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Stereotyped Thoughts of Teacher Candidates Towards Science Courses: Sample of Turkey

Mutlu Pınar Demirci Guler, pinarguler@ahievran.edu.tr, Kırşehir Ahi Evran University Turkey, https://orcid.org/0000-0002-8286-4472

Bayram Irmak, bayramirmak@live.com, MoNE, Turkey, https://orcid.org/0000-0001-5929-8946

SUMMARY

Thoughts that direct individuals' feelings and behaviors within certain non-functional patterns are called stereotyped thoughts. Stereotypes can be positive or negative and it is thought that individuals' stereotyped thoughts towards a phenomenon would affect the other individuals with whom they interact. Based on the idea that student and teacher interaction has a critical importance on academic achievement, the study aims to examine the stereotyped thoughts of teacher candidates' towards science courses on the basis of their gender, academic achievements and the department they are studying. The study group consists of 1627 teacher candidates from seven universities in Turkey. As a data collection tool, the "Stereotypical Thought Scale for Science Lessons" developed by Demirci Güler and Irmak (2020) was used. It is seen that the qualitative value range of teacher candidates' stereotyped thoughts towards science is "indecisive" with 3.18. It has been found that teacher candidates' stereotyped thoughts about science courses differ according to their gender and department they study at, but not according to their academic achievement scores.

Keywords: Science course, stereotyped thought, teacher candidates

INTRODUCTION

Science can be expressed as an important force used in shaping human life (Matthew, 1947). Science is not only the sum of real events in the world, but also a method of thinking and research that aims to question experimental criteria, think logically, and interrogate continuously (Akpullukçu, 2011).When the science courses are examined within this scope, it is seen that they aim to prepare the individual for life and to help him give meaning to the situations that occur during his life and to produce solutions by perceiving the problems to be experienced, to analyze and question problems. It also helps them to produce hypotheses, test them and to make predictions about them (Güden, 2015; Kaptan, 1999; Kayhan, 2012; Saxena, 2008). For these reasons, science education is a goal achievement for individuals and governments.

There are several variables that affect the results towards science courses. When the variables are grouped under three main headings as students, teachers, and other variables, it can be said that teachers are one of the most important parts of the structure. In terms of teachers, one of the common points is that science education should be done by educators who are well trained in their fields (Demirci, 1993). The three basic competence areas teachers should have are general culture and general skills, pedagogical formation and field knowledge (Yetim & Göktaş, 2004). In addition to these areas, being an accoutred science educator is possible with competence in communication (Zlatic, Bjekic, Marinkovic, & Bojovic, 2014).

The basic steps that should be in good communication are the transmitter, channel, message, receiver, and feedback (Yalın, 2018). When these conditions occur in the right order and in a healthy way, it is very unlikely that any problems will occur. However, the problem that happens in one or more steps may occur as a factor that causes a lack of communication between individuals and prevents the communication process. These factors, which can be called indicators of non-communication, are expressed by researchers as "disruptive, constructive, psychological, technical, distance, time pressure, interruptions ..." (Utma, 2019). The most important of these are the thoughts of people who communicate (Dökmen, 2014). The thoughts of individuals are the resources that direct the person's feelings and behaviors, which also direct the individual's life. When these resources are used within certain negative patterns, miscommunication occurs. In other words, communication is the expression of the thoughts of individuals, and noncommunication is the wrong expression of the thoughts held or the failure of the expressed thought to find a response. Misrepresentation of thought is a problem caused by the individual sending the message. The main reasons that create the problem are the thought patterns of the individual. Thought patterns are expressed more as stereotypes in daily life. Based on all these, Aaron Beck (1979) developed Cognitive Therapy and stated that individuals have thoughts that direct their feelings and behaviors within certain non-functional patterns. He defined these thoughts as stereotypes. Another description of stereotyped thought was drawn up as perceptions and thoughts about the person, nation, or culture that are often wrongly formed, simplified, and generalized (Berkant & Baysal, 2020). Stereotypes that individuals have can be positive or negative. While positive stereotypes generally cause less problems in communication between individuals, negative stereotypes cause individuals to have more problems. In this sense, handling negative

This study was produced from Bayram Irmak's (2020) master's thesis.

stereotypes has become essential for solving problems. Many studies have been conducted on this subject (Beck, 1979; Blackburn, 2011; Dökmen, 2014; Köroğlu, 2012; Özer, 2013). According to Beck (1979), stereotyped thoughts that affect the daily life of the individual negatively are as follows;

Arbitrary Conclusions: the tendency of the individual to draw conclusions without any evidence. *Selective abstraction:* While evaluating an event, an individual pays attention to an insignificant detail and draws conclusions by taking this detail as his guide. *Overgeneralization:* an individual's formation of general beliefs and thoughts by looking at only one event. *Exaggeration / Underestimation*: the individual attaches more or less importance to a situation or event than he should. *Personalization*: It is when the individual relates himself to matters or events that he is not responsible for. *Labeling and mislabeling*: when describing a person, it is to characterize the individual according to his past mistakes. *Polarized thinking*: to think and interpret every situation and event as "all or nothing". It is looking at events on the verge of "black and white".

The purpose of this study on stereotypes is to reveal what kind of stereotypical thinking tendencies teacher candidates have towards science, and also, to determine if teacher candidates' stereotyped thoughts about science differ based on gender, academic achievement, grade level, and their departments. In this context, this research is an important study in terms of determining one of the factors that cause failure in science courses which is stereotypical thinking.

METHOD

The research is a descriptive questionnaire model, which is one of the quantitative research models as it follows the application of the developed scale. The descriptive survey model is used in research that aims to explain events, objects, groups and various facts. Descriptive survey studies, attitudes and characteristics of one or more groups (Karasar, 2005; Özmen & Karamustafaoğlu, 2019) and common features of a universe (Büyüköztürk, Çokluk & Köklü, 2014; Cohen, Manion & Morrison, 2007).

Participants

More than one study group has been created by considering multiple elements in the formation of the study groups and multiple sampling methods has been adopted in the creation of these study groups. In this context, stratified sampling, a probabilistic sampling method, is used. If the distribution of individuals in the universe does not show homogeneity, individuals of the same nature are divided into subgroups and these are named as a stratum (Özmen & Karamustafaoğlu, 2019; Yıldırım & Şimşek, 2016). For this purpose, the existing universities in Turkey are divided into three strata as the top, lower and average based on students' university entrance scores. The universe of the research consisted of study groups including teacher candidates studying in the fields of classroom education and science education in the 2018-2019 academic year at seven universities in Turkey. The group consists of 1627 teacher candidates, 1268 are female and 359 are male.

Instruments

The data were collected using the personal information form prepared by the researchers to determine the demographic characteristics of the teacher candidates in the sample and the "Stereotype Scale towards Science Courses (SSTS)" developed by Demirci Güler and Irmak (2020). The Stereotype Scale towards Science Courses was prepared in 5-point Likert type. Positive and negative items on the scale are scored as they are, in other words, negative items are not subject to rotation. Every item on the scale predicts stereotypes whether they are positive or negative statements. For the validity of the scale, the number of CVR was determined in line with the opinions of 14 experts and the scale items were arranged. For the construct validity of the scale, Exploratory Factor Analysis (EFA) was performed and total item correlation and item factor loadings were found to be at the desired level. As a result of the validity-reliability analysis of the study by adopting a Likert-type scale development model, a 28-item scale structure with Cronbach alpha internal consistency coefficient .81, consisting of 5 factors, was obtained, which explains 58.63% of the total variance. The scale, consisting of 28 items, has five sub-dimensions. There are ten (10) identified items, between 1-10. in the first dimension called excessive generalization (eg.:Science is very difficult, so I think I do not want to deal with science topics.), four (4) items between 11-14. in the second dimension called labelling (eg.:Those who can relate science subjects todaily life are more sophisticated.), six (6) items between 15-20. in the third dimension called arbitrary inference (eg.:Since I am afraid of not delivering the result, I cannot experiement in science.), four (4) items between 21-24. in the third dimension called polarization (eg.:I must know all the terms in that experiment to understand an experiment), and four (4) items between 25-28. in the third dimension called selective abstraction.(eg.:I cannot be successful in this course unless the science course is taught in a laboratory environment. The internal consistency coefficients are found as .893 for the first dimension, .740 for the second dimension, 0.77 for the third dimension, .467 for the fourth dimension, and .580 for the fifth dimension. The data regarding the Cronbach's Alpha coefficients of the SSTS show that the entire scale and sub-dimensions have reliable results.

Data Analysis

Before data analysis, missing data were identified, and outlier values were found using the Mahalanobis Distance Method. Mahalanobis value shows the distance between an independent variable and other variables (Can, 2016). Following the elimination of irrelevant data, the analysis was completed by using 1627 data units. Additionally, skewness and kurtosis values were checked. The results showed a normal distribution between +1 and -1 range (Barrett et al., 2006; Can, 2016). Independent t-test, one-way variance analysis, Scheffe-multiple comparison analysis and LSD - multiple comparison analysis were performed. A series of tests are applied to determine whether the scale shows a normal distribution. Average-median-mode values of the scale are examined, Kolmogorov-Smirnov test is applied (p> .05), Q-Q plot graph is evaluated, and kurtosis-skewness values are analyzed. the mean total score of the Stereotype Scale towards Science Courses is observed as 91.55. In the examination of normality assumption, the kurtosis and skewness values are between ± 1.5 and it indicates that the distribution is normal (Tabachnick, Fidell & Ullman, 2007).

The qualification status of the scale on a 5-point Likert scale takes following score range values; "strongly agree" is in the interval of 5.00-4.20 points, "agree" is in the interval of 4.19-3.40 points, "indecisive" is in the interval of 3.39-2.60 points, "disagree" is in the 2.59-1.80 point range, and "strongly disagree" is in the interval of 1.79-1.00 points (Taşdemir, 2011).

FINDINGS

In this section, the findings of the research are presented sequentially to determine whether the stereotypes of teacher candidates towards science courses differ according to gender, graduated high school, academic achievement and departments.

Findings Regarding Teacher Candidates' Stereotype Level towards Science Courses

The findings of the teacher candidates' responses to the stereotyped thought scale for science courses are given in Table 1.

Table 1. *Distribution of stereotype points towards science courses*

	N	X	Qualification Status
SSTS	1627	3,18	Indecisive
Over Generalization	1627	3.48	Agree
Labelling	1627	2.92	Indecisive
Arbitrary Inference	1627	3.52	Agree
Polarization	1627	3.06	Indecisive
Selective Abstraction	1627	2.94	Indecisive

According to Table 1 indicates that views on the whole scale correspond to the "indecisive" interval. Besides, it is seen that the views on the Over-Generalization sub-dimension correspond to the "agree" interval, the views on the Labeling sub-dimension correspond to the "indecisive" interval, the views on the Arbitrary Inference sub-dimension correspond to the "agree" range, the views on the Polarization sub-dimension to the "indecisive" interval and the views on the Selective Abstraction sub-dimension to the "indecisive" interval.

Findings Regarding Teacher Candidates' Stereotypes towards Science Courses and Gender

A study has been conducted to determine whether teacher candidates' stereotypes towards science courses differ by gender. The findings are shown in Table 2.

Table 2. *T-test results of* teacher candidates' stereotypes *towards science courses by gender and sub-dimensions of stereotypes*

Dimension/Variable	Gender	n	$\bar{x}$	Sd	Df	t	p
SSTS	Female	359	3,06	,53038	1625	-3,170	.002*
	Male	1268	3,16	,48945			
Over Generalization	Female	359	3,40	,85315	1625	-1.869	.062
	Male	1268	3,49	,76395			
Labelling	Female	359	2,86	,85394	1625	-1.300	.194
	Male	1268	2,92	,86466			
Arbitrary Inference	Female	359	3,32	,75904	1625	-6.052	.000*
	Male	1268	3,57	,66887			
Polarization	Female	359	3,04	,76312	1625	-.470	.639
	Male	1268	3,06	,68631			
Selective Abstraction	Female	359	2,95	,82683	1625	.621	.535
	Male	1268	2,92	,77468			

*p<0.05

According to Table 2, there is a statistically significant difference between stereotypes towards science courses and gender [t(1627) = - 3.170 and p<.05]. When the t-test results of the teacher candidates' sub-dimensions of stereotypes towards science courses by gender are examined, stereotypes do not show any statistically significant difference in the sub-dimensions of overgeneralization [t(1627) = -1.869 and p> .05], labeling [t(1627) = -1.300 and p> .05], polarized [t(1627) = -0.470 and p> .05] and selective abstraction [t(1627) = 0.621 and p> .05] by gender. Regarding sub-dimension of arbitrary inference, it is found that the mean score of male students is higher than the mean score of female students and this difference is statistically significant. [t(1627) = -6.052 and p< .05].

Findings Regarding Teacher candidates' Stereotypes towards Science Courses and Departments

A study has been conducted to determine whether teacher candidates ' stereotypes towards science courses differ by departments. The findings are shown in Table 3.

Table 3. *T-test results of stereotypes towards science courses by department*

	Department	n	x̄	Sd	df	t	p
SSTS	Science Education	572	3,31	,44180	1625	10,542	.000*
	Class Education	1055	3,04	,50542			

*p<0.05

According to Table 3, there is a statistically significant difference between teacher candidates ' stereotypes towards science courses and departments [t(1627) = 10.542 and p< .05].

The obtained findings to examine the different sub-dimensions of stereotypes towards science courses by the department are given in Table 4.

Table 4. *T-test results of sub-dimensions of stereotypes towards science courses by department*

Dimension/Variable	Department	n	x̄	Sd	Df	t	p
Over Generalization	Science Education	572	3,82	,61428	1625	13,924	.000*
	Class Education	1055	3,28	,80315			
Labelling	Science Education	572	2,83	,88481	1625	-2,935	.003*
	Class Education	1055	2,96	,84700			
Arbitrary Inference	Science Education	572	3,75	,58492	1625	10,228	.000*
	Class Education	1055	3,39	,72063			
Polarization	Science Education	572	3,07	,70511	1625	,402	.688
	Class Education	1055	3,05	,70335			
Selective Abstraction	Science Education	572	3,03	,76955	1625	3,673	.000*
	Class Education	1055	2,88	,79067			

*p<0.05

According to Table 4, it is found that science education students have a higher average than the students in the other department regarding sub-dimensions of overgeneralization [t(1627) = 13,924 and p< .05], arbitrary inference [t(1627) = 10,228 and p< .05] and selective abstraction [t(1627) = 3,673 and p < .05]; and in terms of sub-dimension of labelling [t(1627) = -2,935 and p< .05] the classroom education have a higher average than the students in the other department and this difference is found to be statistically significant. However, there is no statistically significant difference between department scores [t(1627) = ,402 and p> .05] regarding sub-dimensions of polarized thoughts [t(1627) = ,402 and p> .05].

Findings Regarding Teacher candidates' Stereotypes towards Science Courses and Academic Achievement Scores

A study has been conducted to determine whether teacher candidates ' stereotypes towards science courses differ by academic achievement scores. The findings are shown in Table 5.

Table 5. *Anova results of stereotypes towards science courses by year end academic achievement scores*

Descriptive Values				Variance Source	ANOVA Results					
	Academic Achievement	n	X		Sum of Squares	Sd	Mean Square	F	p	Significant difference
SSTS	1,00-1,99	47	3,00	Between	,919	2	,459	1,838	.159	-
	2,00-2,99	968	3,14	Within	405,808	1624	,250			
	3,00-4,00	612	3,14	Total	406,727	1626				

*p<0.05

According to Table 5, there is no statistically significant difference in the total scores of the stereotype scale towards science courses according to the teacher candidates ' year-end academic achievement scores (p> .05).

CONCLUSION AND DISCUSSION

It is discussed whether teacher candidates ' stereotypes towards science and whether these patterns change according to gender, departments, grade levels and academic achievement scores at the end of the year are discussed.

Evaluation of Teacher Candidates' Stereotypes Towards Science Courses

When the qualitative value interval of the stereotypes of the teacher candidates studying in the departments of Classroom Education and Science Education is examined, the result is Indecisive with 3,18. According to Kulas and Stachowski (2009), researchers consider "indecisive" as a moderate situation. When the teacher candidates ' scores about the stereotype levels towards science are examined, the scores range from 2.31 to 3.91. In other words, it concentrates between 2 and 4. The opinion corresponding to this concentration is within the scope of "indecisive" and "agree". The fact that the total scores of teacher candidates move from "indecisive" to "agree" indicates that they have a negative attitude towards science classes. The answer given by candidates to 11 of 28 items corresponds to "agree". When the content of these items is examined generally; it includes some stereotypes such as that they could never understand science courses, they could not be successful even though they studied, questions never came from the well-studied topics, lecturers teach lessons with hard-working students, the need to be appreciated, the male students are more successful, they are afraid to experiment. 11 items correspond to the indecisive interval of the given answers. When the content of these items is examined, it consists of stereotypes like science courses and exams are difficult, they are always tensed in science classes, those who can experiment in the laboratory are popular, those who can relate science subjects to daily life are more cultured, a student is either successful or unsuccessful in science, failures arising from lecturers, failures arising from methods and materials, difficult topics make me think I cannot learn that lesson. Uşaklı and Akpınar (2015) needed to develop a scale within the scope of laboratory studies, which is one of the lessons that many teachers and students are concerned about in science. Ünal and Kılıç (2016) revealed the anxiety states of the students who take science laboratory, general physics, general chemistry and general biology laboratory lessons and proposed suggestions that would allow performing more efficient laboratory lessons and laboratory anxiety levels. One item of the test questions corresponds to the disagree range with 2.31 points. When this item is investigated, it corresponds to the 20th item on the scale, "When science courses become concrete, then everyone can understand easily". These answers suggesting that when science courses become concrete, it can be understood by everyone, can be explained with the idea that material, language, expression and presentation techniques are not important in science. Also in the context of dimensions, it is seen that the opinions on the Over-Generalization and Arbitrary Inference sub-dimensions correspond to the interval of "Agree"; opinions on the labelling, polarization and selective abstraction sub-dimensions seem to correspond to the interval of "Indecisive". The indecisive interval is a critical interval that is sensitive to decrease and increase (Dağıstan, 2017). This indicates that there may be an increase in the rational and unrealistic thoughts created by individuals towards sciences in the labelling, polarization and selective abstraction sub-dimensions when the correct direction is not present. These ideas, which they probably carry without realizing, can push the ideas and actions aside and create stereotyped interests and reactions. Because people do not tend to be willing to test whether their exact thoughts are correct. They either ignore or deny information that goes against their stereotypes (Dökmen, 2014).

Evaluation of Teacher Candidates' Stereotypes Towards Science Courses by Gender

There is a significant difference between teacher candidates ' stereotypes towards science courses and gender. It is found that the mean score of male students is higher than the mean score of female students and this difference is statistically significant. When the sub-dimensions of stereotypes towards science course by gender is examined, there is no statistically significant difference in sub-dimensions of over-generalization, labelling, polarization and selective abstraction. Regarding sub-dimension of arbitrary inference, it is found that the mean score of male students is higher than the mean score of female students and this difference is statistically significant. According to these results, it can be said that male students are more stereotyped than female students. While there is no significant difference between private high school students' (Yanpar-Yelken, Baysal,2021) and higher education students' (Çimenli, Akdoğdu,2020) gender and their stereotyped thoughts about foreign language, the fact that this relationship is significant towards science courses may be due to the content of the lesson. In the study of Soran, Demirci and Atav (1997) and Oral (2004), the attitudes of male and

female students towards the teaching profession are in favour of female students. Although female students are more eager and efficient in the teaching profession, it is seen that they have more stereotypes towards science classes than male students. Akpinar, Yıldız, Tatar & Ergin (2009) 's study, which aims to assess the attitudes of elementary school students towards science and academic courses, indicates that the significant differences between male and female students in Turkey appeared to be in favour of female students. In other words, it is found that female students tend to have a positive attitude towards science courses than male students. Similar results were found in other studies (Alkan, 2006; Blake & Lesser, 2009; Schunk & Lilly, 1984). In terms of gender, reasons of high attitudes of female students towards science classes include the change in traditional female roles, prominent female figures with academic success in society and lack of a gender restriction in our country in obtaining a profession. When studies on attitude towards science are examined, some studies indicate that there is no statistically significant difference between male and female students with attitude dimension (Yaman, Koray & Altunçekiç, 2004; Akbaş & Çelikkaleli, 2006; Çakıroğlu, Çakıroğlu & Bone, 2005), whereas other studies state that the gender variable reveals a statistically significant difference (Neathery, 1997; Jones & Wheatley, 1990; Üredi & Üredi, 2006). The study of Böyük, Demir and Erol (2010), reveals that there is no significant difference between opinions of science and technology teachers towards competence in laboratory studies and gender. The study carried out by Azar and Karaali (2004), demonstrates that there is no significant difference in the attitude scores towards Educational Technologies Practices by gender. There is no significant difference between science teachers' genders and their opinions towards science experiments with simple tools in a study conducted in Tekirdağ central and Çorlu districts by Uzal, Erdem, Önen & Gürdal (2010). Ekici (2002) analyzed the attitude scores of the biology teachers working in the central districts of Ankara according to different variables and states that there isn't any significant difference between the attitudes of teachers towards laboratory lesson by gender. In Neathery (1997)'s study to measure students' perceptions of science, there is a significant difference in favour of men and concluded that male students perceive science as an exciting subject. In the study of Durdukoca (2010), academic self-efficacy perceptions of classroom teaching students are found significant in favour of male students. It is possible to find parallel results in similar studies (Bong, 1999; Busch, 1995; Cantrell, Young & Moore, 2003; Schunk & Pajares, 2002; Türkmen, 2002; Üredi & Üredi, 2006). False behaviors exhibited by teachers with prejudice, that female student have gender differences in terms of academic achievement, may negatively affect the academic achievement of female students (Bulut, 2006).

Evaluation of Teacher Candidates' Stereotypes Towards Science Courses by Departments

There is a statistically significant difference between science education and classroom education students in favour of science education students in terms of the stereotypes towards science courses and the education department. When the sub-dimensions of stereotypes towards science course are analyzed by departments, it is found that science education students have a higher mean than other students in the sub-dimension of over-generalization, arbitrary inference, and selective abstraction and this difference was statistically significant. In the labelling sub-dimension, it is found that classroom education students have a higher mean than other students in the sub-dimension of labelling and this difference is statistically significant. According to this result, it is seen that science students form general beliefs based on a single event related to science, conclude without evidence or draw some conclusions from a minor detail whereas classroom education appears to make some labelling towards science. There is no statistically significant difference in the sub-dimension of polarization. Türkmen (2002) examined the attitudes of students enrolled in Classroom Education Program towards science and science teaching and found that science attitudes of primary school students are positive. When the attitudes of classroom education students towards science and science education are examined separately, it is seen that they develop a negative attitude towards science education. Similar results are reached in another previous study performed by Turkmen (2002). According to these results, it is seen that classroom education students have positive thoughts on science courses and negative thoughts on science education. They make selective abstraction from polarization, considering that teaching is based on rote-learning. In the study of Bonnstetter and Yager (1985), Gabel (1980), Bleicher (2004) and Carroll, Patricia, Morrell (2007) emphasized that although the attitudes of students at different levels and branches towards science are positive, there is no difference between statistical means. In the study of Gabel (1980), he stated that the attitudes of teacher candidates studying in different departments towards Science are proportional to the hours of science lessons. In other words, it is emphasized that the number of courses and the excess of hours contributed to the positive attitude towards that course. Ateş (2002), aimed to measure and compare the scientific thinking abilities of 3rd grade students in Classroom Education and Science Education. As a result of the analyzes made for this purpose, it is found that the mean scores of science students scores in the scientific thinking abilities test are higher than the mean scores of classroom education. It is possible to say that these are expected results since science students have the opportunity to practice more in science lessons. The fact that science education students have taken more science courses before starting their undergraduate education supports these results. The findings obtained by different researchers in different dates and regions are quite similar to the results obtained in this study (Iqbal & Shayer, 2000; Moore & Au,1975; Gabel 1980; Morrisey 1981; Pedersen & McCurdy 1992).

Evaluation of Teacher Candidates' Stereotypes Towards Science Courses by Academic Achievements

There is no statistically significant difference among the total scores of the stereotype scale towards science by the teacher candidates' academic achievement scores. A similar result is obtained in the study of Dağıstan (2017) that aims to determine the stereotypes towards mathematics lesson among secondary school students. When the different status of stereotype sub-dimensions towards the science course are analyzed concerning the year-end academic achievement scores; it is found that mean scores of teacher candidates with a year-end academic achievement score between 2.00-2.99 are statistically significantly higher than teacher candidates with a year-end academic achievement score between 1.00-1.99 in the sub-dimensions of "Overgeneralization". The mean scores of teacher candidates with a year-end academic achievement score between 3.00-4.00 are statistically significantly higher than teacher candidates with a year-end academic achievement score between 1.00-1.99; the mean scores of teacher candidates with a year-end academic achievement score between 3.00-4.00 are statistically significantly higher than teacher candidates with a year-end academic achievement score between 2.00-2.99 regarding sub-dimensions of "Selective Abstraction".

There are no significant differences in labelling, arbitrary inference, and polarization sub-dimensions according to year-end achievement scores of stereotype scale for science. Based on these results, as the year-end academic achievement scores approach 4 (four), the stereotypes towards science increases. In other words, there are more stereotypes as academic achievement score increases. In this sense, there isn't any record available in the literature. It is recommended to conduct studies on the causes of this differentiation. There is a need to perform more studies within the scope of increasing student achievement and reducing stereotypes. Researches reveal that using different teaching strategies in the lessons, attaching importance to laboratory lessons, using sound and useful tools and materials, purifying classes from excessive crowd, teaching according to the student's level of interest, using alternative assessment and evaluation methods have positively affects students' attitudes towards the course and increases their interest in that course (Akgün, 2001; Aladağ, 2005; Baytok, 2007; Baş, 2015; Bol et al., 2002; Bozdoğan, 2007; Çallıca et al., 2001; Demirbaş & Pektaş, 2015; Geer & Barnes, 2007; Güçlüer, 2006; Güzel, 2001; Haladyna & Shaughnessy, 1982; Hançer & Yalçın, 2009; Jang & Tsai, 2012; Köseoğlu, Tümay & Kavak, 2002; Mıhladız, 2007; Nuhoğlu, 2008; Rennie & Punch, 1991; Xin & Sutman, 2011). In the study of Gürkan and Gökçe (2001), there is a significant relationship between students' achievements and attitudes towards science courses; this result is supported by the conclusion that achievement increases as the attitude increases. Students' attitudes towards science are described in the polarization tendency such as "Love or hate science" (Simpson et al., 1994). In this context, it can be said that the positive attitudes of students towards science are directly proportional to having fewer stereotypes. Baker and Piburn (1997) mention about four elements of the attitude. Attitude is associated with the measure of whether a person likes science or not, the characteristics of those who are related to science (shape, scientific attitude, state, value etc.), how the student conceptualizes science, students' interpersonal relationships and how the class is structured, the attitude towards science.

SUGGESTIONS

According to the research findings, it is seen that the total scores of teacher candidates ' stereotypes towards science courses and scale's opinions on labelling, polarization, selective abstraction sub-dimensions correspond to the "indecisive" interval. The indecisive interval is sensitive to decrease and increase and it indicates that there may be an increase in the rational and unrealistic thoughts created by individuals towards science when the correct direction is not present. In this context, research at multiple grade levels may be needed considering the sub-dimensions of the research. It is observed that the teacher candidates ' stereotypes increase as the grade level increase. Therefore, an educational environment suitable for teaching-learning process can be planned according to the grade levels of teacher candidates. According to the research findings; it is found that the teacher candidates' academic achievement scores and stereotype scores towards science courses show parallelism. New case studies can be conducted to investigate the causes of this finding. The stereotyped thinking interval of teacher candidates and equivalent groups can be determined with "Stereotype Scale towards Science". Class environment and course flow can be arranged accordingly. Students' level of achievement can be increased by incorporating different studies in determining stereotypes of the related course to prevent stereotyped thoughts before they occur.

This research has been discussed in terms of identifying the teacher candidates ' stereotypes towards science course, whether these ideas have differed by the gender, departments, grade levels, high school, the university, and the year-end academic achievement scores. Similar researches can be examined in line with different variables. In line with the research results, more in-depth results can be obtained by supporting qualitative research on stereotyped thoughts. While preparing science education programs, a system can be developed which includes activities increasing science awareness and reduce stereotypes towards science from the moment they start science education. Teachers and teacher candidates can obtain information about stereotypes by providing short-term courses or seminars. This research is conducted only to determine the stereotypes of university students towards science. Stereotypes of different groups starting from primary education towards

science can be examined with a similar study. Given the limitations of the scale study, qualitative research or mixed-method studies can be performed by using both scale and interview, observation techniques together through utilizing other data collection methods (interview, observation form). While there are many international qualified studies on stereotypes in the literature, Turkey has limited study related to the particular stereotypes. More studies can be done to enrich the relevant literature.

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