

Research Article

Teacher candidates' attitudes towards mistake and instant feedback

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This study examines science, mathematics, and classroom teacher candidates' attitudes towards mistake-instant feedback. A total of 531 undergraduate students from different universities in Türkiye participated in the study. *Mathematics and science teachers' attitude scale towards mistakes and instant feedback to mistakes* (MST-AS) was used to collect data. Data analysis was conducted using descriptive statistics, *t*-tests, and ANOVA tests. A statistically significant difference between the external and internal attitude dimensions, along with the departments' overall attitude scores, was found. Based on a Tukey's Post Hoc test significant differences were determined between science and mathematics teacher candidates, and between mathematics and classroom teacher candidates in their overall scores, in favour of the science and classroom teacher candidates. The differences among the attitudes of the teacher candidates according to their grade level and achievement was not statistically significant. To better understand the attitudes of teacher candidates, more in-depth or longitudinal studies can be conducted on the variables correlated with high and low attitudes.

Keywords: Teacher candidates; Attitude; Instant feedback; Mistake

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1. Introduction

The way people behave is largely determined by the attitudes, which are sets of feelings and beliefs (Krosnick & Petty, 1995). According to Bloom (1976), attitude is having positive thoughts about a lesson or subject. If a student's attitude towards a course is high, this can ensure that the student is successful in the course. Having negative thoughts about a lesson and subject can lead to student apathy and ultimately failure. It is also possible to have several of these feelings and thoughts at once about a lesson or topic. An individual's attitude is influenced by their learning; it influences their behavior and can influence their decision-making (Ülgen, 1997).

Student-centered mathematics (Türkdoğan, 2011) and science curriculum (Cengiz & Ayvacı, 2017) have been implemented in Türkiye since 2005. One of the most accepted models of the student-centered education system is the 5E learning model. This learning model includes engagement, exploration, explanation, exception and evaluation stages (Bybee et al., 2006). According to Türkdoğan (2011, 2020), it is not possible for teachers not to encounter mistakes, especially in the stages of engagement, exploration and evaluation. In other words, teachers

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encounter student mistakes because of the nature of their profession (Borasi, 1994; Käfer et al., 2019; Santagata, 2002, 2005; Türkdoğan, 2011). In this sense, it is important to identify and develop teachers' perspectives on mistakes (Bybee et al., 2006; Eisenkraft, 2003). Students cannot be expected to easily apply their newly learned knowledge to new situations (Campbell, 2000). The teacher should be able to correct the students' mistakes with their feedback during the learning process (Wilder & Shuttleworth, 2005). It is important for teachers to know how to guide in the event that a mistake occurs in the classroom (Bybee, 2002). However, it is known that teachers do not have enough knowledge about how to deal with mistakes (Watson, 2002). It is undeniable that attitudes play an important role in overcoming mistakes. Since attitudes play a crucial role in influencing behaviors, perspectives on mistake-instant feedback should be determined and positive attitudes fostered.

Because teachers lack experience and knowledge about mistakes, the learning process can be disrupted and they may find themselves in a difficult situation. The sudden appearance of a mistake can cause anxiety, reduce time control, and cause anger in a teacher without the knowledge about mistakes. Getting angry at students who make mistakes on simple subjects is common among teachers (Heinze, 2005). Teachers will be more teacher-centered in an environment where they are worried, lose control of their classroom, and get angry. Having students express their thoughts freely is crucial for a student-centered learning environment. It is therefore necessary for teachers to be better equipped cognitively and emotionally for mistake-instant feedback (Türkdoğan, 2011).

In the learning process, there is limited literature on how to give feedback to a teacher who has made a mistake. Researchers have suggested examining similarities and differences between cultures when it comes to the feedback given to mistakes (Santagata & Stigler, 2000; Santagata, 2002, 2004, 2005). There has been an inadequate study of the factors other than cultural factors that influence the teacher's behavior when a mistake is made. A teacher's attitude towards false-instant feedback is probably one of the most important factors affecting the feedback given to the mistake (the first feedback given as soon as the mistake is made: instant feedback). It takes a long time for attitudes to develop. It is certainly possible to trace the formation of attitudes towards mistake-instant feedback to very early childhood. Teachers' attitudes towards mistake-instant feedback can be influenced by how they give them feedback when they make mistakes, for example. In this study, it is sufficient to take a step back and examine prospective teachers' perspectives on false-instantaneous feedback.

It is undeniable that university education plays an important role in acquiring the behaviors teachers desire. As a result, undergraduate education is perhaps the most important place to start developing positive changes in teachers regarding mistake-instant feedback. Candidates for teacher positions should compare their attitudes towards mistake-instant feedback with those of teachers. The changing attitudes of teachers can be traced back to their teacher candidacy. Teacher candidates' attitudes can be assessed as classes progress. It is therefore possible to understand how undergraduate education affected their attitudes towards mistake-instant feedback. Attitudes can be influenced by cognitive knowledge. An undergraduate misconceptions course is required for pre-service teachers. Additionally, they receive training on how to avoid common mistakes and misconceptions in teaching each of the learning areas. Measuring candidate teachers' attitudes about mistake-instant feedback at the undergraduate level will also provide us with information about the adequacy of their education.

In order to succeed, people need to have a positive attitude. Nevertheless, forming an attitude or changing an existing attitude is very difficult (Erden, 1995). Therefore, it is important to examine and compare teacher candidates' attitudes towards mistake-instant feedback at the undergraduate level. Science teacher candidates and classroom teaching candidates are perhaps the best candidates to compare the attitudes of mathematics teacher candidates on any subject. Courses in science combine knowledge and skills from many disciplines (Yaşar & Anagün, 2009). In many science courses, mathematics is an integral part of the teaching process. In addition to using

mathematics in some courses, classroom teachers directly teach science and mathematics. When students make mistakes, teachers will provide feedback, as their teachers did when they were students. As a result, classroom teachers' perspectives on false-instant feedback should be examined. An attitude scale was developed about mistake-instant feedback (Türkdoğan, 2020) and the attitudes of science and mathematics teachers towards mistake-instant feedback were measured (Türkdoğan & Yıldız, 2021). The literature does not contain any studies evaluating or comparing candidate teachers' attitudes toward mistake-instant feedback. Therefore, this study aims to determine the attitudes of mathematics, science, and primary school teacher candidates towards mistake-instant feedback and to compare them across grade levels and departments. Thus, future studies can be designed in a positive way to influence teachers' attitudes toward mistake-instant feedback.

In a student-centered learning environment, mistakes are both useful and inevitable (Türkdoğan et al., 2009). Consequently, it is important to examine how teachers use instant feedbacks and what factors affect instant feedbacks given to mistakes. An examination of teachers' perspectives on mistakes and instant feedback is the focus of this study. In addition, the study aims to identify pre-service teachers' attitudes towards mistakes-instant feedback. This study will allow teacher candidates in different branches to compare attitudes toward mistakes-instant feedback for the first time. The literature will also benefit from comparing the results of this study with those of preliminary studies. By investigating the changes in teachers' attitudes towards mistakes-instant feedback, we can understand how teachers' views of mistakes-instant feedback can be changed to better serve the needs of students in the future.

1.1. Purpose and Problem Statement

The existence of mistakes in a learning environment is a sign that the lesson is being conducted according to students' zones of proximal development; it is a sign that the course is student-centered (Türkdoğan, 2011). With appropriate instant feedback, mistakes can be turned into opportunities. Otherwise, mistakes may lead to misconceptions (Coştu et al., 2007), and may lead to negative attitudes towards lessons (Memnun, 2008). The teacher may not be able to guide in a student-centered learning environment (Türkdoğan, 2006). Teacher attitudes toward student-centered education may be negatively affected as a result. There's no doubt that students' learning will be positively impacted by the high-level instant feedback they receive when they make a mistake. Teachers and teacher candidates should share their attitudes toward mistake-instant feedback with education stakeholders in order to understand research. This study aims to determine and compare the attitudes of teachers and prospective teachers toward mistake-instant feedback. Teachers' increased attitudes toward mistake-instant feedback will facilitate studies on how their reactions (behaviors) to mistakes they encounter will affect students' success and attitude. It is believed that this study will contribute to the literature in this regard.

Researchers investigated types of mistakes and techniques used by teachers to provide instant feedback on mistakes (Türkdoğan, 2011, 2020; Türkdoğan et al., 2009; Türkdoğan & Baki, 2012; Türkdoğan & Yıldız, 2021). As a result, one of the researchers of this study developed a scale to measure teachers' attitudes towards mistakes and feedback (Türkdoğan, 2020). This scale allows an analysis of the dimensions that influence the manner in which feedback is given to a mistake. Then, researchers conducted a study (Türkdoğan & Yıldız, 2021) to investigate the attitudes of mathematics and science educators toward mistakes and instant feedback based on demographic features. The purpose of this study is to determine and compare how mathematics, science, and classroom teacher candidates view mistakes and instant feedback in light of some demographic characteristics. Then compare them with previous studies' findings about teachers' attitudes. In this regard, we tested the hypotheses listed below.

H1. There is no statistically significant difference in the attitudes of teacher candidates among the branches.

H2. There is no statistically significant difference in the attitudes of teacher candidates among the grade levels.

H3. There is no statistically significant difference in the attitudes of teacher candidates between the genders.

H4. There is no statistically significant difference in the attitudes of teacher candidates among the ages.

H5. There is no statistically significant difference in the attitudes of teacher candidates among the grade point averages.

2. Method

2.1. Design of the Study

This research employed a correlational survey model, which is one of the quantitative research methods. Survey research provides opportunities to identify the perceptions and attitudes of a group of people with certain characteristics towards events, facts and situations (Fraenkel et al., 2015). The correlational survey model is a model that aims to detect the existence and degree of covariance between two or more variables. Therefore, the correlational survey method was used in the research, as it was aimed to determine the attitudes of teacher candidates towards mistakes and instant feedback and to compare these attitudes (Creswell, 2013).

2.2. Sample

This research was conducted with 531 teacher candidates studying at the education faculties of universities in different provinces in Türkiye in the 2020-2021 academic year. The study group consists of 166 science, 202 mathematics and 163 classroom teacher candidates. Convenience sampling method was used to determine the study group of the research. This is a sampling method that provides practicality to the research and aims to prevent time, money and labor loss for the researcher (Yıldırım & Şimşek, 2016). In this study, a study group was formed on the basis of accessibility. Demographic information about the sample is presented in Table 1.

Study group consists of 107 male and 424 female teacher candidates. Nearly half of the participants ages vary from 20 to 21. There is a balanced distribution of the number of participants across the grades. More than half of the participants' GPAs vary between 3.00 and 3.49.

2.3. Data Collection Tool

This study employed a descriptive approach. As a result, numerical descriptions are possible of the sample's behavior. Based on the results obtained, trends and attitudes can be predicted (Creswell, 2013). Basically, the scale is divided into two parts. Questions about demographic characteristics are asked in the first part. There are four characteristics to consider: gender, branch, age, and educational level.

In the second part of the study, MST-AS was used to collect data about class teacher candidates' attitudes towards mistakes and instant feedback. The scale was developed by Türkdoğan (2020). The MST-AS consists of 14 items in a 5-point likert type. There are two factors on the scale: internal causes and external causes. There are 7 negative items and 7 positive items on the scale. Both factors have seven items. In the original scale that was prepared with 420 teachers and teacher candidates, the Cronbach Alpha coefficient was found to be .829. Scales and sub-factors have high Cronbach Alpha coefficients. Furthermore, there is a high correlation coefficient between the subfactors. As a result, MST-AS is found to be a reliable scale (Türkdoğan, 2020). The KMO value was calculated to be .808. The chi-square value was also significant under Bartlett's sphericity test ($\chi^2 = 1574.81$; $p < .01$) (Türkdoğan, 2020). Validity and reliability of the scale were also studied among teacher candidates. Therefore, the MST-AS is also appropriate for teacher candidates.

Table 1
Demographic information about the sample

Variables	N	%
Gender		
Male	107	20.2
Female	424	79.80
Branch		
Science	166	31.3
Mathematics	202	38.0
Classroom	163	30.7
Age		
18-19	86	16.2
20-21	262	49.3
22-23	125	23.5
24-25	30	5.6
26 - Above	28	5.3
Degree of Education		
1st Grade	158	29.8
2nd Grade	147	27.7
3rd Grade	110	20.7
4th Grade	116	21.8
Grade Point Average		
Below 2.00	19	3.6
2.00-2.49	3	0.6
2.50-2.99	121	22.9
3.00-3.49	310	58.2
3.50 - Above	78	14.5

The data were collected between March and April 2021 through Google Forms. A description of sampling, the purpose, scope, and process of the research was provided. The Google Forms link of the scale was shared with experts working in mathematics and science as well as classroom teachers via WhatsApp and other social media. Academicians were asked for help in reaching pre-service teachers. In addition, pre-service teachers are invited to fill out the form.

2.4. Analysis of the Data

SPSS package program 25.0 was used to analyze the data. When the distribution of the scores obtained from the scale was examined, skewness coefficient was calculated as $-.117$ while the kurtosis coefficient was calculated as $.743$. These statistical data depict the normal distribution of the scores (Brownlow, 2004; Tabachnick & Fidell, 2013). Following the normality assumption, it was seen that the homogeneity assumption of variances was provided. Hence, frequency and percentage distributions, independent variable t-test and one-way analysis of variance (ANOVA) were used in the analysis of the data.

2.5. Scale Reliability

Cronbach Alpha coefficient of the MST-AS was found to be $.833$. In the sub-dimensions, the Cronbach Alpha coefficient of the scale was $.770$ for external factors and $.785$ for internal factors. These values show that, the MST-AS' sub-dimensions are reliable. In addition, when Bartlett's Sphericity test results were examined, it was determined that, the chi-square value was significant ($\chi^2 = 2155.074$; $p < .01$). It has been accepted that data can be included according to these results (Child, 2006; Hutcheson & Sofroniou, 1999; Pett et al., 2003). KMO value of $.903$ showed the adequacy of the sample size as it was higher than $.90$ (Brownlow, 2004; Hutcheson & Sofroniou, 1999; Pett et al., 2003). It has been accepted that data can be factored according to these results (Child, 2006; Hutcheson & Sofroniou, 1999; Pett et al., 2003).

3. Results

The attitude scores obtained from the MST-AS were analysed in terms of various demographic variables. Findings regarding the comparison of teacher candidates' scores obtained from the MST-AS with different demographic variables are given below.

3.1. Descriptive Results

According to the result of the data analysis, average attitude scores of the sample is 59.41 (N=531). Hence, teacher candidates possess a high attitude for giving mistake-instant feedback. This also implies that the average score of teacher candidates per item is above 4 ($59.41/14=4.24$). Average external attitude scores of the participants is 30.96 while it is 28.45 for average internal attitude scores. Considering that the highest score that could be obtained from both the external and internal attitude dimension of the scale is 35 ($7 \times 5=35$), it can be said that, the teacher candidates' mistake-instant feedback score is quite high.

3.2. Results Related to the Scores Obtained from MST-AS

One-Way ANOVA test results regarding the sub-dimensions and overall attitude scores of science, mathematics and classroom teacher candidates' MST-AS are given in Table 2.

Table 2

One-Way ANOVA results of MST-AS scores according to branches

	N	Mean	SD	F	p
External attitude					
Science	166	31.60	3.34	3.519	.03*
Math	202	30.52	3.14		
Classroom	163	31.39	3.06		
Internal attitude					
Science	166	28.83	4.09	8.999	.03*
Math	202	27.54	3.83		
Classroom	163	29.17	3.84		
Overall attitude					
Science	166	59.89	6.47	8.384	.03*
Math	202	58.06	6.08		
Classroom	163	60.57	5.73		

Table 2 shows that there is a statistically significant difference in the external attitude dimension among science, mathematics and classroom teacher candidates ($F_{(2,528)} = 3.519, p < .05$). In order to determinate the source of differences, a Tukey's Post Hoc Test had been conducted. According to this test, it is seen that, there is a significant difference only between mathematics and classroom teacher candidates' ($p < .05$).

There is a statistically significant difference in the internal attitude dimension among the participants' departments ($F_{(2,528)} = 8.999, p < .05$). According to the results of Tukey's Post Hoc Test, a significant difference was found between science and mathematics teacher candidates and also between mathematics and classroom teacher candidates ($p < .05$).

There is also statistically significant difference in overall attitude scores among science, mathematics and classroom teacher candidates' ($F_{(2,528)} = 8.384, p = .000 < .05$). Tukey's Post Hoc Test results suggest that there is a significant difference between science and mathematics teacher candidates and also between mathematics and classroom teacher candidates ($p < .05$).

The effect size in the study varies between 0.00 and 1.00 as η^2 , indicating the amount of independent variable explaining the total variance within the dependent variable. The effect size values are evaluated at the levels of 0.01, 0.06 and 1. It has been seen that, the effect size level of teacher candidates' external attitude dimension is 0.013 and the effect size level of the internal attitudes is 0.032 while the effect size level of the overall attitudes is 0.03. So, it was concluded that

the overall and subscale scores of the teacher candidates' MST-AS had a small effect among the teacher candidates.

3.3. Results Regarding the Differences in MST-AS Scores across the Grade Levels

One-way ANOVA test results regarding the scale's sub-dimensions and overall attitude scores according to grade level variable are given in Table 3.

Table 3

One-Way ANOVA results of MST-AS scores according to grade level

	N	Mean	SD	F	p
External attitude					
1 st grade	158	30.56	3.37	4.658	.003*
2 nd grade	147	30.82	3.02		
3 rd grade	110	30.69	3.34		
4 th grade	116	31.91	2.86		
Internal attitude					
1 st grade	158	28.45	4.15	0.340	.796
2 nd grade	147	28.42	3.61		
3 rd grade	110	28.19	3.96		
4 th grade	116	28.72	4.22		
Overall attitude					
1 st grade	158	59.02	6.35	2.038	.108
2 nd grade	147	59.25	5.62		
3 rd grade	110	58.88	6.55		
4 th grade	116	60.63	6.19		

Table 3 show that there is a statistically significant difference in the external attitude dimension among the grade levels of science, mathematics, classroom teacher candidates' ($F_{(3, 527)} = 4.658$, $p < .05$). Tukey's Post Hoc Test results suggest that there is a significant difference between 4th and 1st grade, between the 4th and 2nd grade and between the 4th and 3rd Grade levels ($p < .05$). As a result, it was concluded that the difference in the external attitude sub-dimension upon the teacher candidates' grade levels has a small effect

There is no statistically significant difference in the internal attitude dimension among grade levels of the participants ($F_{(3, 527)} = 0.340$, $p > .05$). However, the highest average belongs to the 4th grades while the lowest belongs to the 3rd grades.

There is no statistically significant difference in the overall attitude scores among the grade levels of teacher candidates' ($F_{(3, 527)} = 2.038$, $p > .05$). However, the highest average attitude score belongs to the 4th grades while the lowest average attitude score belongs to the 3rd grades.

3.4. Results Regarding the Differences in MST-AS Scores across the Gender

T-test results regarding the differences in the scale scores across the gender variable of teacher candidates are given in Table 4.

Table 4

T-test results of MST-AS scores according to gender variable

	N	Mean	SD	t	p
External attitude					
Male	107	30.79	3.53	-0.601	.175
Female	424	31.00	3.10		
Internal attitude					
Male	107	28.91	4.08	1.356	.176
Female	424	28.33	3.95		
Overall attitude					
Male	107	59.71	6.57	0.560	.575
Female	424	59.33	6.09		

Table 4 shows that there is no statistically significant difference in the external attitude scores of the teachers candidates according to the gender variable ($t_{(531)} = -0.601, p > .05$). However, it is observed that the average attitude score of female teacher candidates is higher than that of the male teacher candidates.

Additionally, no statistically significant difference was found in the internal attitude scores of the teacher candidates according to the gender variable ($t_{(531)} = 1.356, p > .05$). However, it is seen that the average attitude score of male teacher candidates is higher than the female teacher candidates.

It is observed that there is no statistically significant difference between teacher candidates' genders in overall attitude scores ($t_{(531)} = 0.560, p > .05$). However, it is seen that the overall score average for the males is higher than that of the female teacher candidates.

3.5. Results Regarding the Differences in MST-AS Scores across the Age Variable

One-way ANOVA test results regarding the scale's sub-dimensions and overall attitude scores according to age variable are given in Table 5.

Table 5

One-Way ANOVA results of MST-AS scores according to the age variable

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>p</i>
External attitude					
18-19	86	30.53	3.22	1.932	.104
20-21	262	30.77	3.23		
22-23	125	31.61	3.19		
24-25	30	31.00	2.98		
26 and above	28	31.03	2.80		
Internal attitude					
18-19	86	28.01	3.43	2.123	.077
20-21	262	28.14	4.05		
22-23	125	29.27	3.90		
24-25	30	28.50	3.92		
26 and above	28	28.96	4.83		
Overall attitude					
18-19	86	58.54	5.29	2.720	.029
20-21	262	58.91	6.30		
22-23	125	60.88	6.16		
24-25	30	59.50	6.29		
26 and above	28	60.00	6.80		

Table 5 shows that there is no statistically significant difference in the external attitude dimension among the ages of teacher candidates ($F_{(2, 528)} = 1.932, p > .05$). However, it is seen that the highest average score of external attitude dimension is in the 22-23 age range, while the lowest average attitude score belongs to the 18-19 age range.

There is no statistically significant difference in the internal attitude dimension among the ages of teacher candidates ($F_{(2, 528)} = 2.123, p > .05$). However, it is seen that the highest average score of external attitude dimension is in the 22-23 age range, while the lowest average attitude score belongs to the 18-19 age range.

There is a statistically significant difference in the overall attitude scores among the ages of teacher candidates ($F_{(4, 526)} = 2.720, p < .05$). Post Hoc Test results show that there is a significant difference between the age groups of 20-21 and 22-23 ($p < .05$).

It is seen that, the effect size regarding the differences among the ages of teacher candidates according to the overall attitude score is 0.02, which means the existence of a small effect.

3.6. Results regarding the Differences in MST-AS Scores across the Grade Point Average

One-way ANOVA test results regarding the scale's sub-dimensions and overall attitude scores according to GPA variable are given in Table 6.

Table 6

One-Way ANOVA results of MST-AS scores according to grade point average

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>p</i>
External attitude					
Below 2.00	19	29.63	2.79	2.172	.071
2.00 – 2.49	3	29.00	5.19		
2.50 – 2.99	121	31.07	3.26		
3.00 – 3.49	310	30.83	3.23		
3.50 and above	78	31.64	2.84		
Internal attitude					
Below 2.00	19	28.63	4.62	0.313	.870
2.00 – 2.49	3	28.00	6.92		
2.50 – 2.99	121	28.61	4.08		
3.00 – 3.49	310	28.29	3.79		
3.50 and above	78	28.77	4.31		
Overall attitude					
Below 2.00	19	58.26	6.36	1.016	.399
2.00 – 2.49	3	57.00	10.53		
2.50 – 2.99	121	59.68	6.19		
3.00 – 3.49	310	59.12	6.11		
3.50 and above	78	60.42	6.33		

Table 6 shows that there is no statistically significant difference in the external attitude dimension among the GPA scores of teacher candidates ($F_{(4, 524)} = 2.172, p > .05$). However, while the highest average external attitude dimension score of teacher candidates' is in the GPA range of 2.50-2.99, the lowest average external attitude dimension score belongs to the GPA range of 2.00-2.49.

There is no statistically significant difference in the internal attitude dimension among the GPA scores of teacher candidates ($F_{(4, 524)} = 0.313, p > .05$). However, the highest average internal attitude dimension score of teacher candidates' is in the GPA range of 3.50 and above, and the lowest average internal attitude dimension score belongs to the GPA range of 2.00-2.49.

It is seen that, there is no statistically significant difference in the overall attitude score among the GPA scores of teacher candidates ($F_{(4, 524)} = 1.016, p > .05$). However, it was determined that the highest average was in the GPA grade range of 3.50 and above, while the lowest average attitude score belongs to the GPA range of 2.00-2.49.

4. Discussion and Conclusion

According to our findings, science, mathematics, and primary school teacher candidates have a high feedback attitude towards mistakes. They also have high average scores on the external and internal scales of the attitude scale. As a cycle, attitude, behavior, and perception are interconnected. Teachers' instant feedback habits can be positively changed by identifying their attitude toward mistakes (Türkdoğan & Yıldız, 2021). High scores can be attributed to teacher candidates' positive and meaningful responses to feedback provided by instructors. It may also be due to their positive response to the feedback they receive from teachers of different grades that they receive such high scores for mistake-instant feedback. Due to the fact that teacher candidates will teach as they learn, every teacher they have encountered from primary school teachers to university instructors may have influenced their current attitudes. According to a growing body of research, teachers and instructors may perceive students' mistakes differently, and their feedback

may differ based on the type of mistake made. It has been found that the instant feedback provided by teachers in the learning environment shapes the learning positively (Cengiz & Ayvaci, 2017; Türkdoğan, 2011; Türkdoğan & Baki, 2012). According to another study, teacher candidates should be allowed to make mistakes in order to learn from them (Son & Sinclair, 2011), pointing out the importance of learning from mistakes.

There is a statistically significant difference in the scores of the external and internal attitude scores, as well as in overall attitude scores. The test results show a significant difference between science and mathematics teaching departments and between the mathematics and primary school teaching departments. The results of this study demonstrate that science, mathematics, and primary school teacher candidates value the feedback provided by instructors during lessons. A teacher candidate's mistakes in the learning environment should be corrected so they do not hinder their learning and don't cause misconceptions (Baştürk, 2009). There was a small effect size between science, mathematics, and classroom teacher candidates' attitudes. It is possible to explain this result by the fact that the overall scores of MST-AS have a negligible effect on teacher candidates' departments. Because science and primary school teaching departments have different instructors, this effect can be explained. A difference in teaching styles and methods, as well as feedback on mistakes, may also contribute to this phenomenon. During lessons, instructors can vary in how sensitive they are to feedback about mistakes made (Çabakçor et al., 2011). Researchers found no significant difference in the attitudes towards mistakes of science and mathematics teachers (Türkdoğan & Yıldız, 2021). There are differences between the results of this study and those of Türkdoğan and Yıldız (2021).

The external attitude scale scores of teacher candidates differed statistically significantly with the years in which they were studying, however, the internal attitude dimension scores remained unchanged. A statistically significant difference was not found between the overall attitude scores of the teacher candidates and their year of study. It may be due to awareness of the importance of giving instant feedback in the learning environment that science, mathematics, and primary school teacher candidates have significant differences in their external attitude dimension scores. Teacher candidates may develop misconceptions if they do not receive feedback following a mistake in the learning environment (Santagata, 2005). In a study conducted with teachers, it was found that most teachers' perspectives on mistakes in the classroom were negative (Gedik-Altun & Konyalıoğlu, 2019). Teachers' feedback techniques differ from one another, according to another study. Insufficient content knowledge is said to result in fewer interviews conducted by teachers and direct answers given by them more often. Also, researchers examined teachers' feedback habits in the first year of their profession, and found that their feedback perceptions changed rapidly (Cengiz & Ayvaci, 2017; Haydar et al., 2009).

In terms of the subscales of external and internal attitudes, there was no statistically significant difference between the genders of the teacher candidates. Additionally, there was no statistically significant difference between the genders of the teacher candidates and the overall attitude score. Teacher candidates' previous education levels, classes taught by the same teachers, and activities they engage in in terms of education and training can explain this situation. Compared to male teacher candidates, female teacher candidates' attitude scores were higher (see Table 4). These results were also confirmed by the previous studies (e.g. Türkdoğan & Yıldız, 2021). Research has shown that female science teachers provide more positive feedback and put in more effort than male science teachers (Özkale, 2018). According to another study (Bedur, 2007), female teachers provide effective feedback to their students and communicate better with them. This study's results are in line with these results.

Teachers' external and internal attitude subscale scores were not statistically different based on their age. There was, however, a statistically significant difference between the age of the teacher candidates and their overall attitude scores (see Table 5). Teacher candidates' MST-AS scores increased as their ages increased. It can be explained by the increased number of courses taken by teacher candidates, their age, the length of their studies, and the increase in their content and

pedagogical knowledge. Meanwhile, instructor feedback can help teacher candidates understand and correct their mistakes. Studying longitudinally can reveal how the change occurs. As well as helping teacher candidates discover their mistakes, feedback is important (Güven, 2004; Odabaşı-Çimer et al., 2010).

Teacher candidates' external and internal attitude sub-scale scores and overall attitude scores did not differ statistically significantly according to their GPA scores. Teacher candidates with a GPA average above 3.50 had higher attitudes toward mistakes than those with a GPA between 2.00-2.49. The literature supports this finding (Heinze & Reis, 2007). Teacher candidates' high GPAs indicate their success. As a result, successful candidates could be those who care about mistake-instant feedback. In a study, teachers' positive feedback to mistakes led to higher student achievement. As in many other studies (Heinze & Reis, 2007; Schleppenbach et al., 2007), teacher candidates with high GPAs show high instant attitudes toward mistakes.

5. Implications

Studies on variables with high and low attitudes determined by the attitude scale can be conducted in depth or longitudinally to further understand the attitude differences of teacher candidates. It is important to consider the dimensions of "perception-attitude-behavior" when studying the concept of instant feedback to mistakes. By using the smear method, it is possible to examine the relationship between teachers' attitudes and behaviors in depth. Teachers with high attitude scores and teachers with low attitude scores can be identified using the attitude scale. The qualitative study can be continued and differences in teachers' behaviors and attitudes in the classroom can be revealed more clearly.

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