

Improving the Attitudes of Preservice Social Studies Teachers towards Mathematics through the Use of the Creative Drama Method

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Abstract. This study aims to improve the attitudes of preservice Social Studies teachers towards Mathematics by means of creative drama method. The study comprised a mixed method integrating both qualitative and quantitative research methods. The quantitative method of this research involved experimental pretest-posttest research design with no control groups. As for the qualitative method of the study, phenomenological research design was used. The study group of this research was formed through purposeful and convenience sampling method used in the mixed method research. Accordingly, the study group of this research consisted of 20 preservice teachers from among the last year students studying at Akdeniz University Faculty of Education Department of Social Studies in the 2017-2018 Academic Year, who volunteered to take part in the research and who thought and stated that they had prejudices against mathematics and geometry lessons. The quantitative data of the research were collected through Mathematics Attitude Scale developed by Aşkar (1999) and Geometry Attitude Scale developed by Bindak (2004), after having obtained the necessary permissions. The collected quantitative data were analyzed with SPSS program. The qualitative data of the research, on the other hand, were collected through the evaluation of written documents received from the study group before and after the practices as well as of written documents received at the end of the 14th workshop. The collected qualitative data were analyzed with descriptive analysis and content analysis. In view of the overall research results, it would be safe to say that positive changes were observed in the attitudes of the study group -consisting of preservice Social Studies teachers-towards mathematics thanks to the use of creative drama method.

Keywords: Social studies, teacher candidate, mathematics, attitude.

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1. INTRODUCTION

Interaction between lessons stand out in addition to the new approaches in the curricula that started to be implemented throughout Turkey in 2005 following the pilot applications between 2004 and 2005. Kaymakçı (2009) points out that Turkish, Mathematics, Social Studies, Science and Technology lessons are associated with each other in this curriculum that was released in 2005 and thus the new Social Studies curriculum enabled introduction of many innovations into the world of education together with the other primary education curricula. In addition, it is stated in the 2005 social studies curriculum that the definition of social studies has changed, and it has become a field making use of social science disciplines and turning into an interdisciplinary field in accordance with the essence and logic of Social Sciences.

In addition to the curricula that have been revised so far, the curriculum that was published by the Ministry of National Education (MEB) in 2017 and put into practice in 2018 states that the aim of the education system is to raise individuals with knowledge, skills and behavior integrated with innovations. In this context, some competences have been determined within the Turkish Qualifications Framework (TYÇ). One of these competences is “Mathematical Competence and Core Competences in Science/Technology” and it is included in the Social Studies Curriculum as follows (MEB, 2018, p.7):

"Mathematical competence is the development and application of a mathematical way of thinking to solve a number of problems encountered in everyday life. Mathematical competence includes the ability and willingness to use the mathematical modes of thinking (logical and spatial thinking) and presentation (formulas, models, fictions, graphics and tables) to different degrees. Competence in science and technology includes knowledge about the basic principles of nature, basic scientific concepts, principles and methods, technology, technological products and methods in addition to an understanding of the natural world, science and the effects of technology, and it focuses on the ability of an individual to recognize the main qualities of scientific research and to reason for discussing and revealing results. This competence includes critical appreciation and curiosity, attention to ethical issues, respect for safety and sustainability and an attitude for appreciation of scientific and technological developments related to oneself, one's family, community and global issues."

Within the scope of this skill, the student is expected to “understand numbers, measures and mathematical expressions, see mathematical principles, develop a positive attitude towards Mathematics and value Mathematics”. This study aims to improve the attitudes of preservice Social Studies teachers towards Mathematics through the creative drama method in line with the qualifications introduced by the 2017 Social Studies curriculum.

The literature reveals that creative drama has been used for many disciplines but there is no evidence that it has been used to combine two different disciplines. Some other studies that can be associated with Social Studies and Mathematics are as follows: Bekdemir and Başbüyük (2011) pointed out that Mathematics achievement and Mathematics anxiety

levels are important factors determining the Geography achievement level while Dönmez, Yazıcı and Sabancı (2007) pointed out that the use of graphic editors in Social Studies lessons has a positive effect on achievement of academic knowledge by students. Göksel (2007) stated that many of his students did not know how to read and interpret graphics, the graphics in the books were insufficient, the textbooks needed to be immediately enriched in terms of graphics and maps, maps and graphics needed to be constantly updated and made interesting for students. Yıldız (2006) concluded that maps, charts and figures were not adequately understood by the students in Social Studies classes.

The activities in most elementary classes are known to be significantly shaped by Mathematics and social fields (Adams & Biddle, 1970; Stodolsky, 1988). In addition to in-class experiences, the types of actual content and competences required for each discipline contribute to different student perceptions (Stodolsky, Salk, and Glaessner, 1991). Success of students (Bloom, 1976) may be related to their perceptions of competence (Frey & Ruble, 1987), senses of being active (Diener & Dweck, 1980), the learning strategies they use (Corno & Rohrkemper, 1985) and their attitudes and perceptions regarding the given subject areas.

Baykul (1999) points out that one of the reasons for students' failure in Mathematics is their negative attitudes towards Mathematics. Ruffell, Mason and Barbara (1998) revealed that most students avoided Mathematics activities for fear of making a mistake while other studies on fear and anxiety about Mathematics have revealed changes in positive attitudes towards Mathematics as children have more experience in Mathematics.

This study focuses on identifying the negative attitudes developed by the students towards the field and eliminating these attitudes and behaviors with long-term activities. Van de Walle (2010) emphasizes the importance of preparing environments that will allow students to do Mathematics, bringing students together with activities worth dealing with in these environments, and then sharing these Mathematical ideas. He also states that it is difficult to create environments that appeal to everyone in classrooms where students with different backgrounds are present, and that it is effective to use situations that all students are familiar within such cases. In this context, he points out in his book that other lessons serve to form problems and teachers need to use them in Social Studies, Science and Technology, and Turkish lessons.

In this context, studies emphasize the higher efficiency of creating environments with the opportunity to do Mathematics and teaching Mathematics in an activity-based manner (Huetinck & Munshin, 2000; Olkun and Toluk, 2003). The importance of creative drama as a method in activity-based Mathematics teaching is undeniable. These studies state that creative drama, as a method for learning by living by doing, can make teaching Mathematics more enjoyable and fun, improve student attitudes positively, increase their success and socialize them (Aktepe & Bulut, 2015). Using creative drama in Mathematics lessons where abstract concepts are predominant and students come with negative biases will enable students to learn concepts and transactions by living and doing, reinforce what

they have learned, and develop affective and kinetic behaviors apart from cognitive behaviors (Özsoy, 2010).

Creative drama refers to dramatization of the learning-teaching process through pretension by volunteer participants using the improvisation, impersonation and acting techniques based on their own lives under the guidance of a leader (Adıgüzel, 2017).

Play and drama can be said to be effective in developing positive attitudes towards Mathematics and increasing creative thinking. Considering this effect and the competence included in the curriculum, it is aimed to improve the attitudes of preservice Social Studies teachers who are thought to have negative attitudes towards Mathematics using the creative drama method. Based on this objective, the problem statement of the study is as follows:

“How do attitudes of preservice Social Studies teachers towards Mathematics change with the creative drama method?”

2. METHOD

A mixed method combining qualitative and quantitative research methods was used in this study. The reason for conducting mixed method research is that the use of qualitative and quantitative research methods together or by blending provides a better understanding of research problems and questions rather than using these methods separately (Creswell, 2008). In this study, which was designed as embedded mixed method research, quantitative and qualitative data were collected together, and the data presentation format was constructed as supportive (qualitative findings supporting quantitative findings). The aim of using a mixed method in this study is to use the qualitative method to show the progress of the study group during the process while determining whether their attitudes towards Mathematics have changed by the quantitative method.

The quantitative method of this study involved experimental pretest-posttest research design with no control groups. In this design, the effect of the experimental process is tested with a test on a single group and the measurements of the subjects regarding the dependent variable are obtained by using the same subjects and the same measuring instruments via a pretest before the practice and a posttest after the practice. There is no randomness and matching and therefore the design can be defined as single factor in-group or repetitive measurements design (Büyüköztürk et al., 2010).

As for the qualitative method of the study, the phenomenological research design was used. The data source in phenomenology is individuals or groups who experience the research topic and can express or reflect this phenomenon (Creswell, 2008).

Study Group

The study group of this research was formed through the purposeful and convenience sampling methods used in the mixed research method. The purposeful sampling part of

the study consisted of people with bias against Mathematics, while the convenience sampling part consisted of easily accessible and willing participants. Accordingly, the study group of this research consisted of 20 preservice teachers among the final year students studying at the Social Studies department in the Faculty of Education of Akdeniz University in the 2017-2018 Academic Year, who volunteered to take part in the research and who thought and stated that they had prejudices against Mathematics and Geometry lessons. The study included final year students because they would take KPSS and ALES exams and it was thought that it could be important for them to realize and explore Mathematics as they could use it when they become Social Studies teachers.

Data Collection and Analysis

The quantitative data of the research were collected through Mathematics Attitude Scale developed by Aşkar (1999) and Geometry Attitude Scale developed by Bindak (2004), after having obtained the necessary permissions. The study aimed to improve the attitudes of preservice Social Studies teachers towards Mathematics but their attitudes towards Geometry were studied as well. This is because the learning areas in the Mathematics curriculum include numbers and operations while the workshops include outcomes in the field of Geometry learning.

Since the collected data displayed non-parametric characteristics, they were analyzed with the Wilcoxon Signed Ranks Test in the SPSS program. The Cronbach-Alpha reliability coefficient was 0.946 for the Mathematics Attitude Scale and 0.919 for the Geometry Attitude Scale. Tests can be said to have high reliability in terms of internal consistency.

The qualitative data of the research was obtained through analysis of the written documents taken from the Study Group before and after the practices, writing information shared at the end of the workshops during the process, letters addressed to leaders received at the end of the term and the written documents obtained at the end of the 14th workshop. The qualitative data used in this study include cards titled "My view of Mathematics and Geometry with the help of metaphors" (before and after the practices) and "I questioned my prejudice to Mathematics", answers to open-ended questions in which the participants expressed their views on the study before and after the practices, written statements containing their pre-study and post-study assessments of the relationship between Social Studies and Mathematics, statements about the contributions of the activities to themselves, and written documents containing explanations about why they need to learn Mathematics. End-of-workshop evaluations, products collected from workshops and letters written to leaders are not included in the scope of qualitative analysis in order to avoid repetition. The collected data were analysed through descriptive analysis (3, 4, 5, 6, 7th sub-problems) and content analysis (8th sub-problem).

The aim of descriptive analysis is to present the findings to the reader in an edited and interpreted manner. Content analysis involves processing data from documents, coding data, finding themes, editing and interpreting codes and themes (Yıldırım & Şimşek, 2006). The data obtained in descriptive analysis and content analysis are summarized and

interpreted according to the previously determined themes. By digitizing the obtained qualitative data, the data are presented with frequencies. Direct quotations were made from the student opinions as follows while presenting the findings: 1F, 2M, 3F, 4M, 5F, 6F, 7M, 8F, 9F, 10F, 11F, 12F, 13M, 14M, 15F, 16F, 17M, 18M, 19M, 20F.

Practice

In this study, a total of 30 workshops including 14 fall semester workshops, 2 semester break workshops and 14 spring semester workshops were applied to 20 preservice Social Studies teachers in the study group. The workshop concept can be defined as the process of warming up, impersonation and evaluation in drama. For this study, each workshop was conducted in 150 minutes (75 hours in total) once a week considering the students' syllabi. The workshop topics were based on the mathematical achievements in the Social Studies curriculum and the Mathematics used in daily life. Although two research experts participated in all workshops together, 14 workshops in the fall semester were conducted by the Social Studies field specialist. 14 workshops in the spring semester were implemented by the Mathematics field specialist. The sessions during the semester were conducted with both experts. Both research experts are creative drama instructors. During the research process, 2 master students studying drama were recruited to observe the process, hold reports and assist instructors. Practices continued throughout the 2017-2018 academic year and they were carried out in Drama Class No 28 in Block A in the Faculty of Education of Akdeniz University.

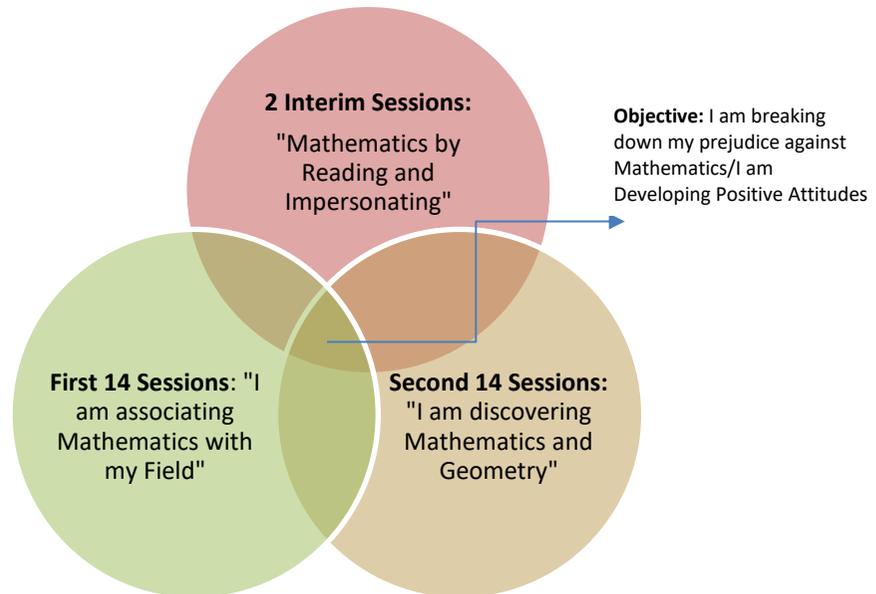


Figure 1. Objectives of the Creative Drama Workshops in the Study

3. FINDINGS

Is there a significant difference between the attitudes of the students in the study group towards Mathematics before and after the practice?

Wilcoxon Signed Ranks Test was used to check whether the attitudes of the participants towards Mathematics before and after the experiment were significantly different and the analysis results are shown in Table 1.

Table 1.

Wilcoxon Signed Ranks Test results of the Mathematics attitude scores before and after the experiment

Pretest-Posttest	n	Rank Mean	Rank Sum	z	p
Negatif Rank	3	4.67	14	-3.399*	0.001
Positive Rank	17	11.53	196		
Equal	0				

* Based on negative ranks ** $p < 0.05$

The results show that there is a significant difference between pre-experimental and post-experimental Mathematics attitude scores ($z=-3.399$, $p=0.001$). When rank averages of the difference scores and the total scores are evaluated, it is observed that this difference is in favor of final test scores. In other words, it can be said that the practice positively affects the attitudes of the participants towards Mathematics.

Is there a significant difference between the attitudes of the students in the study group towards Geometry before and after the practice?

Wilcoxon Signed Ranks Test was used to check whether the attitudes of the participants towards Geometry before and after the experiment were significantly different and the analysis results are shown in Table 2.

Table 2

Wilcoxon Signed Ranks Test results of the Geometry attitude scores before and after the experiment

Pretest-Posttest	n	Rank Mean	Rank Sum	z	p
Negatif Rank	4	6.75	27	-2.739*	0.006

Positive Rank	15	10.87	163
Equal	0		

* Based on negative ranks ** $p < 0.05$

The results show that there is a significant difference between pre-experimental and post-experimental Geometry attitude scores ($z=-2.739$, $p=0.006$). When rank averages of the difference scores and the total scores are evaluated, it is observed that this difference is in favor of final test scores. In other words, it can be said that the practice positively affects the attitudes of the participants towards Geometry.

What are the metaphors of the students in the study group for Mathematics and Geometry lessons before and after the practice?

Table 3

Students' Metaphors for Mathematics before and after the Study

BEFORE THE STUDY	f	AFTER THE STUDY	f
Money	2	Life	5
Puzzle	2	Pomegranate	3
Space	2	Oxygen	2
Obscurity	1	Money Box	2
Grape Fruit	1	Stairs	1
Knot	1	Puzzle	1
Unlocked door	1	Mirror	1
Medicine	1	Growing plants	1
Broccoli	1	Key to life	1
Plague	1	Sea	1
Chaos	1	Key	1
Onion	1	Friend	1
Lemon	1		
Maze	1		
Cliff	1		
Little boy	1		

When students in the study group were asked to develop metaphors for their Mathematics lessons and subjects before and after the practice, it can be said that they developed negative metaphors in general before the practice. Some of the students' answers are as follows:

"Mathematics is like space. Because it's complicated and you can't handle it. A complex stack consisting of endless numbers, formulas, and calculations." (1F)

"I think Mathematics is like onions. That is because Mathematics is eye-watering like onion. The more you study Mathematics, the more it hurts and tears come from your eyes." (15F)

"I think Mathematics is like the plague. Because if you fail, it's worse than death." (13M)

"I think Mathematics is like broccoli. Because even though it looks nice, it tastes really bad. Only some people like broccoli, buy and eat it. They say it's useful, but nobody knows. Most people don't like it. It is just like Maths." (4M)

When students in the study group were asked to develop metaphors for their Mathematics lessons and subjects after the practice, it can be said that the students developed metaphors in a positive way. The same students whose answers before the practice are given above gave the following answers after the practice:

"Mathematics is like a mirror to me. We see ourselves in the mirror the way we look at it. I learned to look in a positive way." (1F)

"Mathematics is life. It gives us clues to succeed in life." (15F)

"Mathematics is like raw material. It gains value as it is processed. You can't understand it if you don't process it." (13M)

"Mathematics is like spinach. It sounds cheesy, but it's very useful. It will be great if it is prepared and served properly." (4M)

Table 4

Students' Metaphors for Geometry before and after the Study

BEFORE THE STUDY	f	AFTER THE STUDY	f
Nothing	3	Game	4
Hot pepper	2	Maze	2
A blind person	1	The Tetris game	1

Turmoil	1	Equal share	1
Shape of the world	1	Harmony	1
Puzzle with infinite number of pieces	1	Stove	1
Medicine	1	Abstract table	1
Mosquito	1	Cake	1
Space gap	1	The secret of the universe	1
Game	1	Mystery	1
Unknown city	1	Sudoku	1
Green vegetable	1	A land of corn	1
A tangled rope	1	Bicycle	1
Purse	1	National Lottery	1
Cliff	1	Raw material	1
Adverse weather conditions	1	Streets	1

When the students in the study group were asked to develop metaphors for the Geometry lessons and subjects before and after the practice, it can be said that the students developed negative metaphors in general before the practice. 3 students wrote that they could not compare Geometry to anything. Some of the students' answers are as follows:

"I think Geometry is like the shape of the world. The more you figure it out, the more you come back to the same place. You are at the same point when you can't figure it out. So, you don't have to figure it out." (16F)

"Geometry is like a complicated chaos. This mayhem will prevent you from seeing ways to get the right answer." (14M)

"Geometry means nothing to me." (6F)

"Geometry is like a blind man. You can't do it if you can't see it." (18M)

When students in the study group were asked to develop metaphors for their Geometry lessons and subjects after the practice, it can be said that the students developed metaphors in a positive way. The same students whose answers before the practice are given above gave the following answers after the practice:

"Geometry is like sudoku. When an angle is written, all the solutions follow." (16F)

"Geometry is like cake. Some people eat a lot, some people say they're on a diet and eat a thin slice. But everybody loves it." (14M)

"Geometry is like a very enjoyable game. Every point has an exit point. You enjoy it as you play" (6F)

"Geometry is an abstract table. If you know how to look and interpret, you really understand it." (18M)

Considering the metaphors of the students in the study group for Mathematics and Geometry before and after the practices, it can be said that the metaphors shifted significantly to positive.

Analysis of the products of the students in the study group in the "Hello to Maths with M. C. Escher" workshop (14th workshop)

Table 5

Analysis of the products of the students in the study group in the "Hello to Maths with M. C. Escher" workshop

My Prejudice against Maths	f	Hello to Maths	f
I didn't like my Maths teacher	1	My problem was just my prejudice.	1
	4		
I can't do it	9	I understood that I could like you	1
A difficult field	6	We can manage if we really want	1
It was my worst lesson throughout my academic life	6	It's a good thing Maths was found.	1
Even the name makes you nervous	5	The teacher really matters	1
It's not for me	3	I saw its point	1
It is scary	2	It wasn't all about numbers.	1
		I got confidence and hope	1
		You can't be that difficult	1
		I stood against my prejudice today.	1
		I need to know Mathematics rather than being a Mathematician.	1
		We thought we were running away, but it's life itself.	1
		I ran away saying I couldn't like Maths, but it turns out that I never tried it.	1

It got easier as I walked towards it.	1
It made me happy to understand that I could do it.	1
Anyone who loves life can do it.	1
Maths is to figure out the everyday life	1
It is not too late to figure it out	1
I can do it if I try	1
I took a step and it ran to me.	1

The Mathematics expert attended the workshop as "M. C. Escher" with the "teacher in role" technique in the last sessions of the first 14 workshops of the study. The students wrote their prejudices against Mathematics before Escher arrived and glued them to black balloons. Escher came up with another technique of drama, the hot seating technique, and listened to the students' prejudices in their black balloons and talked to them. The students, who were prepared to break their prejudice over the 14 workshops and Escher's persuasions, burst their black balloons and wrote something about Maths on the "Hello to Maths" cards dangling from previously prepared white balloons on the ceiling. When the cards and the notes stuck to the balloons by the students were analyzed, it was observed that the source of the students' prejudices was mostly caused by the fact that they did not like their Mathematics teachers. It is also thought that their failures in Mathematics in their academic life contributed to this prejudice. Chatting with Escher about these prejudices, the students burst representative balloons in order to break their prejudices against Mathematics and wrote positive and hopeful messages on their "hello to Maths" cards. When we look at what is written on these cards, it is possible to say that the students became ready to realize the purpose of the study. After this workshop, the students started to get to know Mathematics under the leadership of the Mathematics expert.

What are the views of the students in the study group towards working before and after the practice?

Table 6

Views of the Students about the Thoughts Theme before and after the Study

BEFORE THE STUDY		AFTER THE STUDY	
	f		f
I thought		I think	
Mathematics was unnecessary	5	Mathematics and Geometry make our lives easier	5
That Mathematics and Geometry didn't suit me	4	Mathematics and Geometry can be done	4
I was completely prejudiced against these lessons	4	I have understood they are necessary and I broke my prejudice	4
I was too late to like Maths	3	I can do Maths if I want	4
My attitude to Mathematics would never change	3	I am starting to like Maths	4
Mathematics was unpleasant	2	Mathematics can be popularized in childhood	3
Mathematics was scary	1	I have discovered the lovely aspect of Maths	1
Only smart people could do Maths	1	Only those with prejudice can't do Maths.	1
I couldn't do it all my life	1	The basic thing we need in every field is Mathematics	1
Mathematics and Geometry were difficult	1	Anyone with normal intelligence can do it	1

When we look at what the students thought before the practice, it can be said that there was a general reluctance, fear and prejudice against Mathematics. When we look at what the students think after the practice, it is possible to say that their negative statements have completely disappeared and that they have used positive statements about Mathematics. Some of the answers students gave before and after are as follows:

"I always thought Mathematics was unnecessary. But now I think that Mathematics and Geometry make our lives easier and have many benefits." (7M)

"I thought that Mathematics and Geometry were not suitable for me and that they were difficult. But now I think Mathematics and Geometry can be done." (2M)

"I thought that my thoughts about Mathematics would never change and that I was too late to like it. But now I see that I can do Mathematics if I want to. I even think I'm starting to like it." (5F)

"I thought Mathematics was scary and unlikeable. But now I think that Mathematics can be endeared as of childhood." (9F)

Table 7

Views of the Students about the Emotions Theme (Feelings) before and after the Study

BEFORE THE STUDY		AFTER THE STUDY	
	f		f
I felt		I feel	
Nervous and suffocated when I heard the names of Mathematics and Geometry	7	Mathematics and Geometry do not bother me	5
Uncomfortable with Mathematics and Geometry	5	Mathematics and Geometry actually interest me	4
Distant from Mathematics and Geometry	5	My negative feelings were unnecessary	3
That I would get bored while starting this study	4	That I beat something I thought I couldn't thanks to this study	3
Unhappy	3	It makes me feel happy to see that I can	2
My prejudice would not change		My point of view on Mathematics changed completely	1
Fear and tension	2	My concerns were unnecessary	1
I hated it	2	This study was even more helpful than I expected	1
This study would be useful to me	1	I didn't want to break away from this study	1

When we look at the feelings of the students before the practice, it is observed that there are negative feelings such as fear, hate and unhappiness among the students' feelings.

Likewise, we see that student feelings changed positively after the practice. Some of the students' answers are as follows:

"I was far away from Mathematics in every aspect and I felt unhappy when I thought about it. But now, I feel that my concerns were unnecessary, and they don't bother me." (8F)

"I felt that I would be bored, and it would not be useful while starting this study. But now, thanks to this study, I feel I have defeated my fear of failure that I thought I could never defeat" (12F)

"Before this study, I felt fear because I didn't have the slightest interest in Mathematics. But now, I feel like I'm getting rid of the idea that I can't" (19M)

"I felt that this study would be useful to me (getting rid of my prejudice etc.). But now, I feel that the study has been more beneficial to me than I hoped (my communication skills have increased, my social relationships have increased, I have got to know my friends better, I have seen different aspects of my profession, etc.)." (7M)

Table 8

Views of the Students about the Learning Theme before and after the Study

BEFORE THE STUDY		AFTER THE STUDY	
	f		f
I didn't know		I learned	
How Mathematics and Geometry could be useful	4	That all sciences were born together and related with each other	6
The relationship between Social Studies and Mathematics	3	That Mathematics can be learned in a fun way	5
The fun of Mathematics	2	The lives of famous Mathematicians	4
The lives of famous Mathematicians	2	Scientists and their lives	3
That I could love Mathematics	2	That Mathematics is an important lesson that must be taught at all levels	3
The true purpose of Mathematics	2	That drama is a major force in popularizing Mathematics	3
That Mathematics can be learned in such an enjoyable way	2	Contributions of Mathematics and Geometry to life	2

That drama has such effects	2	Mathematics is the life itself from A to Z	1
What Mathematics is capable of	1	Drama can achieve something in human emotions that are considered unachievable	1

It was observed that the students in the study group uttered sentences in their "I didn't know before the practice" statements regarding the qualities of Mathematics they had not known or witnessed before and considered to be positive. After the practice, we can say that the students expressed their belief in Mathematics, its relationship with their fields, and that they saw the purpose of Mathematics. Some of the students' answers are as follows:

"I didn't know I could like Mathematics. But now, I know that drama can achieve everything that is considered unachievable in human emotions." (20F)

"I didn't know that Mathematics and Social Studies could be related. But now, I know that all sciences were born together, and they are bound together like the rings of a chain." (17M)

"I didn't know what Mathematics was capable of. But now I know that Mathematics is the life itself from A to Z." (5F)

"I didn't know drama could be so effective. But now I know there's an important way to popularize Mathematics." (13M)

When we evaluate the thoughts, feelings and expressions of the students in the study group before and after the practices, it can be said that the students used positive expressions in each theme compared to the period before the practice, and that their attitudes towards Mathematics changed in a positive direction.

What are the views of the students in the study on the relationship between Social Studies and Mathematics before and after the practices?

Table 9

Students' views on the relationship between Social Studies and Mathematics before and after the Study

BEFORE THE STUDY	f	AFTER THE STUDY	f
I comes up in KPSS	1	History (chronology, lives of famous Mathematics, birth of sciences)	2
	4		0

Shopping and calculations in daily life	5	Calculations in Geography	20
The relationship between Economics and Geography	2	Economy	12
Not very related	1	Sciences interact with / help each other	8
No relation	1	Problem solving	6
		Reasoning	4
		Inference	3
		In the field of measurement and evaluation	2
		Developing the power of thought	1
		Statistics	1

When students in the study group were asked about their views on the relationship between Social Studies and Mathematics before and after the practice, it could be said that students were unable to establish a relationship between Social Studies and Mathematics prior to the practice. They expressed these views by saying that they used Mathematics to make calculations in daily life and to get higher scores in the KPSS exam they took in order to start working. Some of the students' answers are as follows:

"One is verbal and the other is numerical, but we are expected to do both in KPSS" (6F)

"It would be good if we could to them in KPSS but it's hard" (16F)

"I could say that KPSS is the strongest relationship between us" (4M)

"The Economy discipline is highly related to Mathematics. Geography benefits from Mathematics as well. Actually, these two fields are close to the numerical areas, but they're in our field." (14M)

It can be said that the students in the study group explained the relationship between Social Studies and Mathematics more accurately and by giving examples after the practice. It was observed that all of the participants associated Mathematics with History and Geography as the social sciences that Social Studies benefited from. Also, there were students explaining it through the relationship between Economy and other sciences. Some of the answers given by the same students after the practice are as follows:

"Mathematics is highly associated with social sciences. We can say that it is an auxiliary discipline. For one thing, every person needs reasoning and inference in their living conditions. Furthermore, Mathematics must be kept in mind during all kinds of

exchange. Considering its relationship with Social Studies, Mathematics, which derives from the social sciences and is shaped by major disciplines such as History and Geography, is actually implicitly helpful in our field. Mathematics actually plays a significant role in subjects such as chronology in History, time calculations and interpretation of tables and graphics in Geography." (6F)

"Mathematics and Social Studies are two sciences that help each other even though they are in different branches of science. In fact, when we look at the birth of science, there is no such distinction. When we take a look at famous philosophers, it is possible to see that they were both Mathematicians and had works in social sciences. It can be argued that especially History, Geography and Economics are the disciplines in social sciences that Mathematics directly helps. I think Mathematics is one of the most important auxiliary sciences to make subjects understood and learned although it cannot help with the contents" (16F)

"Mathematics helps the disciplines of History and Geography in various respects. History and Geography have been the primary disciplines of social studies since their emergence. For example, Mathematics knowledge is important while giving chronology information to children, telling the discoveries of scientists in History, and making Meridian calculations in Geography. Teachers also say they have difficulties especially in teaching time calculations. They may be having a hard time because these subjects are associated with Mathematics. The teacher's knowledge of Mathematics is especially important when teaching Geography..." (4M)

"All sciences are bound together like the Rings of a chain. You get help from others to fully understand, explain and improve one. For example, in our field, can we separate History from Geography? Ibn Haldun's saying "Geography is the destiny of a nation" is the best example of this. Just like this connection, other fields more or less complement each other. Mathematics is one of these fields. Just as History is the sine qua non of the verbal field, Mathematics is the sine qua non of the numerical field. We have to know these sciences even if we are not academics, teachers or scientists. Today, someone who does not work at all uses Mathematics in their daily shopping, calculations etc. Also, this person knows more or less the history of the nation to which he belongs. In other words, these sciences are the basic sciences. They help one another. A Mathematician, for example, learns science history, while disciplines such as history, geography and economics in the social sciences benefit from Mathematics. A teacher from any branch uses Mathematics when performing measurement and evaluation... (14M)

When we look at the views of the students in the study group regarding the relationship between Social Studies and Mathematics before and after the practice, we can say that their views and attitudes changed significantly compared to their previous statements. It was found out in student statements that they evaluate Mathematics free from their prejudices and can associate it with their fields.

What are the views of the students in the study group about “why they should learn Mathematics” before and after the study?

Table 10

The Views of the Students in the Study Group about “Why They Should Learn Mathematics” before and after the Study?

BEFORE THE STUDY	f	AFTER THE STUDY	f
To succeed in KPSS	1	To assist social sciences	2
	0		0
To solve problems in daily life	7	Makes it easier for us to understand social sciences	6
It's not necessary	6	We understand the sciences as a whole	4
I wish I could understand	4	Makes it easier to solve life problems	4
I couldn't do it even if I wanted to	2	For our research	3
		Famous Mathematicians also know social sciences	1

When students in the study group were asked about their views on why they should learn Mathematics before and after the practice, it was observed that the students linked learning Mathematics with success in KPSS prior to the practice. Six of the students said there was no need to learn. Some students stated that they wanted to understand Mathematics and learn Mathematics in order to succeed in daily life, which can be considered to be a positive response. Some of the students' answers are as follows:

“As a preservice teacher, I need to score well in KPSS so that I can be appointed. Doing Mathematics is very important here. But I can't do it even if I want to.” (1F)

“Mathematics is an important lesson, I could never get along with it. We encounter it a lot in daily life. We know enough to save the day.” (14M)

“I could never do Mathematics. I can't spare extra time to learn it from now on. I don't need it anymore.” (4M)

“Exams are the defining moments of our lives. I'll try to do whatever I can to be appointed ... ” (9F)

When we look at the explanations of the students in the study group about why they need to learn Mathematics after the practice, we can say that the students stopped thinking that they could not do it or they did not need it completely because of their exam. Some of the answers given by the same students after the practice are as follows:

It is very important to understand Mathematics and avoid any prejudice as a Social Studies teacher. That is because Mathematics is primarily an auxiliary science to the social sciences. I think if we accept this we don't need to be afraid and develop a prejudice anyway... " (1F)

"We have to understand Mathematics no matter who we are and what we do. At this point, as teachers, we need to use Mathematics to internalize and transfer the social sciences better. We also use Mathematics to solve the problems we face in daily life..." (14M)

"... Since we are going to be Social Studies teachers and teach social sciences, we have to know and understand auxiliary sciences. Mathematics is one of these auxiliary sciences. It is not that I suggest being a famous Mathematician..." (4M)

"Teachers have a hard time explaining certain subjects. They are unfamiliar with certain disciplines. For example, they can be challenged by subjects in Geography and Economics. These disciplines are helped by Mathematics. That's why the teacher has to know Mathematics. Maybe not as much as a Mathematics teacher, but they should know enough to help students with their own subjects. Many famous Mathematicians have studied social sciences and produced works. So there's no such thing as off-field..." (9F)

When we look at the explanations of the students in the study group about why they needed to learn Mathematics, it can be said that the students uttered more positive and justified statements about learning Mathematics compared to their responses before the practice.

What are the comments of the students in the study group about the practices?

Table 11

Comments of the students in the study group about the practices

Themes	Statements	f
	I overcame my prejudice before starting my profession	16
	I discovered a different direction in my profession	9
	As a preservice teacher, I saw ways to break down prejudices.	7

My idea of being a teacher	I was able to relate Mathematics to my field	2
	Teachers should be open to learning and not say that they can't	2
	I've expanded the boundaries of my field	1
	I can make someone who doesn't like Math like it.	1
	I had some good memories to tell my students.	1
	My self-confidence grew while preparing for the exams	11
My personal development	I am beginning to study Mathematics	9
	My confidence has increased	5
	My prejudice is over.	3
	They made it easier for me to communicate	2
	They made me express myself accurately	1
	I did something important for myself in life	1
	My sociability increased in my environment	4
	I got to know people I couldn't get close until now	3
My social life	I got closer with my friends	3
	I developed an interest in such studies	3
	I made different friendships	2
	I saw the importance of group work	2
	I had a desire to enter social environments	2
	I found a common ground with my friends	1

Students in the study group were asked to write a general assessment considering the 30 workshops they attended. These evaluations of students are collected under 3 themes. The students evaluated the study they participated in mostly by the contribution it made to their understanding of teaching. In this theme, the candidates who admitted that they had prejudices before they started the study stated that they had broken this prejudice after the practice. Some of the students' answers are as follows:

"I understood the relationship between my field and Mathematics. This will make my teaching life much easier..." (1F)

"... I no longer see my field in a restricted way. I look at it from the perspective of all sciences. This has contributed a lot to me as a teacher of a multidisciplinary field..." (7M)

"... I have broken down my prejudice as a preservice teacher. Having prejudices affects the teaching process of a teacher significantly. This taught me a lesson and showed me that I could get rid of my prejudice..." (8F)

"...Teachers must always be open to knowledge and shouldn't say they can't. Even though I thought I was too late in this study, I saw that I wasn't too late... I no longer say that I can't learn Mathematics..." (15F)

The second theme that emerged from the evaluation of the students in the study group was the contribution of the study to their personal development. This theme, which we can accept as a gift of the method used to break students' prejudices against Mathematics, has shown that it supports students' inferences about themselves. Some of the students' answers are as follows:

"... I have been freed from a prejudice that I thought I couldn't for years. You even encouraged me to work..." (12F)

"...The drama method helped me a lot to express myself correctly. The point I have reached with the impersonation that seemed ridiculous to me is surprising..." (17M)

"My self-esteem has increased, and my prejudice has been destroyed. A field where I thought I could never succeed turned into a field where there was no reason not to succeed at all..." (14M)

"When I came for this study, I honestly thought I was going to be bored a lot. How much fun can it be to participate in a scientific study? Now I am grateful that I participated. For the first time in my life, I did something important for myself, I invested in myself. It even made me study Mathematics..." (20F)

The last theme that emerged from the evaluation of the students in the study group was the contribution of the study to their social lives. The students stated that the practices "contributed to friendship relations" with the effect of the drama method performed as a group. Some of the students' answers are as follows:

"... I have a reputation for being quiet in new environments. Thanks to this study, I started to be an active and talkative person within the group..." (3F)

"... I saw the importance of group work through the groups we founded for drama..." (6F)

"... I had the opportunity to get to know my friends that I had not known well for four years. Drama was instrumental in starting new friendships..." (18M)

"...My desire to engage in such studies increased ..." (19M)

It can be said that when the students in the study group were asked to make a general evaluation at the end of the practice, the first theme in the students' statements is about developing/starting to develop positive judgment towards Mathematics for the purpose of the study. I can be said that the other two themes included expressions about the contribution of the method used for the practice to personal development and social lives of the students.

4. CONCLUSION AND SUGGESTIONS

To evaluate the results of this research, which aims to improve the attitudes of preservice Social Studies teachers towards Mathematics with the creative drama method, it is possible to say that after 30 workshops (75 hours) prepared with the creative drama method, the attitudes of the study group towards Mathematics and Geometry changed in a positive way.

Considering the metaphors of the students in the study group for Mathematics and Geometry before and after the practices within the scope of the qualitative data of the study, it can be said that the metaphors shifted significantly to positive. According to this conclusion, the fact that the study group, which mentioned their prejudices against Mathematics through metaphors, developed positive metaphors after the practices supports the quantitative results of the study.

When we evaluate the thoughts, feelings and expressions of the students in the study group before and after the practices, which is another qualitative finding, it can be said that the students used positive expressions in each theme compared to the period before the practice, and that their attitudes towards Mathematics changed in a positive direction. When we look at the views of the students in the study group regarding the relationship between Social Studies and Mathematics before and after the practice, we can say that their views and attitudes changed significantly compared to their previous statements. It was found out in student statements that they evaluate Mathematics free from their prejudices and can associate it with their fields. When we look at the explanations of the students in the study group about why they needed to learn Mathematics, which is another qualitative finding, it can be said that the students uttered more positive and justified statements about learning Mathematics compared to their responses before the practice. It can be said that when the students in the study group were asked to make a general evaluation at the end of the practice, the first theme in the students' statements is about developing/starting to develop positive judgment towards Mathematics for the purpose of the study. I can be said that the other two themes included expressions about the contribution of the method used for the practice to personal development and social lives of the students. Finally, when the qualitative findings obtained at the end of the 14th workshop were evaluated, it was seen that the students became ready to fulfill the purpose of the study, decided to put aside their prejudices against Mathematics and started to learn Mathematics from the Mathematics expert acting as the drama leader.

In light of the qualitative findings, it is possible to say that although the students in the study group initially had a prejudice about Mathematics, their negative judgments turned into positive as a result of their activities over two semesters. It is possible to find similar studies in the literature. For example, Biber, Ispir and Ay (2015) concluded that creative drama was effective in teaching Mathematics and its History in the study they conducted with preservice Mathematics teachers. Debreli (2011) revealed in his study with middle school students that students' attitudes towards Mathematics changed positively thanks to creative drama. Duatepe and Ubuz (2004) also showed that creative drama method was useful in developing positive attitudes towards Mathematics and Geometry in their study conducted with primary school students. In addition, Pala and Başbüyük (2019) concluded that mathematical skills had an impact on map, chart and table reading skills, which have an important place in social studies curricula.

One of the other studies that is similar to the results of this research is the study by Kılıç and Tuncel (2009) which showed that students' attitudes towards speaking English changed positively thanks to the creative drama method. In addition, Yılmaz Arıkan (2012) revealed the positive impact of using creative drama in visual arts education on students' attitudes. In their study examining the impact of drama on the attitudes of students towards the Science lesson, Ormancı and Özcan (2014) revealed that their attitudes changed positively. Similarly, Akın (2016) determined that there was a significant difference in students' attitudes thanks to the use of creative drama in foreign language teaching. The study by Taşkın and Mongol (2016) also examined the effect of creative drama on preservice teachers' attitudes towards mechanical subjects, noting that while the students found mechanical subjects boring before drama, they found them more fun at the end of the process and began to like them. Demirağ and Acar Şeşen (2016) also revealed that students' attitudes towards the unit of *granular structure of matter* were positively enhanced by creative drama.

The study conducted by Susar Kırmızı (2008) stands out as a study with results different from the results of this study. It was determined that there was no significant difference in the study aimed at developing the attitudes of students towards reading in the Turkish lesson using the creative drama method. According to the author, the reason for this is that changing attitudes requires a certain process whereas the study had a limited time for practice. Similarly, in a study in which Okvuran (2003) examined attitudes towards drama, it was determined that the attitudes of those who received entry-level training on drama did not change unlike the attitudes of those who received long-term training. It was concluded that in order to change attitudes, it is necessary to be involved in a long-term study with drama. Özçelik and Aydeniz (2012) found out in their study that there was no change in the effect of creative drama on attitudes towards speaking French. It can be argued that the results of these studies in the literature also support the results of our long-term practice in this study aimed at changing attitudes.

It is possible to say that the attitudes of the preservice Social Studies teachers towards Mathematics changed positively thanks to the creative drama method in this study. In light of these results;

1. In order to improve the attitudes of preservice teachers towards a field with the help of creative drama, qualified drama activities including preparation, warm-up, improvisation, evaluation and discussion stages can be created.

2. It can be recommended that academics work in coordination with drama instructors in order to improve attitudes of preservice teachers towards a field/subject.

3. It can be suggested that the university administration recognizes the importance of drama, provides suitable environment for drama activities for preservice teachers and organizes voluntary sessions from time to time in cooperation with educators who are experts in their fields.

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