretest-Posttest Math Skills Scores of Children in the Experimental Group via Wilcoxon Test

Math Skills		**N**	**Mean Rank**	**Sum of Ranks**	**Z**	**p**
POSTTEST- PRETEST	Negative Ranks	1	23.50	23.50	-3.648[c]	0.000
	Positive Ranks	23	12.02	276.50		
	Ties	0				
	Total	24				

According to the Wilcoxon Test results presented in Table 10, the differences between the pretest and posttest measurements of the experimental group's math skills were analyzed via Wilcoxon test. The analyses yielded a Z value of 3.648 between the pretest and posttest math skills of the experimental group. According to these values, a

significant difference was found between the measurements in the experimental group's math skills at a significance level of 0.05. According to the mean ranks, the posttest math skill levels of the children in the experimental group were found to be significantly higher than the pretest results. Table 11 presents the results of the Wilcoxon test conducted between the pretest and posttest scores of the children in the experimental group on the Visual Perception Scale.

Table 11

Analysis of Visual Perception Scale Pretest-Posttest Scores of Children in the Experimental Group via Wilcoxon Test

Visual Perception PostTest-PreTest		N	Mean Rank	Sum of Ranks	Z	p
Hand-Eye-Coordination	Negative Ranks	0[e]	0.00	0.00	-4.307[c]	0.000
	Positive Ranks	24[f]	12.50	300.00		
	Ties	0[g]				
	Total	24				
Pattern-Background	Negative Ranks	1[h]	4.50	4.50	-4.007[c]	0.000
	Positive Ranks	21[i]	11.83	248.50		
	Ties	2[j]				
	Total	24				
Pattern Constancy	Negative Ranks	0[k]	0.00	0.00	-4.346[c]	0.000
	Positive Ranks	24[l]	12.50	300.00		
	Ties	0[m]				
	Total	24				
Position-in-Space	Negative Ranks	0[n]	0.00	0.00	-4.311[c]	0.000
	Positive Ranks	23[o]	12.00	276.00		
	Ties	1[p]				
	Total	24				
Relationship of Pattern to	Negative	0[q]	0.00	0.00	-4.399[c]	0.000

Space	Ranks					
	Positive Ranks	24[r]	12.50	300.00		
	Ties	0[s]				
	Total	24				
TOTAL	Negative Ranks	0[t]	0.00	0.00	-4.291[c]	0.000
	Positive Ranks	24[u]	12.50	300.00		
	Ties	0[v]				
	Total	24				

In Table 11 the pretest-posttest scores of the experimental group were as follows: a Z value of 4.307 for the hand-eye-coordination subscale, a Z value of 4.007 for the pattern-background perception subscale, a Z value of 4.346 for the pattern constancy subscale, a Z value of 4.311 for the position-in-space subscale, a Z value of 3.399 for the relationship of pattern to space subscale, and finally a Z value of 4.291 for the entire scale. A significant difference was found between measurements in the visual perception of the experimental group at a significance level of 0.05. According to the mean ranks, it was observed that the posttest visual perception levels of the children in the experimental group were significantly higher than the pretest results.

DISCUSSION

The present study show that a program enriched with "Six Bricks Duplo Block" activities has a significant impact on preschool children's visual perception and math skills. Findings revealed that children participating in the intervention program showed significant increases in their posttest scores on math and visual perception skills. These results are consistent with previous researches suggesting that the program supported with these activities has a positive impact on children's cognitive development, fosters active participation in learning process, and boosts the development of math and visual perception skills (Gilligan-Lee, et al., 2023; Jerrom, et al., 2023; Kaplan, et al., 2022).

Interaction with building blocks not only improves children's hand-eye-coordination but also significantly supports their spatial thinking skills (Verdine et al., 2014; Mix & Cheng, 2012). In this context, children's experience playing with blocks at an early age may be directly related to their math performance in later years (Wolfgang, Stannard, & Jones,

2001). Indeed, the findings of the current study support the critical role of this play-based approach in preschool education. Object interactions facilitate increasingly complex, flexible, and controlled motor actions (Libertus et al., 2016). In this context, play-based activities with building blocks, such as LEGO Duplo, make children's learning processes fun. While playing with these blocks, children explore the physical properties of objects and gain an important foundation for understanding their three-dimensional structure (Soska et al., 2010). Furthermore, these "Six Bricks Duplo Block" activities positively influences visual perception which enables children nor only remember and recall an image but also its sequence when they see. Visual perception is vital in learning. The activities fosters children's spatial thinking which is the ability of visualizing and reasoning. It is vital in achieving science, engineering and technology related subjects. The connection between motor and cognitive development is strengthened through experiences arising from children's interactions with objects (Libertus et al., 2016). In this regard, the tactile and visual experiences provided by "Six Bricks Duplo Block" activities facilitate children's understanding of the three-dimensional structure of objects and their grasp of spatial relationships (Soska et al., 2010; Rachwani et al., 2020). This is further confirmed by the improvements in visual perception and math performance found in the study. Manual interactions with objects support perceptual development, helping children better understand their environment. During this process, children discover that lids turn, latches open, and blocks match with appropriate shapes. Such interactions enable children to acquire the biomechanical skills necessary to develop motor skills (Rachwani et al., 2020) and also contribute to the internalization of mathematical concepts. Games like Six Bricks are more than just fun activities. They offer important opportunities for children's cognitive, motor, and visual perception development. These types of constructive play encourage children's imagination while developing problem-solving and math skills. This study found that the process of assembling blocks to create different structures reinforces children's spatial thinking skills and contributes to the development of visual perception. Therefore, construction games like this constitute an indispensable resource for cognitive development in early childhood.

These findings support and extend previous research examining the relationship between structured block play and play-based learning approaches and children's academic achievement and math performance across different age groups (Bower, et al., 2020; Nath and Szücs, 2014; Thomson et al., 2018; Richardson, et al., 2014; Verdine et al., 2014). Considering the age group included, the results reveal the relationship between visual perception and math measures in preschool children, drawing attention to the program's effectiveness in preparing children for elementary school.

Furthermore, within the context of Vygotsky's (1978) theory of sociocultural development, social interaction and learning through play are thought to play a critical role in cognitive development (cited in: Cole & Scribner, 1978). In line with this theory, the implementation of "Six Bricks Duplo Block" activities in individual and group work can

support both individual and social cognitive development in children. Visual perception and math skills hold an important place among these cognitive abilities. The development of visual perception is associated with children's ability to mentally visualize a visual scene (Loikith, 1997). In this context, play promotes not only sensory association processes but also the development of visual perception (Brey, 2017; Kellman & Arterberry, 2006). The results contribute to the existing literature on learning through play and games, as well as offer important insights into the successful use of play methods to support academic learning goals in preschool classrooms in developing countries (Strasser et al., 2023).

In this context, it can be argued that the activities planned using the "Six Bricks Duplo Block" play-based technique can support children's observation, modeling, memorizing, and counting of bricks. Through these processes, they develop both visual perception and math skills. This is further confirmed by the increase observed in children's post-test scores. The program's potential to develop visual perception and math skills contributes to children's cognitive development, helping them become better prepared individuals during the preschool period.

LIMITATIONS OF THE STUDY

The present study has several limitations. First, the sample was restricted to a specific age group and a limited number of preschool institutions, which may limit the generalizability of the findings. In addition, the assessment tools primarily focused on mathematics and visual perception skills, leaving out the potential effects of the program on other cognitive and social domains. The relatively short duration of the study also prevented the evaluation of long-term effects. Finally, parental involvement and environmental factors were not included in the research design. Considering these limitations, future studies are recommended.

CONCLUSION AND RECOMMENDATIONS

The findings of this study show that a program enriched with "Six Bricks Duplo Block" activities significantly contributes to the development of preschool children's visual perception and math skills. Experiences gained through structured block play not only enhance fundamental cognitive processes such as hand-eye coordination and spatial thinking but also foster problem-solving, modeling, memory, and the internalization of mathematical concepts. The results highlight that play-based approaches constitute an indispensable resource for supporting cognitive development in early childhood. In this regard, incorporating Six Bricks activities into preschool curricula may facilitate children's preparedness for elementary school by equipping them with stronger academic and cognitive foundations. The results emphasize that integrating innovative, play-based approaches into the preschool curriculum offers a more holistic learning experience,

thereby enhancing school readiness and contributing to broader discussions on innovative approaches in education. Employing larger and more diverse samples, extending the intervention period and examining additional developmental domains are recommended in future studies. Conducting studies that examine the effects of the program enriched with "Six Bricks Duplo Block" play-based activities in different age groups (e.g., 3-4 year-olds or first-grade primary school students) could be beneficial for expanding the program's reach. The program's effects on other areas could enable the program to be evaluated as a holistic educational method. It is recommended that the program be implemented in different cities, rural areas, or private preschools to compare its effects. Besides, the impact of parental involvement in children's learning processes on the effectiveness of such play-based programs can guide parent-child interactions. Moreover, when supported with technologies such as digital platforms or augmented reality it can significantly contribute to the modernization of education. To integrate the "Six Bricks Duplo Block" play-based activities into the preschool curriculum, regular training and seminars can be organized to ensure widespread use of play-based learning approaches not only for math and visual perception but also for other cognitive and social skills.

REFERENCES

Aladwan, S., Awamleh, W., Alfayez, M. Q. E., Shaheen, H. R. A., & Abutaha, M. S. T. (2023). Visual Perceptions Skills and its Association with Written Mathematical Communication Skills among Learning Disabilities Students in Jordan. *Health Psychology Research*, *11*. https://doi.org/10.52965/001c.89427

Balfanz, R., Ginsburg, H. P., & Greenes, C. (2003). The big math for little kids early childhood mathematics program.(Early Childhood Corner). *Teaching Children Mathematics*, *9*(5), 264-269. https://l24.im/sFLO391

Björklund, C., Van den Heuvel-Panhuizen, M., & Kullberg, A. (2020). Research on early childhood mathematics teaching and learning, *ZDM, 52*(4), 607-619. https://doi.org/10.1007/s11858-020-01177-3

Bower, C. A., Foster, L., Zimmermann, L., Verdine, B. N., Marzouk, M., Islam, S., ... & Hirsh-Pasek, K. (2020). Three-year-olds' spatial language comprehension and links with mathematics and spatial performance. *Developmental Psychology*, *56*(10), 1894. https://psycnet.apa.org/doi/10.1037/dev0000899

Brey, A. (2017). *The effect of '6 Bricks' guided play on grade two learners' visual perception and reasoning abilities* [Doctoral dissertation, Nelson Mandela Metropolitan University]. https://core.ac.uk/download/pdf/145031656.pdf

Clements, D. H., & Sarama, J. (2020). *Learning and teaching early math: The learning trajectories approach*. Routledge. https://doi.org/10.4324/9781003083528

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cole, M., & Scribner, S. (1978). Vygotsky, Lev S. (1978): Mind in Society. The Development of Higher Psychological Processes. https://l24.im/4tuY2py

Coşkun, E. & Başgül, Ş., (2025). The Effect of Child-Centered Play Therapy on Self-Compassion and Emotion Regulation Skills in Children with Cancer. *International Journal of Modern Education Studies*, *9*(1), 155-177. https://doi.org/10.51383/ijonmes.2025.383

Erdoğan, S., & Baran, G. (2006). Erken matematik yeteneği testi-3 (TEMA-3)'ün 60-72 aylar arasında olan çocuklar için uyarlama çalışması. [Adaptation study of the Early Math Ability Test-3 (TEMA-3) for 60-72 months children]. *Çağdaş Eğitim Dergisi*, *31*(*332)*, 32-38. https://l24.im/E6JFxG

Gilligan-Lee, K. A., Fink, E., Jerrom, L., Davies, M. P., Dempsey, C., Hughes, C., & Farran, E. K. (2023). Building numeracy skills: Associations between DUPLO® block construction and numeracy in early childhood. *Journal of Intelligence*, *11*(8), 161. https://doi.org/10.3390/jintelligence11080161

Ginsburg, H. P. & Baroody, A. J. (2003). Test of Early Mathematics Ability-Third Edition. TX: Pro-Ed

Harn, Pay-Ling & Bo, Shu-Hui. (2019). The Effectiveness of Playful Positive Psychology Interventions with Six Bricks and DUPLO® Play Box for Taiwan Children on Emotional Adaptation. *World Journal of Research and Review*, *9*(5). https://doi.org/10.31871/WJRR.9.5.4

Herzberg, O., Fletcher, K. K., Schatz, J. L., Adolph, K. E., & Tamis-LeMonda, C. S. (2022). Infant exuberant object play at home: Immense amounts of time-distributed, variable practice. *Child development*, *93*(1), 150-164. https://doi.org/10.1111/cdev.13669

Huntsinger, C. S., Jose, P. E., & Luo, Z. (2016). Parental facilitation of early mathematics and reading skills and knowledge through encouragement of home-based activities. *Early Childhood Research Quarterly*, *37*, 1-15. https://doi.org/10.1016/j.ecresq.2016.02.005

Hutcheson, B. (2018). Six Bricks®. https://www.hispabrickmagazine.com/pdfs/HBM028_ES/HBM028_ES-40-43.pdf

Hutcheson, B. Frank, N & Smith, L. (2014). Back to basics with 6 bricks. Johannesburg: Care for Education.

Hutchesun, B. (2022). Altı tuğla ile temel becerilere dönüş [Back to basic skills with six bricks] (Zülfü Genç, Trans.). Teknokta

Jemutai, S. (2017). *The effect of using a six brick duplo block guided play approach on pre-school learners' visual perceptual abilities* [Doctoral dissertation, Nelson Mandela University].

Jerrom, L., Davies, M. P., Farran, E. K., Gilligan-Lee, K. A., Fink, E., Dempsey, C., & Hughes, C. (2023). Building numeracy skills: associations between DUPLO® Block construction and numeracy in early childhood. https://www.repository.cam.ac.uk/handle/1810/356949

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, *33*(7), 14-26. https://doi.org/10.3102/0013189X033007014

Kaplan, B. E., Rachwani, J., Tamis-LeMonda, C. S., & Adolph, K. E. (2022). The process of learning the designed actions of toys. *Journal of experimental child psychology*, *221*, 105442. https://doi.org/10.1016/j.jecp.2022.105442

Kellman, P. J., & Arterberry, M. E. (2006). Perceptual development. *The handbook of child psychology: Cognition, perception, and language*, *6*, 109-160.

Komisaryk, M., Kuznietsova, K., Taniavska, Y., Chuyko, H., & Kushniryk, R. (2024). The impact of role-playing games on developing empathy of future preschool inclusive teachers. https://archer.chnu.edu.ua/xmlui/handle/123456789/9683

Libertus, K., Joh, A. S., & Needham, A. W. (2016). Motor training at 3 months affects object exploration 12 months later. *Developmental Science*, 19, 1058–1066. https://doi.org/10.1111/desc.12370

Loikith, C. C. (1997). Visual perception: Development, assessment and intervention. *Functional visual behaviour: A therapist's guide to evaluation and treatment options*, 197-247.

Manessis, D. (2014). The importance of future kindergarten teachers' beliefs about the usefulness of games based learning. *International Journal of Game-Based Learning (IJGBL)*, *4*(1), 78-90. https://doi.org/10.4018/IJGBL.2014010105

Mielonen, A., & Paterson, W. (2009). Developing literacy through play. *Journal of Inquiry and Action in Education*, *3*(1), 2. https://digitalcommons.buffalostate.edu/jiae/vol3/iss1/2/

Mix, K. S., & Cheng, Y. L. (2012). The relation between space and math: Developmental and educational implications. *Advances in child development and behavior*, *42*, 197-243. https://doi.org/10.1016/B978-0-12-394388-0.00006-X

Mumcu, T. & Aydoğan, Y. (2021). Chapter VII early literacy skills and early math skills. *Bridging Theory and Practice for Early Years Education*, 135. https://l24.im/fTVGdL5

Nath, S., & Szücs, D. (2014). Construction play and cognitive skills associated with the development of mathematical abilities in 7-year-old children. *Learning and instruction*, *32*, 73-80. https://doi.org/10.1016/j.learninstruc.2014.01.006

Piaget, J. (1962). The stages of the intellectual development of the child. *Bulletin of the Menninger clinic*, *26*(3), 120. https://l24.im/BtP8T

Pieters, S., Desoete, A., Roeyers, H., Vanderswalmen, R., & Van Waelvelde, H. (2012). Behind mathematical learning disabilities: What about visual perception and motor skills? *Learning and Individual Differences*, *22*(4), 498-504. https://doi.org/10.1016/j.lindif.2012.03.014

Petrovska, S., Sivevska, D., & Cackov, O. (2013). Role of the Game in the Development of Preschool Child. *Procedia-Social and Behavioral Sciences*, *92*, 880-884. https://doi.org/10.1016/j.sbspro.2013.08.770

Richardson, M., Hunt, T. E., & Richardson, C. (2014). Children's construction task performance and spatial ability: Controlling task complexity and predicting mathematics performance. *Perceptual and motor skills*, *119*(3), 741-757. https://doi.org/10.2466/22.24.PMS.119c28z8

Sarama, J., & Clements, D. H. (2009). Building blocks and cognitive building blocks: Playing to know the world mathematically. *American Journal of Play*, *1*(3), 313-337. https://eric.ed.gov/?id=ej1069014

Soska, K. C., Adolph, K. E., & Johnson, S. P. (2010). Systems in development: motor skill acquisition facilitates three-dimensional object completion. *Developmental psychology*, *46*(1), 129. https://psycnet.apa.org/buy/2009-24671-004

Sökmen, S. (1994). Beş yaş algı gelişimi (Frostig Görsel Algı Testi Güvenirlik çalışması) [Perceptual development at age five (Frostig Visual Perception Test Reliability study)]. [Master's thesis, Marmara University]. Yükseköğretim Kurulu Ulusal Tez Merkezi. https://tez.yok.gov.tr

Strasser, K., Balladares, J., Grau, V., Marín, A., & Preiss, D. (2023). Efficacy and perception of feasibility of structured games for achieving curriculum learning goals in pre-kindergarten and kindergarten low-income classrooms. *Early Childhood Research Quarterly*, *65*, 396-406. https://doi.org/10.1016/j.ecresq.2023.08.006

Tepeli, K. (2013). TheRelationship Between Gross Motor Skills and Visual Perception of Preschoolers, *Turkish Journal of Sport and Exercise,15*(1), 43-53.

Thomson, D., Casey, B. M., Lombardi, C. M., & Nguyen, H. N. (2020). Quality of fathers' spatial concept support during block building predicts their daughters' early math skills–but not their sons'. *Early Childhood Research Quarterly*, *50*, 51-64. https://doi.org/10.1016/j.ecresq.2018.07.008

Tuğrul, B., Aral, N., Erkan, S. & Etikan, İ. (2001). Altı yaşındaki çocukların görsel algılama düzeylerine frostig gelişimsel görsel algı eğitim programının etkisinin incelenmesi

[Examining the effect of the frostig developmental visual perception training program on the visual perception levels of six-year-old children], *Journal of Qafgaz University*, *8*, 1-10.

Van Veen, S., van Wassenaer-Leemhuis, A. G., van Kaam, A. H., Oosterlaan, J., & Aarnoudse-Moens, C. S. (2019). Visual perceptive skills account for very preterm children's mathematical difficulties in preschool. *Early Human Development*, *129*, 11-15. https://doi.org/10.1016/j.earlhumdev.2018.12.018

Verdine, B. N., Irwin, C. M., Golinkoff, R. M., & Hirsh-Pasek, K. (2014). Contributions of executive function and spatial skills to preschool mathematics achievement. *Journal of experimental child psychology*, *126*, 37-51. https://doi.org/10.1016/j.jecp.2014.02.012

Wiederholt, J.L. (1971). The predictive validity of Frostig's constructs as measured by the developmental test of visual perception. Doctorate Thesis. Temple University, USA.

Zippert, E. L., & Rittle-Johnson, B. (2020). The home math environment: More than numeracy. *Early Childhood Research Quarterly*, *50*, 4-15. https://doi.org/10.1016/j.ecresq.2018.07.009

Zosh, J. M., Hopkins, E. J., Jensen, H., Liu, C., Neale, D., Hirsh-Pasek, K., Solis, S. L., & Whitebread, D. (2017). *Learning through play: a review of the evidence (white paper*). The LEGO Foundation, DK.

Data Availability Declaration

Data Availability Upon Formal Request:

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

Both authors, Yasemin Yüzbaşıoğlu and Banu Uslu, contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. Both authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors declare that there is no conflict of interest.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements: Not applicable.

Biographical notes:

Yasemin Yüzbaşıoğlu: Yasemin Yüzbaşıoğlu is an Assistant Professor at KTO Karatay University, Department of Child Development. Her research focuses on early childhood education, mathematics skills, literacy development, and sustainability awareness, aiming to enhance children's learning and developmental outcomes.

Scopus Author Identifier Number: 57226463141

Web of Science Researcher ID: HGC-7521-2022

Google Scholar Researcher ID: https://scholar.google.com/citations?user=lXvoEQsAAAAJ&hl=tr

Banu Uslu[3]**:** Banu Uslu is an Assoc. Prof. Dr. Emeritus of Preschool Education and educator with 25 years of experience in Türkiye, specializing in child development and education, preschool education and teaching English as a foreign language to preschoolers. She developed the "Life-Focused Foreign Language Acquisition Program and Scale", written English songs for children to boost their vocabulary learning which are on youtube with the title of SEDEP ENGLISH SONGS- OUR VALUES. She authored *Golden Years in Foreign Language Teaching* in 2020 and contributed in many academic books.

Scopus Author Identifier Number: 56800327100

Web of Science Researcher ID: N/A

Google Scholar Researcher ID: N/A

[3] Corresponding Author

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research

Investigation of Preschool Teachers' Emotional Intelligence Level

Turan Çakır[1] Hacer Dervişoğlu[2]

Article Type
Original Research
International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 697- 720
http://www.ijonmes.net

Article Info:

Received 21.08.2025
Revision 21.10.2025
Accepted 02.12.2025

Abstract:

Managing emotions is recognized as one of the teachers' most essential social and emotional competencies. Thus, this study investigates the extent to which teachers employ emotional intelligence (EI) competencies in their professional lives. The study employed a survey design, sampling 400 teachers working in Sakarya Province during the 2023–2024 academic year. Data were collected using the Emotional Intelligence Competencies in Professional Life Scale developed by Titrek (2005). The scale's validity and reliability were confirmed with Cronbach's alpha (internal consistency coefficient) of 0.96, indicating high reliability. The data were analysed using the SPSS statistical package. A one-way analysis of variance (ANOVA) and a t-test were employed to address research problems. The findings revealed that age was associated with statistically significant differences in teachers' self-awareness and empathy. However, no statistically significant differences were found based on gender. Lastly, teachers' empathy levels differed significantly by teaching experience, with the difference observed between teachers with 0-5 years' experience and those with 20 or more years' experience.

Keywords: Teacher, preschool education, emotional intelligence, professional life.

Citation:
Çakır, T., Dervişoğlu, H. (2025). Investigation of Preschool Teachers' Emotional Intelligence Level, *International Journal of Modern Education Studies, 9*(2), 697-720. https://doi.org/10.51383/ijonmes.2025.432

[1] Assist. Prof., Sakarya University, Education Faculty, Sakarya, Türkiye, tcakir@sakarya.edu.tr,
https://orcid.org/0000-0002-8017-5630
[2] Master's Degree Student, Sakarya University, Institute of Educational Sciences, Department of Basic Education, Deparment of Preschool Education, Sakarya, Türkiye, hacer.dervisoglu1@ogr.sakarya.edu.tr,
https://orcid.org/0009-0004-7976-6021

INTRODUCTION

Providing high-quality education in schools is essential for societal growth and for achieving the level of prosperity observed in developed countries. However, for students to succeed, the quality of education in schools must be improved. A significant improvement in the success rates of schools largely depends on the quality of teachers. In other words, quality teachers are indispensable for cultivating successful students (Özyar, 2003; Seferoğlu, 2003). Since teachers are trained in teacher-training institutions, these institutions bear great responsibility for this process (Okçabol, 2000; Türkoğlu, 1991). Teachers, as the cornerstone of human resources in educational institutions, play a critical role in defining the quality and success of these institutions. They form the foundation of educational excellence and are a key factor in establishing an institution's competitive advantage.

Preschool education in Turkey, which changed age levels over the past decade, was first defined in official educational literature at the 14th National Education Council convened by the Ministry of National Education in 1993. It was described as an educational process designed to provide rich, stimulating, and developmentally appropriate opportunities for children aged 0–72 months. This process aims to support their physical, cognitive, emotional, and social development to guide them effectively in alignment with the cultural values of society and to prepare them for primary education, which is part of the broader framework of basic education (Çakır, 2017: 2048). Despite the progress toward becoming an information society, individuals still accept information without questioning it. To prevent this, it is essential to equip individuals, starting from preschool education, with critical thinking — a key higher-order thinking skill — and emotional intelligence competencies such as self-awareness, emotional regulation, self-motivation, empathy, and relationship management. Psychological and developmental research suggests that education plays a role as significant as genetics in the development of emotional intelligence. Although not widely recognized, research and practical applications have clearly demonstrated that emotional intelligence can be learned. Teachers' emotional intelligence and their ability to apply it in their professional practice directly influence the achievement of educational goals. Individuals with high emotional intelligence recognize their emotions, understand what they want, are aware of their strengths and weaknesses, and manage their emotions to make healthier decisions. Thus, a teacher with emotional intelligence is expected to recognize and manage their emotions, empathize with others, and handle challenging situations by drawing on their emotional abilities. Teachers with these skills are considered more likely to achieve happiness in their personal and professional lives, reach their goals, and attain success. In fact, the objectives and duties of preschool education, updated by the Ministry of National Education in 2024, align with the general goals and principles of national education. These objectives include supporting children's physical, mental, and emotional development; helping them develop good habits,

facilitating their adaptation to social life; preparing them for primary school, providing a common and nurturing environment for children from disadvantaged backgrounds and families; and ensuring that children speak Turkish correctly and fluently. Moreover, the 2024 Preschool Education Program includes 22 outcomes and 129 indicators in the domains of social-emotional development and values education (Ministry of National Education Preschool Education Program, 2024). Within this framework, it is evident that emotional intelligence competencies are central to social and emotional development.

Definition and Characteristics of Emotional Intelligence

Following the increased focus on individuals as a key labour factor within organizations, the study of intelligence and its various forms gained prominence. Intelligence remains a concept that psychologists find challenging to define, with no universal consensus on its meaning. According to the philosophy dictionary, intelligence is described as "the ability to comprehend, recognize, combine, separate, and select signs associated with situations and relationships." In contemporary use, intelligence serves as an indicator of quality for a range of behaviours and is used to understand and interpret human behaviour (Doğan and Şahin, 2007: 233). Salovey and Mayer (1990) proposed that intelligence is related to emotions and introduced the concept of emotional intelligence.

The concept of emotional intelligence, commonly abbreviated as EI, is also widely referred to in the literature as EQ (Emotional Quotient). EQ is commonly regarded as the emotional counterpart to IQ (Intelligence Quotient). Emotional intelligence was first defined in 1990 by Peter Salovey of Yale University's Psychology Department and John D. Mayer of the University of New Hampshire. According to their definition, emotional intelligence is "a subform of social intelligence related to the ability of an individual to monitor their own and others' feelings and emotions, to distinguish between them, and to use this information to guide their own thoughts and actions" (Mayer & Salovey, 1995: 433; Salovey & Mayer, 1990: 189).

According to Bar-On (2006), emotional intelligence is a set of emotional and social skills that enable individuals to effectively understand themselves and others, express themselves, build relationships, and address daily needs in the best possible way. Similarly, Baltaş (2006: 7) defines emotional intelligence as the ability to recognize, understand, and effectively use one's own emotions and those of others to cope with stress, to evaluate one's emotions, and to consider the desires, needs, strengths, and weaknesses of others in order to gain social acceptance. Izard (2001) notes that emotional intelligence comprises skills that allow individuals to understand themselves and others, adapt to their environment, establish meaningful relationships, and manage the challenges within their surroundings. According to Cooper and Sawaf (2000), emotional intelligence is "the ability to sense, understand, and effectively use the power and rapid understanding of emotions as a source of human energy, knowledge, relationships, and influence" (Çakar & Arbak, 2004: 39). Konrad and Hendl (2005:13) describe emotional intelligence as a combination of emotional

traits such as composure, effort, perseverance, and talent that are essential for motivating oneself and others.

According to Yaylacı (2006: 49-50):

- Emotional intelligence is not the opposite of intelligence. To think more rationally, we rely on intuition and signals from our emotions. Conversely, we need rational thinking to utilize emotions effectively. The coordinated functioning of the brain and heart is crucial.
- It is not merely about being in touch with emotions or entirely releasing them. Emotional intelligence does not involve acting uncontrollably or impulsively, nor is it about suppressing or rigidly controlling emotions. Rather, it concerns the effective use of the appropriate emotion at the appropriate moment.
- It is not simply about being good or kind-hearted. Emotional intelligence requires individuals, when necessary, to convey unpleasant truths in relationships. It is not merely a concept related to personal development. Skills associated with emotional intelligence—such as empathy, active listening, conflict resolution, and dialogue management—often contribute to success and performance in professional life.
- It is not an activity aimed at improving an individual's performance or ensuring discipline. Emotional intelligence is not a quick solution that enables immediate recognition of differences. While individuals can learn a word or a process within an hour, developing the ability to manage anger or excitability can take much longer. Emotional intelligence is a lifelong process.

Drawing on these explanations, emotional intelligence can be defined as the process by which an individual perceives, interprets, and regulates both their own emotions and those of others and develops strategies that align with emotional expectations and positively influence their life and energy. In other words, emotional intelligence is the ability to perform effective emotional manoeuvres to achieve success and satisfaction in both intrapersonal and interpersonal domains (Yaylacı, 2006: 49).

Goleman (2012a: 62), who made significant contributions to the development of the concept of emotional intelligence, defines it as the ability to motivate oneself, persist in the face of setbacks, control impulses, and delay gratification, regulate one's mood, prevent distress from interfering with thinking, empathize with others, and maintain hope. In short, emotional intelligence is our ability to manage our own emotions and our potential to build positive relationships (Goleman, 2007: 10).

Based on the definitions above, emotional intelligence can be conceptualized as the ability to recognize and control one's emotions, cope with adverse situations, and understand and balance the emotions of others, in order to satisfy needs most effectively. It also involves building and appropriately managing positive relationships. From the perspective of emotional intelligence, its development is particularly important. Research

has shown that the concept of "intelligence" should not be considered solely as intellectual intelligence (IQ), but should also encompass emotional intelligence. Emotional intelligence includes an individual's awareness of their emotional traits, the ability to control these emotions, empathize with others, maintain intrinsic motivation, and attain competence in interpersonal relationships. Emotional intelligence, which plays a crucial role in individuals' attainment of satisfaction and happiness in both professional and social lives, is equally vital in education and organizations. In the 21st century, research has increasingly focused on the application of emotional intelligence in education. The emotional-intelligence teacher model guides students in addressing undesirable classroom behaviours and acquiring essential skills.

Previous research identified various factors influencing emotional intelligence among teachers. Özmen (2009) reported associations between elementary school teachers' fields of specialization, gender, age, experience, and emotional intelligence, highlighting that their fields of specialization and gender significantly affect emotional intelligence. Similarly, Akbaş (2006) suggested that teachers' ages influence their emotional intelligence, while Toytok (2013) found that marital status and experience also influence emotional intelligence among primary school teachers. Erdem, İlhan, and Çelik (2013) revealed that teachers' educational levels impact their emotional intelligence, and Kızıl (2014) concluded that factors such as gender, age, school level, field of specialization, and experience are influential in determining emotional intelligence. Additionally, Yavuz (2018) observed that teachers' gender significantly affects their emotional intelligence. These findings collectively underline the multifaceted nature of emotional intelligence and the various demographic and professional factors that contribute to its development among educators

Dimensions of Emotional Intelligence

Researchers studying emotional intelligence undoubtedly drew significant insights from Howard Gardner's "multiple intelligence" model, introduced in 1983. Gardner, one of the most influential theorists of intelligence, emphasized the distinction between intellectual (academic) abilities and emotional abilities. His framework of seven, later expanded to eight, intelligence domains includes not only traditional verbal and mathematical abilities but also two personal domains: "social and personal intelligence" (Gardner, 1997; 1999). Building on these concepts, scholars of emotional intelligence developed a model encompassing five talent domains, integrating Gardner's personal domains (Goleman, 1998; Lazarus, 1999; Weisinger, 1998):

- Self-awareness is the ability to recognize, understand, and accurately evaluate one's own emotions. Self-awareness forms the foundation of emotional intelligence, involving the recognition of an emotion while it is occurring. It is a psychological insight.
- Emotional self-regulation involves the ability to manage emotions appropriately. It does not imply being overwhelmed by emotions or suppressing them, but rather

expressing emotions in a balanced, harmonious manner. Emotional self-control, including the capacity to delay gratification in pursuit of a goal, is a critical aspect of this ability.

- Motivation: It refers to the capacity to mobilize emotions in pursuit of a goal. It is rooted in internal motivation and key to initiating tasks and seeing them through to completion. In emotional intelligence, motivation involves using one's emotional system to direct energy toward achieving objectives.
- Empathy (understanding the feelings of others) is the ability to put oneself in another person's shoes and to understand their emotions. It is fundamental to building relationships and originates in self-awareness. The more attuned one is to their own emotions, the better they can comprehend others' emotions.
- Managing Relationships (Social Skills): This involves establishing and maintaining effective interpersonal relationships, often referred to as "social arts" or "the art of relationships. According to Goleman (1998), this skill requires the maturation of self-management and empathy.

The Role of Emotional Intelligence in Education

Family life serves as the first school that imparts emotional lessons. In this close-knit environment, we learn how to perceive ourselves, how others react to our feelings, how to process these feelings, and how to respond to them. This also involves understanding how to express hopes and fears. Emotional lessons come not only from what parents directly say and do but also from how they manage their own emotions and how they model interactions. Some parents are gifted emotional teachers, while others can be cruel (Goleman, 2012a: 252). More recently, some authors have argued that emotions are important in schools and in school leadership (Ginsberg, 2020).

In developing emotional intelligence, three factors are key: the student, parent, and teacher. Emotional intelligence education should begin in preschool and continue throughout life. Given that childhood is a pivotal period for emotional development, parents and teachers must prioritize emotional intelligence training during these early years (Vural & Koçabaş, 2011). School administrators and teachers should also play a role in supporting the development of emotional intelligence. These three factors—students, parents, and teachers—should work together in harmony. Emotional intelligence education should begin in preschool and extend to parents, who must also be educated in these skills. Teachers should receive emotional intelligence training during their university education. If this approach is implemented as a program, it could result in a generation of parents and teachers well-equipped to nurture emotional intelligence in students, contributing to a more effective educational experience (Tufan, 2011: 26).

In recent years, emotional intelligence studies have started to focus on preschool and early childhood education processes. Xu (2024) Moreover, Chun & Han (2024), Gavín-Chocano (2024), Wang (2024), Walter et al (2025), Shaffy, A., & Ndijuye, L. G. (2025), Yuan

et al. (2025), Veraksa (2025), Rahmaniya (2025) claim that developing emotional intelligence is an important issue for children and children's education, and they investigated emotional intelligence during pre-school educational processes based on teachers' perceptions.

However, no studies have examined the impact of emotional intelligence on pre-school education in Turkey or the measurement of emotional intelligence among pre-school educators. Pektane Gülmez and Gültekin Akduman (2022) studied mothers of children in preschool education, while Koç Akran and Kocaman (2019) investigated the effects of visualisation-based activities on children's emotional intelligence. Therefore, research aimed at determining pre-school teachers' emotional intelligence levels has emerged as an important topic for the development of pre-school education in Turkey.

Purpose of the study

To ensure the effectiveness of educational institutions, in which human elements and distinctive human characteristics are central, it is more important to consider emotions than in other types of institutions. Human relationships lie at the core of education, and the effective management of these relationships depends on emotional intelligence. This study investigates the extent to which teachers use emotional intelligence competencies in their professional lives, employing a quantitative approach. The aim is to assess the level of participants' emotional intelligence competencies in their professional lives with respect to demographic factors such as age, gender, and years of experience. To this end, the research problems were formulated as follows:

- What is the level of use of emotional intelligence competencies by teachers studying in Sakarya province in their professional life?
- Does the level of teachers' use of emotional intelligence competencies in their professional life differ significantly by their age?
- Does the level of teachers' use of emotional intelligence competencies in their professional life differ significantly by gender?
- Does the level of teachers' use of emotional intelligence competencies in their professional life differ significantly by experience?

METHOD

This section provides information on the research design, sample, data-collection tools, and data analysis.

Research Design

This study adopted a descriptive survey method to assess the teachers' emotional intelligence levels. The survey model is a research method commonly used to determine

participants' attitudes and opinions regarding a particular research topic. Moreover, the descriptive survey model is implemented using questionnaire-type measurement tools and is particularly characterised by its strengths in"obtaining and interpreting behavioural data, collecting more accurate and comprehensive data, being cheaper and faster to implement, and having a rapid data collection processthe ability to collect large volumes of data quickly and at low cost, etc. (Karakaya, 2012). In survey studies, the primary goal is to describe individuals' characteristics, such as their attitudes, interests, skills, and self-efficacy related to the subject under study, without intervening in the current situation (Büyüköztürk et al., 2018). While survey models are not concerned with the causes of events, they aim to uncover individuals' perceptions, attitudes, and other characteristics concerning the situation under study.

Sample

The study sample includes 988 preschool teachers employed in public and private preschool education institutions in the central district of Sakarya Province during the 2023-2024 academic year. The sample was intended to comprise 384 teachers selected through convenience sampling, one of the non-probability sampling approaches (Altınışık et al., 2004: 129-130). However, 400 teachers volunteered to participate in the study.

Data Collection Tool and Data Collection Procedure

Data were collected using "Emotional Intelligence Competencies in Professional Life Scale" developed by Titrek (2005). The scale consists of five sub-scales and a total of 72 items: "Self-Awareness (12 items)", "Managing Emotions (15 items)", "Motivating Emotions (14 items)", "Empathy (12 items)", and "Social Skills (19 items)". The items are rated on a 5-point Likert scale with the following response options: (1) Never; (2) Very rarely; (3) Sometimes; (4) Very often; and (5) Always.

The scale demonstrated high reliability (Cronbach's alpha = 0.84). Confirmatory factor analysis was performed for each subscale, and item validity was confirmed for all subscales. The corrected item-total correlations ranged from .30 to .67, all of which were positive. For each sub-scale, a scoring range was established to assess the level of emotional intelligence:

Self-Awareness: 49–60 points indicate "Very sufficient"; 37–48 points indicate "Sufficient"; 25–36 points indicate "Deficiencies" that require development; and 24 points or below indicate "Insufficient" and require significant improvement.

Managing Emotions: 61-75 points indicate "Very sufficient," 46-60 points indicate "Sufficient," 31-45 points indicate "Deficiencies," and below 30 points indicate "Insufficient" and requiring much effort to improve.

Motivating Emotions: 57-70 points indicate "Very sufficient"; 43-56 points indicate "Sufficient"; 29-42 points indicate "Deficiencies"; and below 28 points indicate "Insufficient" and require substantial effort.

Empathy: 49-60 points indicate "Very sufficient"; 37-48 points indicate "Sufficient"; 25-36 points indicate "Deficiencies"; and below 24 points indicate "Insufficient" and require significant improvement.

Social Skills: 77-95 points indicate "Very sufficient," 58-76 points indicate "Sufficient," 39-57 points indicate "Deficiencies," and below 38 points indicate "Insufficient" and need substantial effort.

The research was conducted with permission from the Sakarya University Ethics Committee on 11.01.2024, under the reference number E-61923333-050.99-324645. A test of normality was performed to determine whether the data were normally distributed. The results of this test are displayed in Table 1.

Table 1.

The distribution of the data

Scale / Sub-scales	N	$\bar{X}$	SD	Skewness	Kurtosis
Emotional Intelligence Scale	400	294.86	30.89	-.181	-.161
Self-awareness	400	49.80	5.47	-.251	-.049
Managing emotions	400	63.24	6.53	-.473	.883
Motivating emotions	400	56.26	6.95	-.253	.005
Empathy	400	49.40	5.84	-.261	-.147
Social skills	400	76.17	10.40	-.315	-.146

The skewness and kurtosis coefficients in Table 1 range from -1 to +1, which, according to Hair et al. (2013), indicate that the data are approximately normally distributed. Based on the results presented in Table 1, the data for all subscales and the total scale are approximately normally distributed. Thus, parametric tests were deemed appropriate to address the research problems. Specifically, an independent-samples t-test was conducted to determine whether the level of teachers' use of emotional intelligence competencies in professional life differed significantly by gender. Additionally, one-way ANOVA was applied to compare teachers' levels of use of emotional intelligence competencies in professional life across age and experience groups.

FINDINGS

In this section of the article, the research data have been analysed and the findings have been tabulated and interpreted.

Findings on the level of teachers' use of emotional intelligence competencies in professional life

Table 2.

Descriptive statistics regarding teachers' levels of using emotional intelligence competencies in professional life

Scale/ Sub-scale	Min.-Max.	X̄	SD	Skewness	Kurtosis
Emotional intelligence	72.00-360.00	294.86	30.89	-.181	-.161
Self-awareness	12.00-60.00	49.80	5.47	-.251	-.049
Managing emotions	15.00-75.00	63.24	6.53	-.473	.883
Motivating emotions	14.00-70.00	56.26	6.95	-.253	.005
Empathy	12.00-60.00	49.40	5.84	-.261	-.147
Social skills	19.00-95.00	76.17	10.40	-.315	-.146

The findings indicate that preschool teachers demonstrate high levels of emotional intelligence competencies in their professional lives ($\bar{X}$ = 294.86; SD = 30.89). Across subscales, mean scores indicate high performance in self-awareness ($\bar{X}$ = 49.80, SD = 5.47), managing emotions ($\bar{X}$ = 63.24, SD = 6.53), motivating emotions ($\bar{X}$ = 56.26, SD = 6.95), empathy ($\bar{X}$ = 49.40, SD = 5.84), and social skills ($\bar{X}$ = 76.17, SD = 10.40). These results suggest that the emotional intelligence competencies of preschool teachers in their professional settings are generally rated as sufficient or very sufficient and reflect a strong ability to manage emotions effectively, motivate themselves and others, empathize, and demonstrate social skills.

Investigation of the level of teachers' use of emotional intelligence competencies in professional life by age

One-way ANOVA was conducted to compare teachers' use of emotional intelligence competencies in professional life, including self-awareness, managing emotions, motivating emotions, empathy, and social skills, across age groups. The results of the analysis are presented in Table 3.

Table 3.

Comparison of teachers' levels of using emotional intelligence competencies in professional life by age

Scale/ Sub-scale	Age	n	X̄	SD	Variance	Sum of Squares	df	Mean square	F	p
Emotional Intelligence	20-30	39	290.69	25.25	Between groups	9681.834	5	1936.367	2.06	.070
	31-35	59	294.93	32.03	Within groups	371033.043	394	941.708		
	35-40	99	287.97	31.36	Total	380714.878	399			

	41-44	86	296.64	33.34					
	45-50	55	300.95	30.47					
	≥51	62	300.53	27.57					
	Total	400	294.86	30.89					
Self-awareness	20-30	39	48.64	5.15	Between groups	404.153	5	80.831	2.76 .018*
	31-35	59	49.68	5.56	Within groups	11542.444	394	29.296	
	35-40	99	48.53	5.62	Total	11946.598	399		
	41-44	86	51.09	5.15					
	45-50	55	50.65	5.61					
	≥51	62	50.11	5.27					
	Total	400	49.8	5.47					
Managing emotions	20-30	39	62.74	5.3	Between groups	342.453	5	68.491	1.62 .154
	31-35	59	62.83	6.62	Within groups	16665.457	394	42.298	
	35-40	99	62.12	6.93	Total	17007.910	399		
	41-44	86	63.34	7.43					
	45-50	55	64.02	6.03					
	≥51	62	64.87	5.29					
	Total	400	63.24	6.53					
Motivating emotions	20-30	39	55.72	5.54	Between groups	494.128	5	98.826	2.08 .068
	31-35	59	56.27	7.28	Within groups	18752.832	394	47.596	
	35-40	99	54.61	7.07	Total	19246.960	399		
	41-44	86	56.63	7.33					
	45-50	55	57.67	6.59					
	≥51	62	57.47	6.65					
	Total	400	56.26	6.95					

Empathy	20-30	39	47.95	5.21	Between groups	476.459	5	95.292	2.86	.015*
	31-35	59	50.05	6.64	Within groups	13145.338	394	33.364		
	35-40	99	47.98	6.04	Total	13621.798	399			
	41-44	86	49.62	6.19						
	45-50	55	50.60	4.82						
	≥51	62	50.58	4.91						
	Total	400	49.4	5.84						
Social skills	20-30	39	75.64	9.98	Between groups	511.846	5	102.369	0.95	.451
	31-35	59	76.1	9.51	Within groups	42625.931	394	108.188		
	35-40	99	74.74	10.37	Total	43137.778	399			
	41-44	86	75.97	11.16						
	45-50	55	78	10.76						
	≥51	62	77.5	10.09						
	Total	400	76.17	10.4						

*p<,05

Table 3 reveals that the overall level of teachers' use of emotional intelligence (EI) competencies in their professional lives does not differ significantly across age groups ($F(5,394) = 2.06$, $p > .05$). Similarly, no significant differences are observed in the subscales of managing emotions ($F(5,394) = 1.62$, $p > .05$), motivating emotions ($F(5,394) = 2.08$, $p > .05$), and social skills ($F(5,394) = 0.95$, $p > .05$). However, self-awareness levels differed significantly by age ($F(5, 394) = 2.76$, $p < .05$), and post hoc analysis indicated that teachers aged 41–44 ($\bar{X} = 51.09$) exhibited higher self-awareness than those aged 35–40 ($\bar{X} = 48.53$). Similarly, empathy levels differs significantly across age groups ($F(5, 394) = 2.86$, $p < .05$), with post hoc results showing higher empathy among teachers aged 45–50 ($\bar{X} = 50.60$) and 51 and older ($\bar{X} = 50.58$) compared to those aged 35–40 ($\bar{X} = 47.98$).

Investigation of the level of teachers' use of emotional intelligence competencies in professional life by gender

An independent-samples t-test was conducted to determine whether the level of preschool teachers' use of emotional intelligence competencies in professional lives differs by gender (Table 4).

Table 4. Comparison of teachers' levels of using emotional intelligence competencies in professional life by gender

Scale / Sub-scale	Group	n	$\bar{X}$	SD	df	t	p
Emotional Intelligence	Female	224	296.37	30.68	398	-1,10	.271
	Male	176	292.94	31.04			
Self-awareness	Female	224	49.68	5.37	398	0,49	.624
	Male	176	49.95	5.61			
Managing emotions	Female	224	63.57	6.66	398	-1,15	.252
	Male	176	62.81	6. 35			
Motivating emotions	Female	224	56. 58	6.95	398	-1,04	.299
	Male	176	55. 85	6.94			
Empathy	Female	224	49.63	5.92	398	-0,88	.380
	Male	176	49.11	5.74			
Social skills	Female	224	76.92	10.49	398	-1,63	,105
	Male	176	75.22	10.23			

As Table 4 shows, the extent to which preschool teachers use emotional intelligence competencies in professional life does not differ significantly by gender. Similarly, an investigation of the subscales reveals no significant gender-based differences in self-awareness, managing emotions, motivation, empathy, or social skills ($p > .05$).

Investigation of the level of teachers' use of emotional intelligence competencies in professional life by experience

A one-way ANOVA was conducted to determine whether the extent to which teachers use emotional intelligence competencies in professional life differs significantly based on their experience.

Table 5. Comparison of teachers' levels of using emotional intelligence competencies in professional life by experience

Scale / Sub-scale	Experience	n	X̄	SD	Variance	Sum of Squares	df	Mean Square	F	p
Emotional intelligence	0-5 years	47	289.49	24.68	Between groups	7094.348	4	1773.587	1.88	.114
	6-10 years	60	294.58	32.34	Within groups	373620.529	395	945.875		
	11-15 years	69	300.52	32.54	Total	380714.878	399			
	16-20 years	143	291.36	33.65						
	≥20 years	81	299.53	25.27						
	Total	400	294.86	30.89						
Self-awareness	0-5 years	47	48.21	4.95	Between groups	191.902	4	47.975	1.61	.170
	6-10 years	60	50.03	5.64	Within groups	11754.696	395	29.759		
	11-15 years	69	50.75	5.35	Total	11946.598	399			
	16-20 years	143	49.64	5.62						
	≥20 years	81	50.01	5.39						
	Total	400	49.8	5.47						
Managing emotions	0-5 years	47	62.47	5.29	Between groups	186.188	4	46.547	1.09	.360
	6-10 years	60	63.02	6.6	Within groups	16821.722	395	42.587		
	11-15 years	69	63.86	7.03	Total	17007.910	399			
	16-20 years	143	62.69	7.23						
	≥20 years	81	64.27	5.21						
	Total	400	63.24	6.53						
Motivating emotions	0-5 years	47	55.85	5.67		146.764	4	36.691	.76	.553
	6-10 years	60	55.55	7.12		19100.196	395	48.355		
	11-15 years	69	57.1	7.53		19246.960	399			

	16-20 years	143	55.89	7.36						
	≥20 years	81	56.96	6.2						
	Total	400	56.26	6.95						
Empathy	0-5 years	47	47.91	4.9	Between groups	429.306	4	107.326	3.21	.013*
	6-10 years	60	49.67	6.78	Within groups	13192.492	395	33.399		
	11-15 years	69	50.52	5.82	Total	13621.798	399			
	16-20 years	143	48.52	6.18						
	≥20 years	81	50.64	4.53						
	Total	400	49.4	5.84						
Social skills	0-5 years	47	75.04	9.38	Between groups	892.213	4	223.053	2.09	.082
	6-10 years	60	76.32	9.56	Within groups	42245.565	395	106.951		
	11-15 years	69	78.29	10.71	Total	43137.778	399			
	16-20 years	143	74.62	11.49						
	≥20 years	81	77.64	8.85						
	Total	400	76.17	10.4						

*p>.05

As Table 5 shows, the overall level of teachers' use of emotional intelligence competencies in professional lives does not differ significantly across experience levels ($F(4, 395) = 1.88$, $p > .05$). However, when examining the subscales, teachers' empathy levels differed significantly across experience levels ($F(5, 394) = 3.21$, $p < .05$). Scheffé's post hoc analysis was applied, and it indicates that this difference occurs between teachers with 0–5 years of experience ($\bar{X} = 47.91$) and those with 20 or more years of experience ($\bar{X} = 50.64$). These findings suggest that teachers with greater professional experience tend to exhibit higher levels of empathy than those in the early stages of their careers.

CONCLUSION AND DISCUSSION

An examination of the findings regarding the level of preschool teachers' use of emotional intelligence competencies in professional life, along with their subscales, revealed that their overall use of these competencies was generally sufficient and commendable. Even the skills perceived as least developed—social skills—are considered by preschool teachers to be adequate.

To determine whether preschool teachers' levels of emotional intelligence competencies in professional life (self-awareness, managing emotions, motivating emotions, empathy, and social skills) differ significantly by age, a one-way ANOVA was conducted. The results indicate no significant differences in the overall levels of emotional intelligence competencies across age groups. Similarly, an analysis of the subscales reveals no significant differences among age groups in managing and motivating emotions or in social skill levels. Preschool teachers' self-awareness levels differed significantly by age. Post hoc analysis revealed that this difference was between teachers aged 35–40 and those aged 41–44. Similarly, preschool teachers' empathy levels varied significantly with age. Post hoc comparisons indicated that teachers aged 35–40 differed from those aged 45–50 and from those aged 51 and over. These findings are consistent with previous research; for example, Akın (2004) found no significant association between emotional intelligence and age. Similarly, Öztürk and Deniz (2006) and Özdemir and Özdemir (2007) reported no significant differences in emotional intelligence dimensions by age. In contrast, Akbaş (2006) found that teachers' ages influenced their emotional intelligence level.

Furthermore, an independent-samples t-test was conducted to examine whether teachers' use of emotional intelligence competencies in professional life differed by gender. The results indicated no significant gender-based differences in emotional intelligence competencies. The findings of this study are consistent with those of Güney (2009), who also found no significant gender-based differences in emotional intelligence. However, Yavuz (2018) determined that gender influenced teachers' emotional intelligence.

To examine whether preschool teachers' use of emotional intelligence competencies in professional life differs significantly based on their experience, a one-way ANOVA was performed. The results indicated no significant differences in overall emotional intelligence competencies across levels of experience. However, when analyzing the subscales, teachers' empathy levels varied significantly with experience. Post hoc analysis revealed that this difference was between teachers with 0–5 years of experience and those with 20 or more years of experience. These findings suggest that teachers with more experience tend to exhibit greater empathy than those in the early stages of their careers. The studies by Güler (2006), Öztürk (2006), and Canbulat (2007) support these findings.

RECOMMENDATIONS

1. Pre-school teachers with higher emotional intelligence tend to have stronger organizational engagement, being highly engaged with their school, their teaching, the teaching profession, and their colleagues. Both preschool teachers and teacher candidates should be advised to attend training courses, seminars, and in-service training programs on developing emotional intelligence and applying it in the educational process.

2. Since emotional intelligence is a skill that can be developed, incorporating such training into educational curricula at all levels (preschool through university) could be valuable for future generations.

3. During teacher-candidate training, case studies and activities designed to enhance emotional intelligence in classroom management could be integrated into the curriculum to improve candidates' practical teaching skills.

4. To support the career advancement of teachers pursuing postgraduate education, institutions can remove barriers, implement measures to increase professional satisfaction, and improve organizational conditions that may negatively affect levels of emotional intelligence.

5. Further research could investigate the level of teachers' emotional intelligence competence in classroom management from the perspectives of their students. Comparative analysis of these findings could yield additional insights and conclusions.

REFERENCES

Acar, F. T. (2001). Duygusal zekâ yeteneklerinin göreve ve insana yönelik liderlik davranışları ile ilişkisi (Publication No. 105020) [The relationship between emotional intelligence skills and leadership behaviors (employee-centered and job-centered): Survey research on bank managers] [Doctoral dissertation, Istanbul University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=5T1_CZ5-UGb9QCmoURec4HK75t2uoY8UqWtBTDkvbH4Hv9WFrfu7OftcqA0fZ0LE

Akbaş, E. (2006). *İstanbul ili Fatih ilçesi ilköğretim okulu öğretmenlerinin duygusal zekâ düzeylerinin belirlenmesi* (Publication No. 190096) [Determining the emotional intelligence levels of the primary school teachers in Fatih, Istanbul] [Master's thesis, Yeditepe University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=XohQ0H2mJnBfxLPsY8dG46RJq-KM_Zw8FOoAETtFJgwKg5E9569eAK2ftE1G20Yq

Altunışık, R., Coşkun, R., Bayraktaroğlu, S., & Yıldırım, E. (2004). *Sosyal bilimlerde araştırma yöntemleri* [Research methods in social sciences]. Sakarya Kitabevi.

Bar-On, R. (2006). The Bar-On model of emotional-social intelligence (ESI). *Psicothema, 18*, 13–25. https://www.psicothema.com/pdf/3271.pdf

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2018). *Bilimsel araştırma yöntemleri* (24th ed.) [Scientific research methods]. Pegem Akademi.

Canbulat, S. (2007). *Duygusal zekâ'nın çalışanların iş doyumları üzerindeki etkisinin araştırılması* (Publication No. 205726) [Research on the effect of emotional intelligence on employees' job satisfaction] [Master's thesis, Gazi University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=lv7JVaM15ze5-ZjJ1trLbw&no=Iib1YcwlNVtaZC5vsvY5hg

Çakar, U., & Arbak, Y. (2004). Modern yaklaşımlar ışığında değişen duygu-zekâ ilişkisi ve duygusal zekâ [Emotional Intelligence: The Changing Relationship of Emotion-Intelligence Under Modern Approaches]. *Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 6*(3), 23–48. https://avesis.deu.edu.tr/yayin/0ef6aa39-fcc2-47bd-894d-93e8da89c18b/modern-yaklasimlar-isiginda-degisen-duygu-zeka-iliskisi-ve-duygusal-zeka

Çakır, T. (2017). The opinions of preschool teacher candidates on vocational and personal achievements from the drama lesson. *Journal of Human Sciences, 14*(2), 2047–2060.

Chung, H., & Han, E. (2024). How does emotional intelligence develop in early childhood?: A meta-analysis of two perspectives on emotional intelligence. *Early Years, 45*(3–4), 563–578. https://doi.org/10.1080/09575146.2024.2378377

Doğan, S., & Şahin, F. (2007). Duygusal zekâ: Tarihsel gelişimi ve örgütler için önemine kavramsal bir bakış [Emotional intelligence: A conceptual view of its historical development and its importance for organizations]. *Ç.Ü. Sosyal Bilimler Enstitüsü Dergisi, 16*(1), 231–252.

Erdem, M., İlğan, A., & Çelik, F. (2013). Lise öğretmenlerinin duygusal zekâ düzeyleri ile eleştirel düşünme eğilimleri arasındaki ilişki [Relationship between emotional intelligence and critical thinking skills of high school teachers]. *Turkish Studies* -

International Periodical for the Languages, Literature and History of Turkish or Turkic, 8(12), 509–532. https://doi.org/10.7827/TurkishStudies.5932

Gardner, D. (1992). Career commitment in nursing. *Journal of Professional Nursing, 8*(3), 155–160.

Gavín-Chocano, Ó., Molero, D., García-Pérez, R., & García-Martínez, I. (2024). The impact of self-esteem, optimism and emotional intelligence on the professional development of future primary and pre-school teachers. *Teacher Development, 28*(5), 694–709. https://doi.org/10.1080/13664530.2024.2340651

Goleman, D. (2009). *Duygusal zekâ neden IQ'dan daha önemlidir?* [Emotional intelligence: Why it can matter more than IQ] (B. S. Yüksel, Trans.). Varlık Yayınları. (Original work published 1995)

Güler, A. (2006). *İlköğretim okullarında görev yapan öğretmenlerin duygusal zekâ düzeyleri ile çatışma yönetimi stratejileri arasındaki ilişkinin incelenmesi* (Publication No. 264875) [Analysis of the relationship between the emotional intelligence levels and conflict management strategies of the primary school teachers] [Master's thesis, Yeditepe University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=ZeTyprYuef2HkaF3xt4wYryRU6nKhwZX3qzcPhUhgPm6PwZfCq9Usm7UTVOjGmvH

Ginsberg, R. (2020). Navigating emotional waters in schools: Becoming an emotionally adaptable leader. *International Journal on Lifelong Education and Leadership, 6*(2), 13–30. https://doi.org/10.25233/ijlel.799828

Güney, F. (2009). *Okul yöneticilerinin duygusal zekâ düzeyleri ile çatışma yönetimi stratejileri arasındaki ilişki* (Publication No. 250373) [The relationship between the levels of emotional intelligence and the conflict management strategies of school managers] [Master's thesis, Yeditepe University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=ueOXms33lm63SfVadWHDgA&no=q-FER1Ao8Tero3Gatk_hPg

Kızıl, Ş. (2014). *Öğretmenlerin duygusal zekâları ile örgütsel adanmışlıkları arasındaki ilişki (Balıkesir İli örneği)* (Publication No. 358489) [The relationship between teachers' emotional intelligence and organizational commitment (A case study in Balıkesir central)] [Master's thesis, Okan University]. Council of Higher Education

Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=vSIQPASlIh-UsT6-FvKF5Q&no=jov2C3EmLl-rBBWBppNdaw

Koç Akran, S., & Kocaman, İ. (2019). *Görselleştirmeye dayalı etkinliklerin okul öncesi çocuklarının duygusal zekâ düzeyine etkisi* [The Effect of Visualising Activities on The Level of Preschool Children's Emotional Development]. *Journal of Education, Theory and Practical Research, 5*(1), 113–123. https://dergipark.org.tr/tr/pub/ekuad/issue/44939/559449

Lazarus, P. (1999). *Emotional intelligence: A paradigm for education in the new millennium* [Paper presentation]. 22nd International School Psychology Colloquium, Kreuzlingen, Switzerland.

Mayer, J. D., & Salovey, P. (1995). Emotional intelligence and the construction and regulation of feelings. *Applied and Preventive Psychology, 4*(3), 197–208. https://doi.org/10.1016/S0962-1849(05)80058-7

Pektane Gülmez, A., & Gültekin Akduman, G. (2022). Okul öncesi dönem çocuklarının ahlaki kural algısı ile annelerinin duygusal zekâ düzeyleri arasındaki ilişki [The relationship between preschool children's perception of moral rules and their mothers' emotional intelligence levels]. *PESA Uluslararası Sosyal Araştırmalar Dergisi, 8*(1), 17–26. https://doi.org/10.25272/j.2149-8385.2022.8.1.02

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality, 9*(3), 185–211. https://doi.org/10.2190/DUGG-P24E-52WK-6CDG

Milli Eğitim Bakanlığı Okul Öncesi Eğitim Programı, 2024. 30.12.2024 tarihinde https://tegm.meb.gov.tr/dosya/okuloncesi/guncellenenokuloncesiegitimprogrami.pdf linkinden 15 Temmuz 2025 tarihinde indirilmiştir.

Milli Eğitim Bakanlığı. (2024). *Okul öncesi eğitim programı* [Preschool education program]. Retrieved July 15, 2025, from https://tegm.meb.gov.tr/dosya/okuloncesi/guncellenenokuloncesiegitimprogrami.pdf

Okçabol, R. (2000). *Eğitim fakültelerinin derdi belli YÖK'ün derdi ne?* [The trouble of faculties of education is evident, what is the trouble of the Council of Higher Education?]. Eğitim Sen Yayınları.

Oskay, Ö. Ö., & Şenocak, E. (2008). *Kimya öğretmen adaylarının öğretmenlik uygulamaları ve duygusal zekâları üzerine bir çalışma* [A study on chemistry preservice teachers' teaching practices and emotional intelligence]. *Kazım Karabekir Eğitim Fakültesi Dergisi, 17*, 228–242. https://dergipark.org.tr/tr/download/article-file/31371

Özdemir, A. Y., & Özdemir, A. (2007). Duygusal zekâ ve çatışma yönetimi stratejileri arasındaki ilişkilerin incelenmesi [Investigation of the relationship between emotional intelligence and conflict management strategies]. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* (18), 393–410. https://dergipark.org.tr/tr/pub/susbed/issue/61794/924251

Özdemir, A. Y., & Özdemir, A. (2007). Duygusal zekâ ve çatışma yönetimi stratejileri arasındaki ilişkilerin incelenmesi [Investigation of the relationship between emotional intelligence and conflict management strategies]. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* (18), 393–410. https://dergipark.org.tr/tr/pub/susbed/issue/61794/924251

Özyar, A. (2003). *Milli Eğitim Bakanlığı'nın öğretmen yetiştirme politikaları* [Teacher training policies of the Ministry of National Education]. Ministry of National Education. Retrieved July 23, 2025, from http://oyegm.meb.gov.tr/ortasayfa/gn_md_sunu.htm

Rahmaniya, R., Muthmainah, M., & Arifudin, M. (2025). Understanding emotion in early age: A systematic review of the role of emotional awareness in early childhood education. *Education 3-13*, 1–10. https://doi.org/10.1080/03004279.2025.2460585

Seferoğlu, S. S. (2004). Öğretmenlerin hizmet içi eğitiminde yeni yaklaşımlar [New methods for teacher inservice training]. *Akdeniz Üniversitesi Eğitim Fakültesi Dergisi*, (1), 83–95.

Shaffy, A., & Ndijuye, L. G. (2025). Observations of socio-emotional intelligence in pedagogical competence of pre-primary teachers in Tanzania. *Education 3-13*, 1–15. https://doi.org/10.1080/03004279.2025.2496368

Titrek, O. (2005). Duygusal zeka yeterliliklerini meslek hayatında kullanma düzeyi ölçeğinin geliştirilmesi: Geçerlik ve güvenirlik çalışmaları [Developing the scale of the level of using the competence of emotional intelligence in professional life: Validity and reliability studies]. *Türk Psikolojik Danışma ve Rehberlik Dergisi, 3*(24), 73–87.

Titrek, O. (2007). *IQ'dan EQ'ya: Duyguları zekice yönetme* (2nd ed.) [From IQ to EQ: Managing emotions intelligently]. Pegem Akademi.

Toytok, E. (2013). Öğretmenlerin duygusal zekâ yeterliklerini sınıf yönetimi sürecinde kullanma düzeyleri: Sakarya ili örneği [Teachers' levels of using emotional intelligence competencies in classroom management process: Sample of Sakarya province]. *Anadolu Eğitim Liderliği ve Öğretim Dergisi, 1*(1), 27–43.

Tufan, Ş. (2011). *Geliştirilen duygusal zekâ eğitim programının ortaöğretim dokuzuncu sınıf öğrencilerinin duygusal zekâ düzeylerine etkisi* (Publication No. 302910) [The effect of developed emotional intelligence training programme on the levels of emotional intelligence of 9th grade students at high school] [Master's thesis, Ankara University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=cRtcLk696p21V7flC_9s5Q&no=MyuH2vlIXcv0ILHAQF4OPQ

Türkoğlu, A. (1991). Öğretmen yetiştirmede amaçlar [Aims in teacher training]. *Çukurova Üniversitesi Eğitim Fakültesi Dergisi*, 1(5), 105–111.

Xu, J. (2024). Developing emotional intelligence in children through dialogic reading, self-made books, and visible thinking routines. *Early Childhood Education Journal, 52*, 1693–1705. https://doi.org/10.1007/s10643-023-01520-9

Veraksa, A. N., Guidetti, M., Tvardovskaya, O. A., & Kalimullin, A. M. (2025). Non-therapeutic play to overcome negative emotional symptoms and improve emotional intelligence in children aged 3–7: A systematic review. *Frontiers in Psychology*, 16, Article 1475387. https://doi.org/10.3389/fpsyg.2025.1475387

Walter, O., & Amram-Vaknin, S. (2025). Impact of parental relationships and parents' emotional intelligence on children's development of emotional intelligence: A dyadic clinical intervention. *Early Childhood Education Journal,* 53, 2575–2587. https://doi.org/10.1007/s10643-024-01762-1

Wang, Y., Pan, Y., & Zhang, X. (2024). The relationship between preschool teacher trait mindfulness and teacher–child relationship quality: The chain mediating role of emotional intelligence and empathy. *Current Psychology, 43*, 2667–2678. https://doi.org/10.1007/s12144-023-04512-5

Weisinger, H. (1998). *İş yaşamında duygusal zekâ* [Emotional intelligence at work]. MNS Yayıncılık.

Yavuz, S. (2018). *Meslek lisesi öğretmenlerinin duygusal zekâlarının çeşitli değişkenler açısından incelenmesi* (Publication No. 523177) [The analysis of the emotional quotient of the teachers who teach in vocational high schools in terms of a variety of factors] [Master's thesis, Istanbul Sabahattin Zaim University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=aEzj_IdWAsjiSAfK3qwrBq_J0l1OtMo0Xe_QnjR63i3FtgFZyQZ5RgrY3kSH9uD3

Yuan, H., Yan, Z., Zhao, Y., & [Diğer Yazarların Soyadı, Adının Baş Harfi]. (2025). The relationship of rural kindergarten teachers' emotional intelligence and work engagement in China: The chain mediation role of emotional labor strategies and general self-efficacy. *BMC Psychology, 13*, Article 154. https://doi.org/10.1186/s40359-025-02475-9

Data Availability Declaration

The data can be shared upon request.

Author Contributions

Turan Çakır and Hacer Dervişoğlu contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data acquisition, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. All authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest:

Funding: No funding provided.

Acknowledgements:

Biographical notes:

Turan Çakır: He completed her undergraduate education at Hacettepe University, Department of Educational Sciences in 1988. He completed his master's degree at Sakarya University, Department of Educational Administration and Supervision in 1999

and his doctorate at Marmara University, Department of Preschool Education in 2003. He was appointed as a lecturer at Sakarya University, Department of Preschool Education in 1998 and as an assistant professor in 2004. He has 2 books, 13 articles and 5 papers on preschool education. He took part in 6 projects, 5 of which were European Union projects. He teaches undergraduate and graduate courses on Language and Concept Development in Early Childhood, Introduction to Early Childhood Education, Play Development in Early Childhood

Google Scholar Researcher ID:

https://scholar.google.com/citations?user=edfEUrIAAA

Hacer Dervişoğlu: She completed her primary, middle, and high school education in Bingöl province. In 2020, she was accepted into the Preschool Teacher Training undergraduate program at Sakarya University's Faculty of Education. During her third and fourth years of studies, she participated in field and survey work with her instructors. She graduated from the Preschool Teacher Training undergraduate program in July 2025. Currently, she is a thesis-based master's student in the Preschool Education Department of the Institute of Educational Sciences at Sakarya University.

Orcid Researcher ID:

https://orcid.org/0009-0004-7976-6021

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 2 - December 2025 - ISSN 2618-6209 |

Research Article

Impact of Proficiency Level and Formal Instruction on Language Learners' Behaviours of Oral Communication Strategies in Online Learning Environments

Özlem Cengiz[1] **Zübeyde Sinem Genç**[2]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 2
Pages: 6721- 740
http://www.ijonmes.net

Article Info:

Received 18.09.2025
Revision 11.12.2025
Accepted 19.12.2025

Abstract:

Considering the transition of more classes to online education after COVID-19, understanding learners' behaviours is crucial for teachers to manage interactions in online learning environments (OLEs). This quantitative study investigates which Oral Communication Strategies (OCS) language learners use in OLE and examines the impact of proficiency level and length of formal instruction on OCS use. Data were collected from 93 tertiary-level foreign-language learners by administering Nakatani's (2006) adapted Oral Communication Strategy Inventory (OCSI). The SPSS analyses reveal that language learners use 'negotiation for meaning' most frequently and 'message abandonment' least frequently in the OLE. While further analyses found no difference in OCS use across proficiency levels, they revealed a significant correlation between the length of formal English instruction and affective OCS use. Moreover, the length of formal instruction predicts foreign language learners' use of planning and organising strategies, which is a novel finding in the field. These empirical insights yield practical implications by informing language teachers' in-the-moment decision-making behaviours during online language classes.

Keywords: Oral communication strategies (OCS), Interactional setting, Proficiency level, Formal instruction, Online learning environments (OLE), EFL

Citation:
Cengiz, Ö., & Genç, Z. S. (2025). Impact of proficiency level and formal instruction on language learners' behaviou of Oral Commmunication Strategies in online learning environments. *International Journal of Modern Education Studies*, *9*(2), 6721- 740. https://doi.org/10.51383/ijonmes.2025.438.

[1] Lecturer, Bursa Technical University, School of Foreign Languages, Bursa, Türkiye. ozlem.cengiz@btu.edu.tr, https://0000-0001-8260-2598

[2] Prof. Dr., Bursa Uludağ University, Faculty of Education, Bursa, Türkiye. zsgenc@uludag.edu.tr, https://0000-0003-3857-2955

INTRODUCTION

Obviously, the Covid-19 pandemic has accelerated changes in the nature of language lessons and routines by shifting face-to-face communication to synchronous meetings. However, the need for learner-teacher and learner-learner interaction is not distinct from that in conventional settings. Language learners are still required to express themselves in the target language through participation in various activities, answering and asking questions to their teacher or friends and discussing their needs or even technical issues, all of which are part of their language acquisition process. Therefore, learners' OCS use might have changed direction, yet has certainly not disappeared completely.

OCS have attracted the attention of many researchers, particularly since Canale and Swain (1980) redefined communicative competence. More precisely, many studies have investigated the perceived use of OCS (Pawlak, 2015), the actual implementation in class (Ibrahimova, 2017; Uztosun & Erten, 2014), and its teachability (Nakatani, 2005). Moreover, various factors that impact learners' use of OCS, such as gender (Yaman et al., 2013), proficiency level (Hsieh, 2014), willingness to communicate (Arpacı-Somuncu, 2016), learner autonomy (Gökgöz, 2008), and self-efficacy (Meigouni & Shirkhani, 2020), have provided valuable insights into OCS use in English as a foreign language (EFL) settings. However, all were conducted in face-to-face, brick-and-mortar classrooms, where communication is immediate. Moreover, the link between proficiency level and OCS remains inconclusive, and we have limited knowledge about the potential impact of formal English instruction on EFL learners' use of OCS.

Considering these gaps in the literature and the relevance of this issue in any type of course offered online, the current study aims to investigate EFL learners' OCS use in OLE and how it is impacted by proficiency level and length of formal instruction. Accordingly, this study is guided by three research questions:

1. What OCS are used by EFL learners in OLE?

2. How does EFL learners' proficiency level impact their OCS use in OLE?

3. How does EFL learners' length of formal English instruction impact their OCS use in OLE?

This study is particularly significant and timely because the number of OCS studies conducted in OLE is limited. Given that a substantially greater number of courses are delivered online worldwide, the results of this study will enhance all teachers' and teacher educators' understanding of learners' communication behaviours in OLE, regardless of their subjects.

Theoretical Underpinnings of OCS

Proper OCS literature dates back to 1972, when Selinker broadly defined them as the strategies learners employ by simplifying their interlanguage. At that time, they were not

called OCS, but were referred to, in general, as 'second-language learning strategies'. However, it was not until Canale and Swain (1980) that OCS became a major focus of research. Primarily drawing on Hymes' (1972) discussion, Canale and Swain (1980) redefined communicative competence in an organised and thorough manner. In their dichotomy, OCS fall under strategic competence, which is divided into verbal and non-verbal strategies that speakers 'employ to handle breakdowns in communication' (p.25). With the growing popularity of Communicative Language Teaching in the 1980s and its application in language classes, OCS have been extensively researched from various perspectives.

From a theoretical perspective, OCS have been described as interactional and psycholinguistic. While interactionists consider OCS a mutual attempt by conversation partners to handle communication breakdowns (Tarone, 1980), the psycholinguistic view explains OCS as learners coping with breakdowns by using their cognitive skills, such as problem-solving (Faerch & Kasper, 1983), rather than relying on an interlocutor. During the 1980s and 1990s, many researchers proposed several taxonomies based on these two distinct views. Despite the varied names, some strategies overlap in these taxonomies (see Dörnyei & Scott, 1997, for the similarities and differences). In 2006, Nakatani developed an OCSI inventory that lists listening and speaking strategies separately on interactional and psycholinguistic grounds. According to this inventory, the classification of speaking strategies is presented in Table 1. This most up-to-date inventory has been widely used in various contexts (Gökgöz, 2008; Isa, 2017; Najjari, 2016; Ounis, 2016).

Table 1

Speaking Strategies in Nakatani's (2006) OCSI Inventory (p. 155-156)

Speaking Strategies	Learner Behaviour
1. Social affective	controlling anxiety, risking making mistakes, avoiding silence, enjoying communication
2. Fluency-oriented	attention to rhythm, intonation, pronunciation, clarity of speech
3. Negotiation for meaning while speaking	conducting modified interaction, checking listener's understanding, repeating speech, giving examples
4. Accuracy-oriented	attention to forms, seeking grammatical accuracy by self-correction
5. Message reduction and alteration	reducing an original message, simplifying utterances, using similar expressions to ones with confident use

6. Nonverbal strategies while speaking	using eye contact to attract attention, using gestures and facial expressions to give a hint
7. Message abandonment	giving up attempt to communicate, leaving the message unfinished, seeking help from others to continue communication
8. Attempt to think in English	thinking in English during interaction

While these theoretical perspectives and taxonomies have largely been developed within face-to-face communicative contexts, the widespread use of OLEs requires reconsideration of OCS use in digitally mediated interactions. In OLEs, interaction is shaped not only by linguistic competence, but also by technological affordances and modes of communication. Moore's (1989) Model of Interaction conceptualises distance education through learner-content, learner-instructor, and learner-learner interactions, positioning these interactions as a key site for communicative engagement. Building on this foundation, the Community of Inquiry (CoI) framework (Garrison et al., 1999; Garrison, 2016) conceptualises effective online learning as the integration of social, cognitive, and teaching presence across synchronous and asynchronous modes of digital interaction. Within this framework, learners must actively manage communication, regulate affect, and sustain discourse under conditions of reduced non-verbal cues and technological mediation. OSC can therefore be conceptualised as learner-level mechanisms through which social presence and cognitive presence are enacted during online interactions. Affective strategies support social presence by helping learners manage anxiety and project themselves socially, while negotiation for meaning and planning and organising strategies facilitate cognitive presence by sustaining meaning-making processes. From this perspective, OCS use represents a strategic response to the interactional demands of OLEs.

Earlier OCS Studies

OCS mainly appear in two strands of research. First, experimental studies have shown that strategy training can be effective in helping students cope with communication breakdowns (Nakatani, 2005); however, reviewing these studies is beyond the scope of this paper.

The second line of studies is descriptive, portraying learners' OCS use as reported through questionnaires or inventories, and as observed through their learning behaviours. Although this body of research provides valuable practical insights, a problem is that the findings are not comparable and, thus, not generalizable because the studies use a wide range of inventories based on various taxonomies (Chou, 2018; Hua et al., 2012; Manzano, 2018; Uztosun & Erten, 2014). On the other hand, many other studies employing Nakatani's (2006) OCSI inventory yield similar results across various EFL contexts with young adult

learners majoring in a range of departments, such as English language teaching, where the primary focus is not on language learning (Ha et al., 2022; Hsieh, 2014; Huang, 2010; Najjari, 2016; Ounis, 2016; Pawlak, 2015; Yaman et al., 2013). The majority of these studies identify 'negotiation for meaning' as the most widely used strategy, and 'message abandonment' as the least, with a few exceptions. However, a closer analysis of studies involving EFL learners primarily focused on language learning indeed shows a similar trend, without exception across various face-to-face settings (Demir et al., 2018; Meigouni & Shirkhani, 2020; Nakatani, 2006; Rayati et al., 2022). While these observed patterns are extremely valuable in understanding learners' communicative behaviours in class, they do not have implications for OLE, where the nature of communication is completely different from face-to-face communication.

On the other hand, the number of studies on learners' OCS behaviours in OLE is rather limited, and the results are inconsistent due to several issues. The aforementioned 'different-inventory-use issue' applies here as well; therefore, it is difficult to demonstrate a trend in learners' behaviour. To illustrate, Parcon and Reyes (2021), working with 36 high school students, used Dörnyei and Scott's taxonomy and analysed recordings of online discussions. The most frequently used strategy here was code-switching. Nevertheless, Shih (2014) investigated the strategy development of five graduate students from different majors in Taiwan using Tarone's taxonomy and reported that 'non-verbal communication' was the most frequent strategy, while 'all-purpose words' was the least. Therefore, different taxonomies lead to inconsistent results. Another problem is the presentation of only thick descriptive data. For instance, Aljohani and Hanna (2023) examined the online oral performances of 24 Saudi EFL learners. They categorised learners' OCS based on a compilation of various taxonomies they developed and reported the range of observed strategies qualitatively using example meaning units rather than frequency counts, which makes it difficult to draw firm conclusions. A study by Cirit-Işıklıgil et al. (2023) compared OCS use across face-to-face, videoconferencing, and virtual-world environments. The results indicated that fillers and self-repetition were the most frequently used strategies shared across all settings, but no significant differences were observed among learning environments. Only one study similar to the present one used Nakatani's (2006) OCSI inventory for analysis (Huang & Loranc, 2022). Huang and Loranc collected data from 70 EFL learners from Poland and Taiwan over a twelve-week period as part of an exchange project conducted in an OLE. Interestingly, 'negotiation for meaning' and 'message abandonment' were reported to be the most and least frequently used strategies respectively, consistent with results from face-to-face settings.

Proficiency Levels and Exposure to Target Language in OCS Use

The impact of proficiency level on OCS use has been the focus of many studies. However, the findings are mixed: some studies show no significant difference in OCS use between high- and low-proficiency groups (Huang, 2010; Uztosun & Erten, 2014) or a weak correlation (Demir et al., 2018), while other studies report inconclusive results or that certain

strategies are employed more often than others (Ounis, 2016; Rayati et al., 2022; Yaman et al., 2013). Overall, further research employing the same taxonomy and well-defined proficiency levels is necessary to draw conclusions.

Despite the limited opportunities in EFL settings, exposure to the target language outside formal school instruction and its effect on OCS use are additional research questions that have attracted researchers' attention. All of these studies report a significant positive change in learners' use of OCS when they have greater exposure to the target language (Demir et al., 2018; Huang, 2010; Zhao, 2013). Another way to be exposed to the target language in EFL settings is through formal instruction; however, to the best of the researchers' knowledge, no study has investigated its impact on OCS use, although exposure to formal instruction has been collected as demographic information (Hua et al., 2012; Pawlak, 2018). This study intends to shed light on this variable.

METHOD

Research Design

This study employed a quantitative, cross-sectional survey design to examine tertiary-level EFL learners' use of OCS in OLEs. By analysing learners' responses to the OCSI using descriptive and inferential statistical procedures, the design enables a systematic investigation of relationships among OCS use, proficiency level, and length of formal instruction.

Participants

Data were collected using convenience sampling from 93 preparatory-year students enrolled in EFL at a Turkish state university. The university offers a preparation year for students to improve their English language skills. While some faculties make the preparation year mandatory (as their medium of instruction is 30% or 100% English), others offer it as an elective course. Courses at three levels (A2, B1, and B2 CEFR) are offered to students, and they are placed into one of these levels by an in-house placement test administered at the beginning of each academic year. A course takes nine weeks to complete, and students are expected to attain the B2 level to be considered successful in the programme. The courses are standardized and intensive with 21 lessons per week. At the time of data collection, the participants had already completed one nine-week course and they were pursuing their second course. The distributions of participants' proficiency levels and lengths of formal instruction are shown in Table 2.

Table 2

Demographic Information of the Participants

Proficiency Level	Frequency (n)	Percentage (%)
A2	6	6.5

B1	73	78.5
B2	14	15.1
Total	93	100

Length of Formal Instruction	**Frequency (n)**	**Percentage (%)**
0 – 6 months	59	63.4
7 months – 1 year	6	6.5
2 – 5 years	6	6.5
6 – 9 years	15	16.1
10 – 15 years	7	7.5
Total	93	100

Instrument

The Turkish version of the OCSI Inventory, originally devised by Nakatani (2006) and adapted to Turkish by Kavaşoğlu (2011), was used in this study. The original scale (Nakatani, 2006) included two sections with listening and speaking strategies, but only the speaking section, adapted by Kavaşoğlu (2011), was employed in this study. The reliability of the adapted scale with 23 items and five strategy categories was reported to be 0.79 (Cronbach's alpha) by Kavaşoğlu (2011); therefore, no further factor analyses were conducted.

Data Collection

Prior to data collection, ethical approval from the university Research Ethics Committee and approval from the Institutional Review Board were granted. Because the distance education program was implemented during data collection, the scale was prepared in Google Forms and distributed via class WhatsApp groups.

The scale on Google Forms consisted of three sections. In the first section, participants were informed about the research details, and their informed consent was requested. Unless they gave their consent, they would not be able to move on to the next page. The second page included items on demographic information, and on the final page participants were asked to rate items about their OCS behaviours.

The form was sent to over 200 students, yet only 98 of them completed it. The researchers noticed that one participant had completed it twice and two participants had

completed it three times; therefore, those answers were removed. The final sample size available for data analysis was 93.

Ethical Review Board: Science, Engineering and Social Sciences Research Ethics Committee

Date of Ethics Review Decision: 17.08.2023

Ethics Assessment Document Issue Number: 118157

Data Analysis

Because construct validity had been established and all factors were found valid and reliable in the original study (Kavaşoğlu, 2011), only internal consistency was evaluated using Cronbach's alpha (Cronbach's alpha = 0.72). Descriptive statistics were used to present the demographic information. Mean scores for each item and for each strategy category were computed to enable comparisons between categories.

Further analysis was performed on the relationships between the independent variables, namely proficiency level and length of formal instruction, and OCS use (the dependent variable). To enable detailed interpretation of the findings, correlation analysis, one-way ANOVA, post hoc (LSD) tests, and regression analysis were conducted using SPSS version 22.

RESULTS

EFL Learners' OCS Use in OLE

To address the first research question "What OCS are used by EFL learners in OLE?" descriptive statistics were computed using SPSS and the mean scores for each item and category were calculated. These are presented in Table 3.

Table 3

Descriptive Statistics of OCS Use

Categories	N	Min-Max	$\overline{X}$	SD
Negotiation for Meaning	93	2.29-5.00	3.8	.49
Message Abandonment	93	1.25-5.00	2.8	.77
Planning / Organising	93	1.40-4.80	3.5	.65
Affective	93	1.33-5.00	3.5	.74
Compensatory	93	2.50-5.00	3.7	.60

The results show that participants in OLE reported using the 'negotiation for meaning' strategy most often and 'message abandonment' least often.

Impact of EFL Learners' Proficiency Level on Their OCS Use

For the second research question, "How does EFL learners' proficiency level impact their OCS use in OLE?" Pearson's correlation analysis indicated no significant relationship between proficiency level and OCS use, as displayed in Table 4. Therefore, no further analyses were performed.

Table 4

Correlaton Analysis of Proficiency Level and OCS Use

Correlation of Proficiency Level and OCS Use	Pearson Correlation	Significance (2-tailed)
Negotiation for Meaning	.124	.238
Message Abandonment	-.138	.188
Planning / Organising	-.075	.475
Affective	.000	.998
Compensatory	.065	.539

Impact of EFL Learners' Length of Formal Instruction on Their OCS Use

For the third research question, "How does EFL learners' length of formal English instruction impact their OCS use in OLE?", Pearson's correlation analysis demonstrated a statistically significant association between affective strategies and participants' formal instruction (Table 5), highlighting that participants who dedicated more time to formal instruction used more affective strategies in their communication.

Table 5

Correlation Analysis of the Participants' Formal Instruction Length and OCS Use

Correlation of Formal Instruction and OCS Use	Pearson Correlation	Significance (2-tailed)
Negotiation for Meaning	.136	.192
Message Abandonment	-.078	.458
Planning / Organising	-.148	.157
Affective	.222	.032*

Compensatory	.172	.099

* The correlation is significant at $p < 0.05$ level.

Based on this finding, a regression analysis was performed to determine the extent to which these two variables were correlated. The impact of formal instruction on the participants' use of affective strategies was found to be low (4.9%) but statistically significant (Table 6).

Table 6

Regression Analysis of the Participants' Formal Instruction and Affective Strategy Use

Independent Variable	Dependent Variable	B	S	Beta	t	P	R	R^2	F	*p*
Formal Instruction	**Affective Strategies**	3.354	.130	.222	25.798	.00	222	.049	4.738	.032

To examine differences in subgroup mean scores for formal instruction and OCS use, a one-way ANOVA was conducted. As Table 7 shows, there is a significant difference in 'planning/organising' strategy use across different time periods of formal instruction [0-6 months (M=3.62, S=.60), 7 months-1 year (M=3.23, S=.29), 2-5 years (M=3.06, S=.70), 6-9 years (M=3.69, S=.55) and 10-15 years (M=3.08, S=1.05)]. The effect size was close to moderate (eta squared 0.046). Moreover, post hoc tests (LSD) showed that participants who received formal instruction lasting between 0 and 6 months used planning and organising strategies more than those who had received 2-5 years or 10-15 years of instruction (Table 8).

Table 7

One-way ANOVA Results of OCS and Formal Instruction

Strategy Categories	Formal Instruction	N	$\overline{X}$	SD	P
Negotiation for Meaning	0-6 Months	59	3.82	.53	.638
	7 Months-1 Year	6	3.76	.28	
	2-5 Years	6	3.76	.39	
	6-9 Years	15	3.99	.46	
	10-15 Years	7	4.02	.45	
Message Abandonment	0-6 Months	59	2.87	.72	.111

	7 Months-1 Year	6	2.12	.68	
	2-5 Years	6	3.08	.43	
	6-9 Years	15	2.86	.96	
	10-15 Years	7	2.46	.75	
Planning / Organising	0-6 Months	59	3.62	.60	.044*
	7 Months-1 Year	6	3.23	.29	
	2-5 Years	6	3.06	.70	
	6-9 Years	15	3.69	.55	
	10-15 Years	7	3.08	1.05	
Affective	0-6 Months	59	3.45	.82	.183
	7 Months-1 Year	6	3.94	.32	
	2-5 Years	6	3.61	.57	
	6-9 Years	15	3.75	.52	
	10-15 Years	7	4.00	.66	
Compensatory	0-6 Months	59	3.73	.63	.507
	7 Months-1 Year	6	3.62	.37	
	2-5 Years	6	3.91	.43	
	6-9 Years	15	3.91	.58	
	10-15 Years	7	4.07	.60	

* $p<0.05$

Table 8

Post Hoc Test (LSD) Results

Strategy Categories					

LSD	(I) Formal Instruction	(J) Formal Instruction	Mean Difference (I-J)	S	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Planning / Organising	0-6 Months	7 Months-1 Year	.39	.27	.154	-.1487	.9295
		2-5 Years	.55*	.27	.043	.0179	1.0962
		6-9 Years	-.06	.18	.705	-.4334	.2942
		10-15 Years	.53*	.25	.036	.0351	1.0410

* The mean difference is significant at the 0.05 level.

Overall, the findings indicate that EFL learners in OLE most frequently employ 'negotiation for meaning' strategies and least frequently use 'message abandonment'. While OCS use showed no significant change across proficiency levels, length of formal English instruction was modestly but significantly associated with affective strategies, and regression analysis confirmed that formal instruction accounted for 4.9% of the variance in their use. Further group comparisons revealed a significant difference in planning and organising strategies across instructional length groups, with learners who had received 0-6 months of formal instruction using these strategies more frequently than learners with 2-5 years or 10-15 years of instruction.

DISCUSSION

This study aimed to examine the OCS behaviours of EFL learners whose primary aim is to learn the English language in OLE. Further statistical analyses were conducted to investigate the impact of learners' proficiency level and formal instruction on their OCS behaviours.

The first research question sought to identify the OCS behaviours of EFL learners in OLE. According to the descriptive statistics, EFL learners use the 'negotiation for meaning' strategy most frequently and 'message abandonment' least frequently in their communication breakdowns in OLE. This result is in line with Huang and Loranc (2022), who similarly adopted Nakatani's (2006) OCSI inventory and identified the same strategies as the most- and least-frequently used during online discussions. This congruence may be attributed to the similarity of online class content. In other words, although the participants in Huang and Loranc (2022) were pursuing education-related majors (which means they

were not merely language learners, unlike the participants in this study), they were asked to respond to the inventory as EFL learners who participated in online discussions as part of their twelve-week project, where the purpose was simply to communicate their messages in English. This is similar to the interactions in EFL classes. Consequently, we conclude that when learners attempt to communicate their ideas in OLE, they most often prefer to negotiate meaning with the teacher or peers to overcome communication breakdowns, and they are least likely to leave their message incomplete.

On the other hand, this result contradicts other studies conducted in OLE (Cirit-Işıklıgil et al., 2023; Parcon & Reyes, 2021; Shih, 2014), since the inventories adopted in these studies relied on taxonomies other than Nakatani's (2006) and did not include negotiation as a strategy in those inventories. Therefore, they all demonstrated different strategies as their most- and least-frequently employed ones, which poses a challenge for comparing results.

The results pertaining to the first research question also allow comparison of learners' OCS behaviours between face-to-face learning environments and OLEs, owing to the adoption of the same inventory in many previous studies. To illustrate, the majority of the studies conducted with university students across various contexts that adopted Nakatani's (2006) OCSI inventory (Demir et al., 2018; Meigouni & Shirkhani, 2020; Najjari, 2016; Ha et al., 2022; Ounis, 2016; Pawlak, 2015; Rayati et al., 2022; Yaman et al., 2013) show that 'negotiation for meaning' and 'message abandonment' are the most and least frequently applied strategies, respectively, in face-to-face learning environments. More precisely, the participant samples in Meigouni and Shirkhani (2020), Rayati et al. (2022), and Demir et al. (2018) comprise EFL learners whose primary purpose was to learn English, similar to the sample in this study. Therefore, it is possible to conclude that not only in Türkiye but in any EFL context, when learners encounter communication problems while trying to convey their messages, they predominantly rely on other interlocutors, such as their teacher or peers and consider leaving their message incomplete a last resort. As a result, the alignment of these results with previous OCS studies that used the same inventory and the same participants suggests that the instructional mode does not appear to affect EFL learners' OCS behaviours. Whether face-to-face or online, EFL learners prefer to negotiate first to convey their messages, which lends support to the interactionist perspective. From the CoI perspective, this tendency can be interpreted as learners actively sustaining cognitive presence in OLEs by negotiating meaning to maintain shared understanding when contextual cues are reduced.

The second research question aimed to investigate the impact of proficiency level on learners' OCS behaviours. Some previous studies have identified an association between the two variables. Although the strategies used by high-proficiency learners may vary, low-proficiency learners tend to use 'message abandonment' strategies more than high-proficiency learners (Hsieh, 2014; Mei & Nathalang, 2010; Nakatani, 2006; Ounis, 2016). However, the current analyses have revealed no significant relationship between the

proficiency level and OCS behaviour, supporting Huang (2010), and Uztosun and Erten (2014). One possible reason is the uneven distribution of participant levels. While the majority of the participants were at the B1 level during data collection in this study, only six were at the A2 level and 14 were at the B2 level. A correlation analysis with a more balanced distribution of participants across proficiency levels might yield different findings.

The last research question investigated the impact of the participants' length of formal instruction on their OCS behaviours, an area not previously explored. To begin with, a significant positive correlation was noted between learners' length of formal instruction and affective strategies, highlighting that the longer the formal instruction learners receive, the more affective strategies they employ. However, based on the regression analysis, only 4.9% of this phenomenon can be explained by formal instruction, indicating a weak but significant association. This suggests that as learners receive further instruction, they are exposed to the target language for longer periods and they tend to overcome communication breakdowns through affective strategies rather than through other strategy types, such as planning or negotiation. Within the CoI framework, the increased use of affective strategies may reflect learners' enhanced ability to project social presence, enabling them to regulate emotions and sustain participation in online interaction. This result supports studies demonstrating the link between exposure to the target language and OCS (Demir et al., 2018; Huang, 2010; Zhao, 2013), emphasizing the relationship between OCS behaviours and exposure based on learners' informal as well as formal learning experiences. However, further research is necessary to determine whether this result applies to other settings and to identify which other factors, beyond the length of formal instruction, influence learners' affective OCS behaviours.

A closer analysis of the connection between formal instruction and OCS reveals that participants in the early stages of formal instruction (up to 6 months) used 'planning/organising' strategies significantly more than participants who had spent longer time on formal instruction. This shows that, in the beginning phase of their language-learning journeys, L2 learners pay more attention to the organization of words at the sentential level and think more about the rules of the target language than experienced language learners do. This result supports the Skills Acquisition Theory, which proposes that beginning learners cannot automatize their language knowledge within a short timeframe because proceduralisation of knowledge requires time and practice. Therefore, learners depend on their declarative knowledge base when attempting to make meaning (de Keyser, 2017). At this point, by 'beginning-level learners', we do not mean to equate this term with the proficiency label 'beginners'; rather, we mean learners who have just begun their language-learning journeys, because we believe the two terms denote different groups. A learner may receive formal instruction for years, yet they may still be at a beginning level of proficiency. However, they may have more language-learning experience than novice learners. Therefore, this finding should be interpreted with caution. Further conceptual

research to clarify definitions of proficiency levels and more empirical research to distinguish proficiency levels from language-learning experience are necessary.

CONCLUSION

The purpose of this quantitative study is to investigate what OCS EFL learners use in OLE and how the proficiency level and length of formal instruction impact learners' OCS behaviours. For this purpose, 93 EFL learners studying at a Turkish state university completed Nakatani's (2006) adapted OCSI Inventory via Google Forms. The results indicated that 'negotiation for meaning' strategies were used most and 'message abandonment' strategies were used least in EFL language-learning contexts, highlighting a notable similarity between face-to-face and online settings. Further statistical analyses did not show a significant relationship between OCS use and proficiency level. However, a significant positive correlation was found between 'affective' strategies and the participants' length of formal instruction. Novice learners with English learning experience between 0 and 6 months were found to use 'planning/organising' strategies more than participants with longer English learning experience. Overall, these findings highlight the importance of considering learners' instructional histories when interpreting OCS use in OLE.

These findings offer several pedagogical implications not only for language teachers but also for all educators delivering online courses. For language teachers, learners' strong reliance on 'negotiation for meaning' suggests that tasks requiring clarification, confirmation, and collaborative repair can be effectively incorporated into online speaking activities. The limited use of 'message abandonment' indicates a need for explicit instruction in communication strategies to help learners sustain communication when they encounter breakdowns during online interactions. From the CoI perspective, such task designs contribute to cognitive presence by encouraging learners to actively construct and confirm meaning through interaction. More broadly, teachers across all disciplines can draw on these insights while designing online lessons to support learners' interactional, emotional, and organisational needs. Structured opportunities for peer discussion in breakout rooms, clear guidelines for asking questions, and modelling how to handle misunderstandings can enhance online communication in any subject area. These practices also facilitate social presence by creating a supportive OLE in which learners feel confident in participating and expressing themselves. Furthermore, the link between instructional length and the use of affective and planning and organising strategies highlights the importance of providing novice learners with emotional scaffolding, planning tools such as checklists, and reflective prompts, all of which help them manage anxiety and prepare for online tasks. By intentionally supporting communication, emotional regulation, and self-organisation, teachers of all subjects can create more engaging and effective OLEs.

Like many other studies, this study has limitations. First, the sample size was small (n=93), and the study was conducted at a single university. While the results cannot be

generalized, future research incorporating larger and more varied cohorts would strengthen the scope and applicability of these findings. Secondly, a survey design was adopted in this research. A qualitative approach using class observations and stimulated-recall interviews might provide a deeper understanding of why learners prefer certain OCS in OLE. Thirdly, the majority of participants in this study were at the B1 level. Replication of this study using purposive sampling may allow additional statistical analyses, yielding more conclusive results on the relationship between learners' proficiency levels and OCS behaviours. Finally, further research is necessary to clarify the relationship between OCS use and the duration of learners' formal instruction. Closely intertwined with that, proficiency level and length of formal instruction should be treated as two separate variables and clearly defined.

REFERENCES

Aljohani, N. J., & Hanna, B. E. (2023). 'I do not know what's that word in English, but I will tell you about my cousin': EFL learners' communication strategies in online oral discussion tasks. *The Language Learning Journal, 51*(2), 223-237. https://doi.org/10.1080/09571736.2021.1989017

Arpacı-Somuncu, D. (2016). Turkish EFL learners' use of communication strategies and its predictors. *ELT Research Journal*, *5*(3), 178-192. https://dergipark.org.tr/en/download/article-file/292059

Canale, M., & Swain, M. (1980). Theoretical bases of communicative approaches to second language teaching and testing. *Applied Linguistics, 1*(1), 1-47.

Chou, M. (2018). Speaking anxiety and strategy use for learning English as a foreign language in full and partial English-medium instruction contexts. *TESOL Quarterly, 52*(3), 611-633. https://www.jstor.org/stable/44987083

Cirit-Işıklıgil, N. C., Sadler, R. W., & Arıca-Akkök, E. (2023). Communication strategy use of EFL learners in videoconferencing, virtual world and face-to-face environments. *ReCALL, 35*(1), 122-138.

De Keyser, R. (2017). Knowledge and skill in ISLA. In S. Loewen & M. Sato (Eds.), *The Routledge Handbook of Instructed Second Language Acquisition* (pp. 15-32). Routledge.

Demir, Y., Mutlu, G., & Şişman, Y. S. (2018). Exploring the oral communication strategies used by Turkish EFL learners: A mixed methods study. *International Journal of Instruction, 11*(2), 539-554. https://doi.org/10.12973/iji.2018.11237a

Dörnyei, Z., & Scott, M. L. (1997). Communication strategies in a second language: Definitions and taxonomies. *Language Learning, 47*(1), 173-210.

Faerch, C., & Kasper, G. (1983). On identifying communication strategies in interlanguage production. In C. Faerch & G. Kasper (Eds.). *Strategies in interlanguage communication* (pp. 210-238). London: Longman.

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Garrison, D. R. (2016). *E-learning in the 21st century: A community of inquiry framework for research and practice* (3rd ed.). Routledge. https://doi.org/10.4324/9781315667263

Gökgöz, B. (2008). *An investigation of learner autonomy and strategies for coping with speaking problems in relation to success in English speaking class* (Publication No: 228471) [Master's thesis, Middle East Technical University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=9YvRp5LFKExJnzZODY0_cw&no=Z7qHg1x5lKxFL9Rrr9zYuQ

Ha, N. T. T., Phuong, V. V., & Yen, D. T. T. (2022). The influences of oral communication strategies on students' English speaking proficiency. *Can Tho University Journal of Science, 14*(2), 8-17. https://doi.org/10.22144/ctu.jen.2022.012

Hsieh, A. F. Y. (2014). The effect of cultural background and language proficiency on the use of oral communication strategies by second language learners of Chinese. *System, 45*, 1-16. https://dx.doi.org/10.1016/j.system.2014.04.002 0346-251X

Hua, T. K., Nor, N. F. M., & Jaradat, M. N. (2012). Communication strategies among EFL students-An examination of frequency of use and types of strategies used. *GEMA Online Journal of Language Studies, 12*(3), 831-848.

Huang, C. P. (2010). Exploring factors affecting the use of oral communication strategies. *LongHua Technology University Journal, 30*(1), 85-104. https://www.academia.edu/22788882/Exploring_Factors_Affecting_the_Use_of_Oral_Communication_Strategies_Exploring_Factors_Affecting_the_Use_of_Oral_Communication_Strategies

Huang, H. C., & Loranc, B. (2022). EFL learners' oral communication strategies: Insights from a Taiwan and Poland exchange project. In J. Colpaert, Y. Wang, & G. Stockwell (Eds.), *Proceedings of the XXIst International CALL Research Conference*: *Vol. 2022* (pp. 64-71). https://doi.org/10.29140/9781914291050

Hymes, D. H. (1972). On communicative competence. In J. B. Pride & J. Holmes (Eds.), *Sociolinguistics: Selected readings* (pp. 269-293). Harmondsworth: Penguin. https://wwwhomes.uni-bielefeld.de/sgramley/Hymes-1.pdf

Ibrahimova, F. (2017). The use of communication strategies in oral interaction. *Electronic Turkish Studies, 12*(34), 501-510. https://dx.doi.org/10.7827/TurkishStudies.12628

Isa, M. (2017). *A study of English oral communication strategies used by students at SMK N 1 SALATIGA* [Unpublished master's thesis]. Universitas Kristen Satya Wacana. https://repository.uksw.edu/bitstream/123456789/14512/1/T1_112013112_Abstract.pdf

Kavaşoğlu, M. (2011). *Oral communication strategies used by Turkish students learning English as a foreign language: The development of "Oral Communication Strategy Inventory"* (Publication No: 289652) [Master's thesis, Mersin University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=HNC91xrkEx2ztEe4h9EAAQ&no=XwFYm0FKkCKuNWIv9iVr1Q

Manzano, B. A. (2018). Examining the oral communication strategies used by a group of Nepalese adult learners in an ESL context. *3L: The Southeast Asian Journal of English Language Studies, 24*(1), 84-96. http://doi.org/10.17576/3L-2018-2401-07

Mei, A., & Nathalang, S. S. (2010). Use of communication strategies by Chinese EFL learners. *Chinese Journal of Applied Linguistics, 33*(3), 110-125.

Meigouni, E. A. M. M., & Shirkhani, S. (2020). Oral communication strategies used by Iranian EFL learners and their relationship with the learners' self-efficacy beliefs and anxiety level. *Research in English Language Pedagogy, 8*(1), 1-20. https://doi.org/10.30486/RELP.2019.669075

Moore, M. G. (1989). Editorial: Three types of interaction. *American Journal of Distance Education, 3*(2), 1–7. https://doi.org/10.1080/08923648909526659

Najjari, B. (2016). *Use of oral communication strategies in English language by graduate students in an international context* (Publication No: N/A) [Master's thesis, Eastern Mediterranean University (EMU)]. http://i-rep.emu.edu.tr:8080/xmlui/handle/11129/3785

Nakatani, Y. (2005). The effects of awareness-raising training on oral communication strategy use. *The Modern Language Journal, 89*(1), 76-91.

Nakatani, Y. (2006). Developing an oral communication strategy inventory. *The Modern Language Journal, 90*(2), 151-168.

Ounis, T. (2016). Exploring the use of oral communication strategies by high and low proficiency learners of English: Tunisian EFL students as a case study. *International Journal of Humanities and Cultural Studies, 3*(1), 1077-1098. https://www.ijhcs.com/index.php/IJHCS/issue/viewIssue/9/47

Parcon, R. E., & Reyes, Z. Q. (2021). Exploring the oral communication strategies used in online classroom discussion. *Journal of English Language Teaching, 10*(3), 198-211. http://journal.unnes.ac.id/sju/index.php/elt

Pawlak, M. (2015). Advanced learners' use of communication strategies in spontaneous language performance. In M. Pawlak, & E. Waniek-Klimczak (Eds.), *Issues in teaching, learning and testing speaking in a second language* (pp. 121-141). Springer, Berlin, Heidelberg.

Pawlak, M. (2018). Investigating the use of speaking strategies in the performance of two communicative tasks: The importance of communicative goal. *Studies in Second Language Learning and Teaching, 8*(2), 269-291. http://pressto.amu.edu.pl/index.php/ssllt

Rayati, M., Abedi, H., & Aghazadeh, S. (2022). EFL learners' speaking strategies: A study of low and high proficiency learners. *MEXTESOL, 46*(4), 1-16.

Selinker, L. (1972). Interlanguage. *IRAL, 10*(3), 209-231.

Shih, Y. C. (2014). Communication strategies in a multimodal virtual communication context. *System, 42*, 34-47. http://dx.doi.org/10.1016/j.system.2013.10.016

Tarone, E. (1980). Communication strategies, foreigner talk, and repair in interlanguage. *Language Learning, 30*(2), 417-431.

Uztosun, M. S., & Erten, İ. H. (2014). The impact of English proficiency on the use of communication strategies: An interaction-based study in Turkish EFL context. *Journal of Language and Linguistic Studies, 10*(2), 169–182.

Yaman, Ş., Irgın, P., & Kavaşoğlu, M. (2013). Communication strategies: Implications for EFL university students. *Journal of Educational Sciences Research, 3*(2), 255-268. https://dergipark.org.tr/tr/download/article-file/698010

Zhao, T. (2013). Use of communication strategies by tourism-oriented EFL learners in relation to attitude towards English speaking and English language and exposure to oral communication in English. *International Journal of Scientific and Research Publications, 3*(5), 1-8. https://www.ijsrp.org/research-paper-0513.php?rp=P171180

Author Contributions

Both authors, Özlem Cengiz, and Prof. Dr. Zübeyde Sinem Genç, contributed equally to this work. They collaboratively handled the conceptualization, methodology design, data collection, and analysis. Each author played a significant role in drafting and revising the manuscript, ensuring its intellectual depth and coherence. Both authors have thoroughly reviewed, provided critical feedback, and approved the final version of the manuscript. They jointly take responsibility for the accuracy and integrity of the research.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: The authors declare that there is no conflict of interest regarding the publication of this paper.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit organizations.

Biographical notes:

Özlem Cengiz[3]*:* Özlem Cengiz is a lecturer in the School of Foreign Languages in Bursa Technical University. She has over 15-year experience in teaching General English, Business English and EAP in EFL context. Her research interests are CAF, TBLT, corrective feedback strategies and reflective teaching. Currently she is coordinating an Erasmus+ KA2 project on the integration of Web2.0 tools into language classes.

Scopus Author Identifier Number: N/A

Web of Science Researcher ID: N/A

Google Scholar Researcher ID: N/A

***Prof. Dr. Zübeyde Sinem Genç*:** Zübeyde Sinem GENÇ is a full Professor at the ELT Department, Faculty of Education, Bursa Uludağ University. She has conducted research and Erasmus+ projects and published articles and book chapters by Cambridge University Press, John Benjamins, Wiley, TESOL, Peter Lang, and Springer. Her professional interests include language teacher education, use of technology in language teaching, and second language acquisition.

Scopus Author Identifier Number: 36473476800

Web of Science Researcher ID: AFS-2001-2022

Google Scholar Researcher ID: to be added before publication

[3] Corresponding Author

IJONMES

INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

The International Journal of Modern Education Studies publishes original research and theoretical articles in the field of educational sciences. The journal publishes manuscripts that have direct relevance to the principles of learning and teaching, the significance of quality education, the role of technology in education, application of psychological concepts to education, student health and wellness, the importance of curriculum development and sociology of education. The journal also welcomes contributions from closely related research areas such as: educational leadership, creative pedagogy, special education, educational policy, educational management, language education, career planning and educational finance etc.

The IJONMES welcomes any papers on educational sciences: original theoretical works, literature reviews, research reports, social issues, psychological issues, curricula, learning environments, research in an educational context, book reviews, and review

ISSN: 2618-6209
URL: https://www.ijonmes.net