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Research

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

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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

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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.

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