Evaluate the Attıtudes of the Pre-Servıce Teachers towards STEM and STEM's Sub Dımensıons

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Abstract

As the importance of interdisciplinary studies is on the rise, countries have developed innovative educational approaches. One of these innovative approaches is STEM. STEM focuses on interdisciplinary cooperation, systematic thinking, openness to communication, ethical values, research, production, creativity and problems, focusing on the intersection of knowledge and skills in science, technology, mathematics and engineering, it is a new learning teaching approach that aims to gain the ability to solve. In this context, the aim of this study is to evaluate the attitudes of the pre-service teachers towards STEM and STEM's sub dimensions. Therefore; it was used as a data collection tool from attitude scale for Stem and Stem's sub dimensions developed by Keles, Kiremit and Aktamis (2017). In the data collection tool, 5 scales were developed in order to reveal the existence of the relationship between pre-service teachers' attitudes towards STEM and their attitudes towards; science, technology, mathematics and engineering. The related scale was applied to 204 pre-service teachers in various departments of the Faculty of Education at Sakarya University. In the research, the necessary correlations were made by considering the demographic characteristics such as gender, age and class of teacher candidates. The overall average and standard deviation values are taken into account, when explaining the data differences for the sub-dimensions of the scale. According to the results obtained from the relevant data collection tool, when pre-service teachers' attitudes towards STEM and STEM sub-dimensions were evaluated; especially in the Mathematics and Engineering dimensions, it was revealed that their attitudes were more positive and they were indecisive in other dimensions (Science and Technology). As a result, it is thought that the acceptance of STEM method by teacher candidate, which is an innovative educational approach of the research results, will contribute to the literature and the future studies in this field.

Keywoords: pre-service teachers, STEM method, attitude

1. Introductıon

Developing and renewed technology within the scope of scientific research and development activities has become an indispensable element of our daily life. Together with the technologies that entered our lives, there have been some changes in the vision of raising individuals. In today's world, educating individuals who can develop, criticize, design, produce, and find fast and effective solutions to problems; who are also equipped with the 21st century skills and integrated with the society has become the most important purpose of developed countries. However, it has been observed that the developed countries have gone through a continuous renewal in the educational programs in the context of reaching this goal (Akgunduz, et al., 2015; Bybee, 2010 and Sanders et al., 2009). STEM (Science-Technology-Mathematical-Engineering) is one of the teaching approaches that are thought to serve the purpose of achieving all these visions and targets; and increases its popularity day by day. It is noteworthy that this approach has taken part in many countries' educational programs in recent years and many studies have been conducted in this field (Bakırcı and Karışan, 2018; Pekbay, 2017).

STEM (FeTeMM) ("Science, Technology, Engineering, Mathematics") is an abbreviation with the initials of science, technology, engineering and mathematics. Although this teaching approach is called STEM in the USA, has become more widely used as an integration of mathematics and science courses, it also serves to teach engineering and technology in and out of classroom activities (Şahin, et al., 2014). The origins of the STEM-FeTeMM teaching approach date back to 1990 (Yamak, et al., 2014; Sahin, Ayar and Adıgüzel, 2014; Yıldırım and Altun, 2015; Corlu, et al., 2014).

Judson and Sawada (2000) in their study to investigate the effect of integrating mathematics course with science lesson, it was determined that students reached statistically high achievement levels in mathematics courses.

Looking from Turkey's perspective, according to Corlu, Capraro and Capraro (2014), STEM education has an important place from a strategic point for the economic competitiveness of Turkey in the global arena. In this context, the need of individuals with the qualifications to work in the field of STEM for economic development which are powered by innovation is increasing everyday (PwcTurkiye and TÜSİAD, 2017). Increasing students' interest in STEM education is important in their participation in the professions of future (Knezek, et al., 2013). According to the "OECD Education at a Glance 2017" report, it has been observed that Turkey is the last among the 34 countries when considering the countries that will lead the STEM professions in the future (OECD Education at a Glance, 2017).

Corlu, Capraro and Capraro, (2014) emphasize the need for students to be educated with STEM education in order to be able to adapt to the future professions; while on the other side, they suggested that the teachers who will give this education should be educated within the context of STEM education. According to Wang, (2012), teachers have a key importance in the dissemination and implementation of STEM education approach throughout the country; especially in the field, there is a need for teachers who will provide this education at an early age to the students. Therefore, teachers who are the most important stakeholders in the integration of STEM approach into different disciplines are required to be equipped with these knowledge and skills as a teacher candidate in the periods they are educated (Buyruk and Korkmaz, 2016).

Cunningham and Hester (2007) state that students' real-world engineering experiences can motivate students to learn math and science.

Moll and Coat (2012) planned a 4-day summer program in order to increase the skills of the teachers in the STEM teaching approach, to improve their content knowledge and to increase the use of inquiry-based teaching methods in teaching. As a result, at the end of the program which included 230 teachers working at the class 4th-9th levels, it was found that there was a positive relationship between the participant teachers' perceptions about the STEM teaching qualifications, the inquiry-based practices and feeling comfortable about the teaching of STEM.

Pinnell et al. (2013) proposed a further study to develop teachers' and prospective teachers' knowledge and skills related to STEM education. In this context, 10 teachers and 5 teacher trainees participated in the 6-week program which was developed to increase the engineering and design knowledge of teachers. Participants took part in workshops and activities related to educational program development, inquiry-based learning and the conceptual framework of STEM education. They then collaborated with an engineer candidate studying in the faculty of engineering, an instructor from the engineering faculty and an engineer working in the industry. As a result; evaluating the outcomes of the program, the researchers stated that the participant teachers developed their STEM skills and they continued to improve their skills by leading the implementation of STEM training in their schools.

Yildiz (2013) stated that STEM applications create an environment where students can understand the relationships between mathematics, science and engineering technology.

Mills (2013) stated that students' perception of Science and Technology has improved positively with STEM.

Knezek, Christensen, Tyler-Wood and Periathiruvadi (2013), students' science, technology, engineering and mathematics skills in secondary school are thought to form the basis for a successful career at STEM.

In the last study of Yıldırım and Altun (2015), STEM education and engineering applications were found to be effective in improving the academic achievement of prospective teachers.

Gulhan and Sahin (2016) concluded that STEM integration increased students' conceptual understanding in science, improved their perceptions about engineering and increased their interest in STEM professions in general.

Aeschlimann et al. (2016) stated that increasing motivation of students to science and mathematics classes directly affects STEM career choice.

Colakoglu and Gokben (2017), conducted a study in Turkey on the efficacy of the STEM education level in the Faculty of Education, the thesis studies, training programs, projects supported from national and international sources, and reports prepared in them. Within the scope of the study, they conducted a survey with the 92 deans of Faculties of Education, to examine the STEM education activities of their faculties applying 12 questions on the categorical level, and one open-ended question. The results of the analysis of responses from 61 faculties has shown that; it has been established that although there is a high level of awareness and interest of the faculty members at the faculties of education, there is not enough practice and preparation at the theoretical level in the field of STEM education. As a suggestion in the study, it was pointed out that important steps should be taken in the trainings to be given to the teacher candidates / instructors in the field of STEM.

When the Scale Studies on STEM Education were examined, Buyruk and Korkmaz (2016) obtained 17 items from two-factor scale (positive view, negative view) which emerged in exploratory factor analysis. The procedure was applied again four weeks later to the group of 29 people using the 17 items and the last version as 5-Likert (Buyruk and Korkmaz, 2016). At the end of the procedure, it was concluded that FFÖ is a valid and reliable scale that can be used to measure teacher candidates' awareness about STEM education.

Another scale study is the validity and reliability study of the Turkish version of the Integrated Education STEM Education Orientation Scale developed by Lin and Williams (2015). This study has been carried out with 253 class teacher candidates and it aimed to obtain a measurement tool to determine their opinions on the subject (Hacıomeroğlu and Bulut, 2016). The scale consists of 31 items and is 7-point Likert type. The Turkish version of the scale was developed by Hacıömeroğlu and Bulut (2016) as an adaptation. The results shown that Turkish version of the scale was valid and reliable for class teacher candidates, and the items in the scale were similar to the original ones.

Thus, Keles, Kiremit and Aktamıs (2017) developed an attitude scale for Stem and Stem the sub-titles. A 5-point Likert-type rating was used for each item in the scales. The pilot scale was prepared and applied to 158 students. The items of the scales include; Attitude scale for science-15; Attitude scale for technology-18; Attitudes scale for mathematics-16; Attitude scale for engineering-15; Attitude scale for Stem consists of 20 items. As a result of the validity and reliability studies, it was concluded that the scale is a valid and reliable scale that can be used on teacher candidates.

Sivrikaya (2019) found a relationship between education level and STEM and subdimension technology.

In light of the collected data, for the teacher candidates were equipped with STEM teaching approach; it is thought that there are and/or will be some people who have high level cognitive skills, who can think creatively, critically and analytically, who will organize and guide the learning environments for the education of researching-questioning students. Therefore, it is envisaged that the opinion and the level of knowledge of teacher candidates about the STEM approach will be important for future studies. Therefore, the main purpose of this research is to determine the attitudes of teacher candidates about the STEM approach.

2. Purpose

The aim of this study is to evaluate the attitudes of the pre-service teachers towards STEM and STEM's sub dimensions.

2.1 Importance

We claim that the acceptance of STEM method, which is an innovative educational approach of the research results, by teacher candidates will contribute to the literature and the future studies in this field.

3. Method

3.1 Model of Research

In this study, the relational research model of quantitative methods was used to evaluate the attitudes of the pre-service teachers towards STEM and STEM's sub dimensions. The relational research model aims to determine the presence or degree of change together between two and more variables (Karasar, 2005).

3.2 Study Group

The study group includes a total of 204 pre-service teachers (117 females and 87 males) studying in various departments of Sakarya University Faculty of Education.

3.3 Sampling-Universe

The universe of this research consists of university students studying at Sakarya University. The sample of the research consists of students studying in various departments of Sakarya University Faculty of Education. Convenience sampling method was used in selecting the sample of the research. A convenience sample is; a non-probability sample in which the researcher uses the subjects that are nearest and available to participate in the research study. This technique is also referred to as "accidental sampling," and is commonly used in pilot studies prior to launching a larger research project (Creswell, 2007).

3.4 Data Collection Tools

In this study, the aim is to evaluate the attitudes of the pre-service teachers towards STEM and STEM's sub dimensions. In this context; it was used as a data collection tool from attitude scale for Stem and Stem's sub dimensions developed by Keles, Kiremit and Aktamis (2017).

Attitude scales prepared previously for science, technology, mathematics, engineering and STEM subjects were analyzed for each scale. A 5-point Likert-type rating was used for each item in the scales; (5 = Totally Agree, 4 = Agree, 3 = No Idea, 2 = Disagree, 1 = Completely Disagree).

Number of items of scales;

Attitude scale for science - 15

Attitude scale for technology - 18

Attitude scale for mathematics - 16

Attitude scale for engineering - 15

Attitude scale for STEM - 20.

3.5 Data Analysis

General average and standard deviation values were taken into consideration in interpreting the data differences between the sub-dimensions of the scale.

3.6 Demographic Data

Gender

Table 1 presents the frequency (f) and percentage (%) distributions of the gender of the students of the study.

Table 1. Gender

Gender	**f**	**%**
women	117	57,4
man	87	42,6
Total	**204**	**100**

Class

Table 2 presents the frequency (f) and percentages (%) of the students of the study group.

Table 2. Class

Class	**f**	**%**
1	44	21,6
2	28	13,7
3	63	30,9
4	69	33,8
Total	**204**	**100**

Department

Table 3 presents the frequency (f) and percentages (%) of the students of the study group.

Table 3. Department

Department	**f**	**%**
science	87	42,6
maths	47	23,0
computer	26	12,7
other	44	21,6
Total	**204**	**100**

Taking lessons about STEM during university education

Table 4 presents the frequency (f) and percentages (%) of STEM related courses during the university education of the students of the study.

Table 4. Taking lessons about STEM

STEM Course	f	%
Yes	117	57,4
No	87	42,6
Total	**180**	**100**

The analysis of Table 4 show that the most of the students take STEM related courses during their university education.

Related to STEM

The status of the students related to STEM is presented in Table 5 as frequency (f) and percentages (%).

Table 5. Related to STEM

Related to STEM	f	%
No knowledge	34	16,7
Some	48	23,5
Enough	108	52,9
Too much	14	6,9
Total	**204**	**100**

The analysis of Table 5 show that the majority of students with STEM related cases to be "enough" is observed that, with the option.

Having knowledge about STEM

The knowledge of the students who are the working group of the study about STEM are presented in Table 6 as frequency (f) and percentages (%).

Table 6. Status of knowledge about STEM

Status of knowledge about STEM	f	%
Irrelevant	17	8,3
Some	107	52,5
Very relevant	80	39,2
Total	**204**	**100**

The results on the table 6 show that the majority of the students evaluate their knowledge about STEM with a little in option.

3.7 STEM and STEM Attitude Scale for Subheadings and Results

A. Dimensionof Science

Table 7. Average and Standard Deviation Values in Dimension of Science Scale Items

Factors and Item	$\bar{X}$	SD
Dimension I: Importance	**4,20**	**,921**
Science is important in daily life,.	4,25	1,027

Science helps me to understand life around me.	4,15	,998
Having a knowledge about science will help me with many things throughout my life.	4,21	,773
The sciences have a positive effect on manufacturer learning.	4,21	,836
I will need science in future for my studies.	4,20	1,115
I will use science after graduating from school.	4,20	1,014
It is appropriate to use the technological tools in the science courses to do it again.	4,21	,687
Dimension II: Enjoyment	**2,89**	**1,201**
I'm thinking about having a career in science / science.	3,62	1,275
I can safely use science.	3,51	1,285
I can do a lot of things, but I can't do a good job in science.	2,38	1,240
I like to be interested in science.	2,07	1,005
Dimension II: Technology Integration	**1,75**	**,941**
The use of technological tools in science courses does not increase the motivation of the students.	1,75	,855
The use of the Internet in the science learning process is a waste of time.	1,75	1,027
Total Dimension	**2,94**	**1,021**

According to Table 7, 15 items for the dimension of Science and 3 dimensions for the average between 4.25 and 1.75 values have been shown. The points used to interpret the results are; Totally Disagree: 1,00-1,79; I do not agree: 1.80-2.59; I have no idea: 2,60-3,39; Agree: 3,40-4,19; Totally Agree: 4,20-5,00 (Buyukozturk, 2013). Since the overall average of all items for the relevant scale is 2.94, it can be considered that the students' responses are generally focused on the "No idea" option.

The item with the highest mean in 15 items: Science is important in studies in daily life, whereas the items with the lowest average are; "The use of technological tools in science courses does not increase the motivation of the students" and " The use of internet in the process of science learning is wasted time ".

B. Dimension of Technology

Table 8. Average and Standard Deviation Values with Dimension of Technology Scale Items

Factors and Item	$\bar{X}$	SD
Dimension I: Enjoyment	**3,60**	**,906**
I can do a lot of things, but I can't do a good job in technology.	2,32	1,314
I know I can do a good job in technology.	3,84	,941
After graduating from school, I will use technology in my daily life.	4,25	,916
I'm thinking of having a career in technology.	3,43	,756
I can safely use technology well.	3,84	,748
I enjoy taking care of technology.	3,95	,764
Dimension II: Technology Integration	**4,17**	**,654**
Students need to have a basic education for computer literacy.	4,25	,789
Technological tools encourage more production.	4,10	,556
Courses must include computer assisted instruction	4,10	,556
Students need to get information before they can use new technologies	4,25	,718
Dimension III: Importance	**3,08**	**,983**

I will need technology for my future work.	4,41	1,053
Having some information about technology will help me with many things in my life.	4,41	,945
Using the Internet in the learning process is a waste of time.	1,75	,856
I need technology for my future work.	1,75	1,080
Total Dimension	**3,03**	**,847**

According to Table 8, 14 items for the dimension of the technology and 3 dimensions for the average between the values ranged between 4,41 and 1,75. The points used to interpret the results are; Totally Disagree: 1,00-1,79; I do not agree: 1.80-2.59; I have no idea: 2,60-3,39; Agree: 3,40-4,19; Totally Agree: 4,20-5,00 (Buyukozturk, 2013). Since the overall average of all items for the relevant scale is 3.03, it is understood that the students' responses are generally focused on the 3 No idea option.

The items with the highest mean in 14 items: ”I need technology for my future works and “Having knowledge about technology will bring me many things in my life“, whereas the items with the lowest average are; ”Internet use in the learning process is a waste of time için and” I need technology for my future work “.

C. Dimension of Math

Table 9. Average and Standard Deviation Values with Dimension of Math Scale Items

Factors and Item	$\bar{X}$	SD
Dimension I: Enjoyment	**3,46**	**1,00**
I'm thinking about making a career in math.	2,89	,799
I use math in a way sure of myself.	3,51	,949
I know I can do a good job in math.	3,42	,887
I'd really like to take care of math.	3,72	1,125
I enjoy learning math.	3,77	1,251
Dimension II: Importance	**3,28**	**1,033**
I can do a lot of things, but I can't do a good job in math.	2,33	1,034
Mathematics is a boring course.	1,90	1,032
Dimension III: Integration of Technology and Daily Life	**3,86**	**,851**
Knowing math will give me many things in my life.	4,36	,746
After graduating from school, I believe I will use my mathematics.	3,84	,879
Mathematics helps me to understand life around me.	4,25	,790
I need mathematical knowledge for future studies.	4,10	,725
I think it is appropriate to use technological instruments in mathematics lessons again.	3,88	,792
In everyday life, mathematics is important.	2,75	1,176
Total Dimension	**3,53**	**,960**

According to Table 9, for mathematics dimension, 13 items and 3 dimensions ranged from 4.36 to 1.90. The points used to interpret the results are; Totally Disagree: 1,00-1,79; I do not agree: 1.80-2.59; I have no idea: 2,60-3,39; Agree: 3,40-4,19; Totally Agree: 4,20-5,00 (Buyukozturk, 2013). Since the overall average of all items for the relevant scale is 3.53, it is understood that the students' responses focus on the 3 Agree option in general.

The item with the highest average score in 13 items: ”Knowing math will give me many things in my life“ is the lowest average of the item; “ Mathematics is a boring course “.

D. Dimension of Engineering

Table 10. Average and Standard Deviation Values Dimension of Engineering Scale Items

Factors and Item	$\bar{X}$	SD
Dimension I: Enjoyment	**3,35**	**1,05**
I can do a lot of things, but I can't do a good job in engineering.	3,36	,995
I know I can do a good job in engineering.	3,52	,827
I want to invent things like an engineer in my future work.	3,30	,923
After graduating from school, I think I will use my engineering knowledge.	2,84	,946
I'm thinking about making a career in engineering.	2,88	,972
I can use my engineering knowledge with confidence.	3,25	1,170
I like to deal with engineering.	3,84	,669
Engineering helps me to understand the life around me.	3,88	,976
Dimension II: Importance	**4,32**	**,787**
I like to imagine that I'm producing something new like an Engineer.	4,42	,594
In daily life, engineering is important.	4,37	,741
Knowing how to use mathematics and science in engineering will make me useful inventions.	4,25	,789
To think like an engineer will help me understand engineering in everyday life.	4,25	1,027
Total Dimension	**3,53**	**,960**

According to Table 10, for engineering dimension, 12 items and 2 dimensions ranged between 4.42 and 2.84. The points used to interpret the results are; Totally Disagree: 1,00-1,79; I do not agree: 1.80-2.59; I have no idea: 2,60-3,39; Agree: 3,40-4,19; Totally Agree: 4,20-5,00 (Buyukozturk, 2013). Since the overall average of all items for the relevant scale is 3.53, it is understood that the students' responses focus on the 3 Agree option in general.

The item with the highest average in 12 items: I like to imagine that “I produce new things like an Engineer “, but the lowest average; “After graduating from school, I think I will use my engineering knowledge “.

E. Dimension of STEM

Table 11. Dimension of STEM Scale Items with Average and Standard Deviation Values

Factors and Item	$\bar{X}$	SD
Dimension I: Self-confidence	**3,82**	**,856**
I trust myself with STEM.	3,68	,867
I think students will be sufficiently effective in controlling STEM projects.	3,74	,722
As much effort as I think I will integrate STEM into the science course.	3,47	1,048
I know how to help students who have difficulty in understanding STEM concepts.	3,79	,775
I think integrating STEM into courses is as important as teaching other science subjects.	4,09	1,030
In general, I think I can answer students' questions about STEM.	3,74	,859
I would like to develop educational materials for STEM projects for the future science course.	4,05	,897
I would like to take part in programs designed to help teachers integrate STEM into the course.	4,47	,599

I think I will find the necessary materials for STEM projects.	3,47	1,004
I feel sufficiently prepared to integrate STEM into classes.	3,52	,759
Dimension II: STEM-oriented force	**2,62**	**,994**
I do not think that I will be sufficiently effective in supervising students' STEM projects.	2,53	1,146
As much effort as I think I can not integrate STEM in science.	2,43	1,195
I'm worried I can't have the skills for STEM.	2,95	1,276
I do not feel sufficiently prepared to integrate STEM into classes.	2,58	,935
I think I will not find the necessary materials for STEM projects.	2,65	,989
Dimension III: STEM Point of View	**2,20**	**1,066**
I do not think that students will be very interested in STEM projects.	2,22	1,004
I think STEM projects are generally aimed at successful students.	2,22	1,117
I think STEM projects are generally aimed at unsuccessful students.	2,05	1,054
I think that integrating STEM into the course has little impact on the success of the students with low motivation or less.	2,32	1,092
Total Dimension	**2,88**	**,972**

According to Table 11, for STEM dimension, 19 items and 3 dimensions were found to be between 4.47 and 2.05. The points used to interpret the results are; Totally Disagree: 1,00-1,79; I do not agree: 1.80-2.59; I have no idea: 2,60-3,39; Agree: 3,40-4,19; Totally Agree: 4,20-5,00 (Buyukozturk, 2013). Since the overall average of all items for the relevant scale is 2.88, it is understood that the students' responses are generally focused on the ,8 No idea option.

The item with the highest mean in 19 items: “I would like to participate in the programs designed to help teachers integrate STEM into the course “; “I think STEM projects are generally aimed at unsuccessful students”.

4. Dıscussıon and Results

In this study, which aimed to evaluate teacher candidates' attitudes on STEM, interpretations have been made considering the overall average and standard deviation values in explaining the data differences related to the sub-dimensions of the scale used for the purpose.

When sub-dimensions are considered respectively;

In the Science dimension; students' responses are generally focused on the “No Idea “option. In terms of items, the scale item which has the highest average among the 15 items is “Science is important in studies in daily life” whereas the items with the lowest average are; ”The use of technological tools in science courses does not increase the motivation of the students” and “The use of internet in the process of science learning is a waste of time“.

In the Technology dimension; it was found that the students' responses were generally focused on the ”No idea” option. In terms of items, the scale items with the highest average among the 14 items is “I need technology for studies I will do in the future” and “Having knowledge about technology will bring me many things in my life”, whereas the items with the lowest average are; “The use of internet in the process of learning is a waste of time” and “I need technology for studies I will do in the future“.

In the Mathematics dimension; in contrast to the other dimensions, it is understood that the students' responses generally focus on the “I Agree” option. In term of items, the scale item with the highest average among the 13 items is “Knowing Mathematics will bring me many things in my life” whereas the item with the lowest average is “Mathematics is a boring course “.

In the Engineering dimension; it is understood that the students' responses are generally focused on the ”I Agree” option. In term of items, the scale item with the highest average among the 12 items is “I like imagining that I produce new things like an Engineer” whereas the item with the lowest average is “After graduating from school, I think I will use my engineering knowledge“.

Finally, when the STEM dimension is examined; it is understood that the students' responses are generally focused on the “No idea” option. In term of items, the scale item with the highest average among the 19 items is “I would like to participate in the programs prepared to help teachers to integrate STEM into the course” whereas the item with the lowest average is “I think that STEM projects are generally aimed at unsuccessful students “.

As a similar study; Sivrikaya (2019) found a relationship between education level and STEM and subdimension technology.

According to the results of the related data collection tool, when the teacher candidates' attitudes towards STEM and the sub-dimensions of STEM are evaluated; it has been established that especially their attitudes towards Mathematics and Engineering were found to be more positive, while in the other dimensions (Science and Technology) they experienced uncertainty. When the STEM dimension was examined, it was found that the teacher candidates experienced uncertainty in terms of the three dimensions studied: Self-confidence, fear in relation with STEM and point of view on STEM; but in general they want to participate in the programs prepared and/or to be prepared to integrate STEM into the course. This situation shows that the teacher candidates have positive attitudes towards the trainings and programs to be given for STEM.

When the literature was examined, Sen and Timur (2018) investigated the teacher candidates’ orientation towards the teaching of integrated STEM and their attitudes towards technology, and found that the teacher candidates' tendency towards technology and integrated STEM teaching was at an acceptable level. Uğras and Genc (2018) examined Preschool teacher candidates' opinions on STEM education in their studies. The results revealed that the teacher candidates who participated in the research supported the integration of science, technology, mathematics and engineering courses in undergraduate programs, and that the teachers from different disciplines focused on carrying out collaborative studies with each other.

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