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# The effect of the slowmation technique on attitudes towards social studies lessons, active learning, and metacognitive awareness

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**Abstract:**

*The role and importance of technology applications in increasing the cognitive and affective learning of students have been accepted. For this reason, it has been considered important to use different materials and various educational technologies in the preparation of active learning environments. In this context, the effect of the use of the slowmation technique in primary school Social Studies Courses on students' attitudes, active learning, and metacognitive awareness was investigated in this study. The sample of the study, in which a quasi-experimental design was used, consisted of 4th-grade primary school students. The social studies attitude scale, active learning process scale, and metacognitive awareness scale for children were used. During the 5-week practices, slowmation covering different subjects were prepared. Parametric analyses were applied to the data obtained during the application process. According to the analyses performed, the slowmation technique was effective in improving the attitudes towards and active learning of the Social Studies Course. Based on the findings, the limitations of the slowmation technique were mentioned, long-term studies were suggested, and it was suggested to investigate the issue of permanence.*

**Keywords:** *metacognitive awareness, primary school, slowmation, social studies attitude*

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## INTRODUCTION

Social Studies Courses have important functions in providing the knowledge, values, and skills that individuals will need throughout their lives. In this context, Social Studies Courses require students to have skills for constructing knowledge and actively using it throughout their lives. This knowledge structure is gathered under the umbrella of metacognitive skills (Brown, 1977). In the event that an individual organizes this own knowledge, plans these studies, and evaluates this own learning situation by analyzing and synthesizing, it means that the individual employs these metacognitive skills (Flavell, 1979). It has been stated that individuals with metacognitive awareness in the educational environment achieve more permanent, successful, and active learning (Perry et al., 2019). Active learning is regarded as a component of metacognition (Dearnley & Matthew, 2007) therefore; the dependent nature of metacognitive learning and active learning is emphasized. At this point, the effect of technology on both active learning (Singhal et al., 2021) and increasing the metacognitive learning of students (Özkaya et al., 2016) is undeniable. Technology, which is a new tool for knowledge acquisition in the active learning process, has been a great advantage for individuals in obtaining information easily (Pappa et al., 2017). Active learning environments have been transformed by changing environments and opportunities. One of these opportunities is technology (Mutekwe, 2015). Thus, the students took place in the center of the learning process. It has been stated that technology-supported classrooms increase students' cooperation and interaction (Nicol et al., 2018) and learning motivation (Donkin & Kynn, 2021) and that students perform better than in traditional classrooms (Shieh, 2012). Thus, it is stated that technology-supported classrooms improve active learning compared to traditional classrooms (Park & Choi, 2014). In classrooms where instructional technologies are used, students stated that they enjoyed the Social Studies Courses which they attended (Shieh, 2012). Thus, students realize active learning (Green et al., 2018). Based on this context, using of technology and the active learning process are discussed together in this study.

### Theoretical Framework

### Active Learning

Active learning, which focuses on the student, is based on constructivist understanding (Açıkgöz, 2003). Active learning is a learning process that enables individuals to use their mental abilities in complex teaching processes in (Fleming, 2000) which they are responsible for their own learning (Eugène, 2006). In active learning, the teacher and the student share responsibility (Lee, 1999). Teachers should guide students by organizing active learning environments (Felder & Brent, 1996) and should allow their students to acquire learning skills that will enable them to construct knowledge (Russell et al., 2007). Social Studies Courses organized in accordance with active learning environments are stated to increase the permanence of learning, success, and positive attitudes of students towards the lesson (Özcan, 2019), eliminate misconceptions (Dündar & Aksoy, 2010),

stimulate historical consciousness, and provide an empathetic approach to events (Özcan, 2019). The use of different materials and various educational technologies is considered important in the preparation of active learning environments (Hatta et al., 2020; Holloway et al., 2021).

### Metacognitive Awareness

The concept of metacognition, which was first introduced by Flavel (1979), is expressed as the cognition of one's own cognitive processes. Metacognitive knowledge is information that deals with the factors or variables that are effective in the cognitive process (Wilson, 1999), while metacognitive awareness is the individual's knowledge of the control of these cognitive processes and the strategies this uses (Flavel, 2000). In other words, metacognitive awareness is expressed as a way of learning to learn (Dunlosky & Metcalfe, 2008). The relevant literature indicates that metacognitive awareness is directly related to academic achievement (Cautinho, 2007) and if attention-grabbing activities are included in the classroom (Wagener, 2013) that the level of anxiety toward the lesson has decreased (Everson et al., 1994). Additionally, it has been reported that metacognitive awareness improves with technology-supported applications (Gama, 2001). At this point, it can be inferred that technology-supported course contents, especially at young ages, will contribute to the development of students' metacognitive awareness levels.

### Using Slowmation in Education

Slowmation is an animation technique that consists of the processes of narrating a scientific concept that needs to be explained with models, taking photos, and slowing these photos down together in a digital environment (Hoban, 2005). The use of slowmation allows students to work in groups and communicate with each other, concretizing abstract subjects and making the concept simple and understandable. In studies in which slowmation is used, the contributions to collaborative learning among students (Brown et al.; 2013; Nielsen & Hoban, 2015) and the effects on academic achievement (Hoban & Nielsen, 2012; Hager, 2013) are mentioned. In addition, a positive attitude towards the lesson is gained with the slowmation technique (Brown, 2011), attempts are made to create conceptual and in-depth understanding (Devadason et al., 2012; Kidman et al., 2012), learning is facilitated, and positive contributions to 21st-century skills are made (Ochsner, 2010).

In the related literature, the slowmation technique has been used in pre-school (Mou et al., 2021), primary education (Brown et al., 2013; Shepherd et al., 2013), and secondary education levels (Mills et al., 2020; Occelli et al., 2017) and also has applications at the undergraduate level (Devadason et al., 2012; Hoban & Nielsen, 2012). Therefore, the technique can be used effectively at all levels. Different technological applications are included in the Social Studies Courses (Çelik, 2020; Hilton, 2016) and the attitudes of these applications (Koca & Daşdemir, 2016; Wieking, 2016) and their effects on critical thinking skills (Ünlü & Yang, 2020). Therefore, students' attitudes, active learning, and metacognitive

awareness can be tested in the Social Studies Courses with an experimental study to be carried out using the slowmation technique.

Social Studies Course is an interdisciplinary field due to its structure; it allows to bring content related to many different subject areas to the classroom (Maguth, 2012). Using of technology in the teaching of the course has undeniable importance, thanks to the structure of the Social Studies Course that is intertwined with life and covers all fields (Celik, 2021). Although the slowmation technique, which is a technological teaching tool, has an effect in various courses (Atalay et al., 2019; Mills et al., 2018), it is not used in Social Studies Courses. However, it is seen that some technological tools contribute positively to the learning of the lesson in the teaching of verbal concepts. Thus, the slowmation technique is important in concept teaching thanks to the modeling of the concepts and storytelling in the Social Studies Courses (Curry & Cherner, 2016). In this context, it is thought that it will be effective in using the slowmation technique as a teaching tool in the Social Studies Courses.

### Purpose of the Research

Especially with technological applications for younger age groups, students' active learning (Donkin & Kynn, 2021) and metacognitive awareness (Gündüzalp, 2021; Teng, 2021) are seen to increase. According to the National Council for Social Studies (NCSS, 2013), the objectives of the Social Studies Courses are to have the ability to acquire and use information about the individual's community, nation, and the world, to act in cooperation throughout the process and to actively participate. Thus, students will gain lifelong learning skills. Technology has started to be preferred by teachers as a teaching tool in the classrooms to achieve the targeted goals for digital-age children (Instefjord & Munthe, 2017). In order to adapt to the digital age and to communicate with students, teachers also need to use technology in Social Studies Courses. Active participation and having technology literacy as 21st-century skills is an educational requirement for students (Erdogan & Serefli, 2021). These requirements are important in the Social Studies Courses as well as in every other course (Curry & Cherner, 2016). Although the research on the use of technology in Social Studies Course is limited (Celik, 2021; Erdogan & Serefli, 2021; Krutka et al., 2022; Ünlü & Yangın, 2020), the technology-supported Social Studies Course academic success, attitude towards the lesson and conceptualization of the contents (Curry & Cherner, 2016) are stated to have positive contributions. In addition, the Social Studies Courses includes knowledge and skills for solving the problems encountered in daily life. In the present study, the effect of the slowmation technique, which allows cooperative learning, on attitudes towards Social Studies Courses, active learning, and metacognitive awareness was investigated. For this purpose, the sub-problems created in the study are as follows:

1. Among the experimental and control group students; is there a significant difference between the attitudes towards the Social Studies Courses, active learning, and pretest scores related to metacognitive awareness?

2. Among the experimental and control group students; is there a significant difference between the attitudes towards the Social Studies Courses, active learning, and posttest scores on metacognitive awareness?

3. When the pretest scores were examined, did the slowmation activities cause a difference in the posttest scores of the experimental and control group students?

## METHOD

### *Research Model*

A quasi-experimental design, which is a quantitative research method, was used. Quasi-experimental studies are a research design in which groups are determined purposefully, not randomly (Gürbüz & Şahin, 2018). In this design (Table 1), the groups to be included in the experiment are selected without random assignment and the same tests are applied to both the experimental and control groups (Büyüköztürk et al., 2018). It is seen that the quasi-experimental design is suitable for the present study, in which the effectiveness of the slowmation technique is tested.

**Table 1.**

*Reseacrh Model*

| Group | Pre-test | Implementation | Pos-test |
|---|---|---|---|
| Experimental | $O_1$ | X | $O_3$ |
| Control | $O_2$ | | $O_4$ |

*$O_1$ = $O_3$= Social studies attitude scale, social studies course active learning process scale; Metacognitive awareness scale for children-A*

*$O_2$ =$O_4$= Social studies attitude scale, social studies course active learning process scale; Metacognitive awareness scale for children-A*

### *Participants*

The study sample consisted of students in the 4th-grade of a public school in Konya in the 2021-2022 academic year. A convenience sampling technique was used. Because implementations were done by a primary school teacher. In this technique, it is essential to collect data from a sample group that the researcher can easily reach (Büyüköztürk et al., 2018). In the present study, the researchers used this technique, which allows for the collection of data regarding time and space. The demographic characteristics of the students participating in the study are presented in Table 2. Thirty (49.3%) of the students in the study group were female and 31 (50.7%) were male.

**Table 2**

*Demographic Features*

| | | Control Group | Experimental Group | Total |
|---|---|---|---|---|
| **Gender** | Female | 14 | 16 | 30 |
| | Male | 15 | 16 | 31 |
| | Total | 29 | 32 | 61 |

### *Data Collection Tools*

The students' attitudes, active learning, and metacognitive awareness were examined. In this context, the relevant scales and an application form to collect the demographic information of the students were used. The measurement tools used within the scope of the study are introduced below.

### *Social Studies Attitude Scale (SSAS)*

There are 12 items in this scale developed by Ulu Kalın and Topkaya (2017) to reveal the attitudes of 4th-grade primary school students towards the Social Studies Course. The scale is arranged in a 4-point Likert type and has a single-factor structure. Scale items are scored as 1: I totally disagree… 4: I totally agree. The lowest score that can be obtained from the scale is 12 and the highest score is 48. As the total obtained from the scale increases, the level of attitude also increases. The Cronbach's alpha value of the scale was reported as .84, and the value in the present study was calculated as .86.

### *Social Studies Course Active Learning Process Scale (SSCALP)*

This scale developed by Burak (2020) aimed to reveal the active learning processes of primary school students in the Social Studies Course. The scale is a 4-point Likert type consisting of 30 items. Scale items are scored as 1: never… 4: always. The SSCALP consists of seven dimensions. These dimensions are "individual participation in the learning process", "group participation in the learning process", "participation in the extracurricular learning process", "teacher's participation in the learning process", "interest in the lesson", "importance towards the lesson", and "attitude towards the lesson". The stated reliability coefficient of the scale is .88, and the Cronbach's alpha value calculated for the present study is .92. This value is .59 for the first dimension, .68 for the second dimension, .66 for the third dimension, .82 for the fourth dimension, .58 for the fifth dimension, .83 for the sixth dimension, and .59 for the seventh dimension.

### *Metacognitive Awareness Scale for Children-A (Jr. MAI-A)*

This was developed by Sperling et al. (2002) to measure metacognitive skills in primary school students; adaptation of Jr. MAI A and B forms to Turkish language and culture was conducted by Karakelle and Saraç (2007). The scale was adapted as the A form for the 3rd, 4th, and 5th grades of primary school and as the B form for the 6th, 7th, and 8th grades. In the present study, form A, which is suitable for primary school students, was used. The scale consists of 12 items and has a 3-point Likert-type structure (1: never, 2: sometimes, 3: always). A score between 12 and 36 can be obtained on the scale. A high total score indicates high metacognitive skills. The test-retest correlation value for the scale was reported as .74 and the Cronbach's alpha value as .64. The Cronbach's alpha value for the present study was calculated as .61.

### *Implementation and Data Collection*

In the present study, in which the effect of the slowmation technique was investigated in the unit called "*where we live*" in the 4th-grade Social Studies Course, the primary school program was applied in the control group, while the slowmation technique was applied in the experimental group. The "*where we live*" unit of the Social Studies Course was chosen because it contains visuals, is suitable for photography and animation, and is thus suitable for storytelling the subject using technology. In addition, the unit covers a five-week period. After deciding on five different topics from those in the unit in the study, a slowmation was created each week with the students. Expert opinions (Ph.D. lecturer who has studies on technology, especially slowmation) were obtained during the creation and implementation of the animation. In this context, the slowmation was created week by week, considering the gains in the unit.

Week 1: Directions were discussed. The directions were indicated on the model sketches made of cardboard. The sketches were prepared together with the students and visuals made of cardboard were added to the sketches. At this stage, a student performed a voiceover in the background. During this voiceover, each movement in the sketch was photographed and created in slowmation.

Week 2: Natural and human factors were discussed. Then natural and human structures were gradually shaped by the students with play dough and then these structures were photographed. During this process, it was realized that natural elements were formed without human intervention and human elements were formed by human hands. With the photographs obtained, a voiceover was performed with the students and a slowmation was created.

Week 3: Weather conditions were discussed. After a one-week follow-up of the weather conditions and the temperature in the city where the students lived, the weather conditions were shown with symbols in the tables and graphs. In addition, weather events in different cities on the same day were shown on the map of Turkey. The students

photographed symbols, tables, and graphics, and a slowmation was prepared from these photographs.

Week 4: The subject of maps was discussed. The political map of Turkey was turned into a jigsaw puzzle and put together by the students, and each stage was photographed. The types of physical and human maps and the characteristics of these maps were illustrated by the students. Different colors were used in the pictures. Thus, height on physical maps and what this height means were made noticeable. The students actively participated in the preparation and vocalization processes of the slowmation animation.

Week 5: The subject of natural disasters was discussed. During this process, 2D models were created with waste materials found in nature. These models were then photographed at each stage. For example, attempts were made to explain how landslides occurred, using soil brought into the classroom. In the meantime, the students slowly moved the soil in their hands and photographs were taken during this time. When the whole photographing process was finished, a voiceover was added to the background and a slowmation was created together with the students. The creation process (Fig. 1) and sample demonstrations of the products (Fig. 2) are presented in the study.

***Figure 1.*** *Sample Images for the Slowmation*


***Figure 2.*** *Sample Slowmation Images*

## *Data Analysis*

Within the scope of the study, it was determined whether the data showed a normal distribution before the data analysis. After providing the appropriate sample size (Büyüköztük, 2011), the Kolmogorov–Smirnov test results were analyzed ($p$>.05). In addition, skewness and kurtosis values for each scale were examined (Table 3) and it was seen that the normality assumptions for parametric data analysis were met (Hair et al., 2013). Then descriptive analyses in the study, indexed sample t-test, and ANCOVA were applied.

**Table 3**

*Skewness and Kurtosis Coefficients of the Data*

| | S | Skewness | Kurtosis |
|---|---|---|---|
| **SSAS -Pre-test** | .587 | 1.462 | 1.487 |
| **SSAS -Post-test** | .636 | 1.385 | 1.524 |
| **SSCALP - Pre-test** | .504 | -.304 | -.674 |
| **SSCALP - Post-test** | .518 | -.912 | 1.005 |
| **Jr. MAI-A - Pre-test** | .276 | -.577 | .352 |
| **Jr. MAI-A - Post-test** | .279 | -.473 | .520 |

### *Ethical considerations*

Ethical and security concerns were also considered during the study. The consent of the participants was taken into consideration in the study. In this context, parent consent forms were filled. Necessary permissions were obtained from the school administration. Accordingly, the related questionnaire was applied to the students face to face.

The ethical approval document was taken from a "Higher Education Institutions Scientific Research and Publication Ethics Directive."

Ethical review board name: Necmettin Erbakan University Ethical Review Board

Date of ethics review decision: 10.12.2021

Ethics assessment document issue number: 2021/570

## RESULTS

For determining the effect of the slowmation technique on primary school students' attitudes towards Social Studies Course, active learning, and metacognitive awareness, firstly, the equivalence of the pre-test scores of the experimental and control groups before the application was assessed (Table 4).

**Table 4**

*Pre-test Scores of the Experimental and Control Groups*

| Scale | Groups | M | M/k* | S | d*f* | t | *p* |
|---|---|---|---|---|---|---|---|
| **SSAS** | Experimental | 19.15 | 1.59 | .61 | 59 | .01 | .89 |
| | Control | 19.08 | 1.59 | .56 | | | |
| **SSCALP** | Experimental | 93.90 | 3.13 | .48 | 59 | .98 | .76 |
| | Control | 90.00 | 3.00 | .52 | | | |
| **Jr. MAI-A** | Experimental | 28.32 | 2.36 | .28 | 59 | -.89 | .55 |
| | Control | 29.04 | 2.42 | .27 | | | |

**k=items number*

According to Table 3, there was no significant difference between the scores of the students in SSAS, SSCALP and Jr MAI-A before and after the application ($p$>.05). This shows that the experimental and control groups were equivalent at the beginning of the study. Accordingly, SSAS scores were low for both groups, SSCALP scores were moderate for both groups and Jr.MAI-A scores were moderate for both groups. Accordingly, the posttest scores were analyzed to observe the effect of the practice carried out in the study (Table 5).

**Table 5**

*Post-test Scores of the Experimental and Control Groups*

| Scale | Groups | M | M/k | S | df | t | p | *d* |
|---|---|---|---|---|---|---|---|---|
| **SSAS** | Experimental | 23.52 | 1.96 | .32 | 59 | 4.03 | .00* | .56 |
| | Control | 16.32 | 1.36 | .74 | | | | |
| **SSCALP** | Experimental | 75.90 | 2.53 | .26 | 59 | 2.68 | .94 | .26 |
| | Control | 70.50 | 2.35 | .26 | | | | |
| **Jr. MAI-A** | Experimental | 39.84 | 3.32 | .33 | 59 | 3.77 | .00* | .46 |
| | Control | 34.20 | 2.85 | .58 | | | | |

**p*<.05

Table 4 shows the experimental and control groups' post-test scores from the SSTS, SBAI, and Jr. MAI-A. According to the results obtained, the points obtained from SSCALP decreased for both groups. Accordingly, when the attitude scores towards the social studies course are examined, it is seen that there is a difference between the experimental and control groups. Also, the mean score of the experimental group (M=1.965) was higher than the score of the control group (M=1.362) and this was statistically significant ($t_{(59)} = 4.033$; $p>.05$). When the significant difference is considered in terms of effect size, it is seen that the effect (d=.56) is moderate (Cohen, 1988). When the post-test scores of metacognitive awareness of the experimental and control groups are examined, it is seen that there is a significant difference. Accordingly, it is understood that the mean score of the experimental group (M=3.321) was higher than the score of the control group (M=2.858) and this was statistically significant ($t_{(59)} = 3.772$; $p>.05$). When the significant difference is considered in terms of effect size, it is seen that the resulting effect (d=.46) is at a low level (Cohen, 1988). On the other hand, it was observed that the active learning scores of the students in the social studies course did not differ between the experimental and control groups in the post-tests ($p>.05$).

In order to test whether the result obtained in the study was really due to the slowmation technique, all pretests were considered as covariant variables and the change in the posttests was examined (Table 6).

**Table 6**

*ANCOVA Results Regarding the Difference in Post-test Mean Scores of Experimental and Control Group Students*

| SSCALP | | | | | |
|---|---|---|---|---|---|
| **Source** | **Type III Sum of Squares** | **df** | **Mean Square** | **F** | ***p*** |
| **Intercept** | 2.996 | 1 | 2.996 | 25,177 | <.001 |
| **Group** | 1.795 | 1 | 1.795 | 15,085 | <.001 |
| **Pre-test-SSCALP** | 4.700 | 1 | 4.700 | 39,498 | <.001 |
| **Group * Pre-test SSCALP** | 1.234 | 1 | 1.234 | 10,369 | .002* |
| **Error** | 6783 | 57 | .119 | | |
| **Total** | 602.969 | 61 | | | |
| R Squared = .580 (Adjusted R Squared = .558) | | | | | |
| **SSAS** | | | | | |

| Source | Type III Sum of Squares | df | Mean Square | F | *p* |
|---|---|---|---|---|---|
| **Intercept** | 4.564 | 1 | 4.564 | 21.016 | <.001 |
| **Group** | .014 | 1 | .014 | .065 | .800 |
| **Pre-test-SSAS** | 5.941 | 1 | 5.941 | 27.356 | <.001 |
| **Group * SSAS** | .963 | 1 | .963 | 4.435 | .040* |
| **Error** | 12.379 | 57 | .217 | | |
| **Total** | 190.174 | 61 | | | |
| R Squared = .491 (Adjusted R Squared = .464) | | | | | |

**Jr. MAI-A**

| Source | Type III Sum of Squares | df | Mean Square | F | *p* |
|---|---|---|---|---|---|
| **Intercept** | 1.651 | 1 | 1.651 | 27.811 | <.001 |
| **Group** | .000 | 1 | .000 | .003 | .954 |
| **Pre-test- Jr. MAI-A** | .765 | 1 | .765 | 12.882 | <.001 |
| **Group * Pre-test- Jr. MAI-A** | .006 | 1 | .006 | .104 | .748 |
| **Error** | 3.384 | 57 | .059 | | |
| **Total** | 369.854 | 61 | | | |
| R Squared = .277 (Adjusted R Squared = .239) | | | | | |

**p<.05*

In Table 6, the change in the post-tests in terms of attitude towards the Social Studies Courses and active learning and metacognitive awareness was examined by ANCOVA. Accordingly, separate analyses were performed for each variable. When the active learning pre-test scores of the experimental and control groups were assessed, it was observed that there was a significant difference between the corrected post-test scores of the groups ($F_{(1.57)}$ =25.177, $p$<.05) and accordingly corrected post-test scores. When considered, it was seen that the experimental group scores (M=3.305) were higher than the control group scores (M=2.915). When the social studies attitude pre-test scores of the experimental and control groups were examined, it was seen that there was a significant difference between the corrected post-test scores of the groups ($F_{(1.57)}$ =21.016, $p$<.05). It was seen that the scores of

the experimental group (M=1.966) were higher than the control group (M=1.362). Finally, when the metacognitive awareness pre-test scores of the experimental and control groups were checked, it was determined that there was no significant difference between the corrected post-test scores of the groups ($p$>.05). This showed that the slowmation technique applied to the students did not significantly contribute to their metacognitive learning.

## DISCUSSION

In the present study, the effect of the slowmation technique on primary school students' attitudes towards Social Sciences Courses, metacognitive awareness, and active learning in Social Studies Courses within the scope of the "*where we live*" unit of the 4th-grade Social Studies Courses were tested. As a result of the analyses conducted in the light of the collected data, some conclusions were reached. First of all, a significant difference was found between the attitudes of the experimental group, in which the slowmation technique was used in the Social Studies Courses, and the control group, in which the traditional teaching method was used, towards the Social Studies Courses. This difference is in favor of the experimental group in which the slowmation technique is applied in the Social Studies Course. In this case, it can be concluded that teaching with the slowmation technique is effective in developing positive attitudes towards the Social Studies Courses. This result obtained from the research is supported by various studies that show that technology-based techniques in the literature improve students' attitudes in Social Studies Courses (Koca & Daşdemir, 2016; Wieking, 2016). In addition, it has been observed that gaining a positive attitude towards the lesson and conceptual understanding increased in other lessons that include the slowmation technique (Devadason et al., 2012). Hoban and Nielsen (2012) stated that slowing down and dividing the subjects into sections in the slowmation technique helps students to grasp and understand concepts much better and provides opportunities for effective learning. This situation also contributes to the development of social skills of students who need special education (Shepherd et al., 2013). Therefore, it is seen that the slowmation technique, which has a wide coverage area, is effective in developing a positive attitude towards the lesson.

A significant difference was found between the experimental group, which was taught with the slowmation technique in the Social Studies Courses, and the control group, where the traditional teaching method was used, in terms of active learning for the social studies lesson. This difference is in favor of the experimental group in which the slowmation technique is applied in the Social Studies Courses. In this case, it is seen that teaching with the slowmation technique contributes to the active learning of the students in the Social Studies Courses. In this context, a student-centered, inquiry-based approach in social studies education has been supported by technology. Students are required to be active and questioning during the learning process so that they can become competent and relevant citizens, which is the ultimate goal of the Social Studies Courses. It is seen in the literature that similar studies have been carried out in different disciplines. A mixed-method study

was conducted by Mills et al. (2020) concerning 9th-grade students learning geology. According to the results obtained from the research, the active learning of the students who use the slowmation technique in the lesson is positively affected and the students have learning opportunities in applied and collaborative ways. In the literature, it is generally seen that technology-supported course materials increase active learning in accordance with the constructivist approach (Holloway et al., 2021). In a study conducted by Sinhal et al. (2021), it was determined that there was an increase in the active learning of students in classes in which digital technologies were used, compared to classes in which traditional methods were used.

Within the scope of the study, it was seen that the slowmation technique was not effective in increasing metacognitive awareness. However, there are different findings about this situation in the literature. While it is stated in some studies that the use of technology-supported instructional tools does not contribute to the metacognitive learning of students (Özabacı & Olgun, 2011), some studies have shown the opposite (Bakar & Ismail, 2020; Gündüzalp, 2021; Teng, 2021). The reason for obtaining different results on this subject in the literature may be related to the limitations of the slowmation technique (Hoban & Ferry, 2006). According to Hoban (2007), students need more time in the preparation process for the animations they prepare, sometimes they cannot be creative, and there may be misunderstandings when they cannot do enough preparation and research. Due to these limitations of the slowmation technique, it seems that it does not contribute enough to students' metacognitive learning, because during the process students may have focused on preparing the animation and metacognitive learning may not have been triggered. Also, active learning is a teaching technique that provides participation and cooperation in lessons (Özcan, 2019. Like active learning, slowmotion is a technique that provides the class acts in groups and participates actively in the lesson. The main purpose of both techniques is the participation and cooperation of the students in the lesson (Hatta et al., 2020; Holloway et al., 2021). Metacognitive awareness is the state of being aware of one's own learning strategy. There may be complex components that affect metacognition and the regulation and evaluation of mental activities of the individual constitute a comprehensive process. For this reason, although metacognitive awareness generally progresses in parallel with academic success and an active learning environment (Chan et al., 2021; Gonzalez Nieto, 2017; Pantiwati & Husamah, 2017), there are studies that show that the effect of metacognition may be diverse. For this reason, it is thought that the slowmation technique, which is a technology-based teaching technique, affects active learning but does not affect metacognitive awareness.

## LIMITATIONS AND RECOMMENDATIONS

The results obtained in the current study showed that the slowmation technique was effective in developing positive attitudes towards Social Studies Courses and active learning, but not students' metacognitive awareness. This situation can be explained by the

limitations of the slowmation technique and reasons originating from the student or the teacher. In addition, the lesson was found to be quite different and enjoyable for students who were introduced to the slowmation technique for the first time, and this may have affected their attitude scores. Therefore, the results obtained from the study can be considered as both a contribution and a limitation to the literature. Finally, the study was carried out with 4th-grade primary school students over a 5-week period. The change or development in students' attitudes, active learning, and metacognitive awareness levels during the period after this process is completed is not known. Considering this limitation, it is recommended to conduct studies that measure longer durations and permanence. The effects of the technique on attitude and active learning are the desired findings, but students' opinions can also be included in order to consider the continuity of the findings. Considering the limitations of the study, it is recommended to carry out follow-up studies, thus underlining the effect of the technique on metacognitive awareness in long-term studies.

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

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