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ACTUAL RESEARCH IN MATHEMATICS AND SCIENCE EDUCATION

Doç. Dr. Tayfun TUTAK

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Genel Yayın Yönetmeni: Yusuf Ziya Aydoğan (yza@egitimyayinevi.com)
Genel Yayın Koordinatörü: Yusuf Yavuz (yusufyavuz@egitimyayinevi.com)
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sevkiyat@egitimyayinevi.com

Kitabevi Şubesi: Eğitim Kitabevi, Şükran mah. Rampalı 121, Meram, Konya, Türkiye
+90 332 499 90 00
bilgi@egitimkitabevi.com

İnternet Satış: www.kitapmatik.com.tr
+90 537 512 43 00
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Hasan KİRİKTİR[1], Gülen ÖNAL KARAKOYUN[2], Erol ASİLTÜRK[3]

ABSTRACT

The aim of this research is to examine the science lesson test anxiety, psychological resilience levels and decision-making skills of middle school 7th and 8th grade students. The research was carried out in Düziçi District of Osmaniye Province in the 2020-2021 academic year. 349 students enrolled in 4 different public middle schools in Düziçi district participated in the research. Participants were randomly selected on a voluntary basis. Data were collected using the Friedben Test Anxiety Scale, Adolescent Resilience Scale, and Adolescent Decision Making Scale. In the data analysis process, t-test was used to reveal the significant difference between the means of two variables, and one-way Analysis of Variance was used to reveal the significant difference between the means of more than two variables. As a result of the research, it was determined that secondary school students' science lesson anxiety levels and decision-making levels were above the average. It was determined that the psychological resilience levels of the students were below the average.

Keywords: Decision Making, Exam Anxiety, Resilience, Science Education

1 Haruniye Middle School, Duzici, Osmaniye, Turkey, ORCID: 0000-0002-7180-241X, e-mail: hasankiriktir80@gmail.com
2 Van Yuzuncu Yil University, Muradiye Vocational High School, Chemistry and Chemical Business Technologies Department, Van, Turkey, ORCID: 0000- 0002-7675-0006, e-mail:gulenonal@yyu.edu.tr
3 Corresponding author: Firat University, Faculty of Education, Science Education Department, Elazig, Turkey, ORCID: 0000-0001-8126-7812, e-mail: ecil@firat.edu.tr

INTRODUCTION

When the education system of our country is examined, it is seen that the number of exams students face is quite high. The high number of exams students face and the fact that students are not fully prepared for these exams tire and affect students both mentally and physically during this process. Among these exams, one of the courses that students have the most difficulty with and get tired of is the science course. Anxiety is a state of arousal that occurs with the mental and emotional changes that an individual experiences when faced with a situation (Stöber, 2004). Exam anxiety is an undesirable mood caused by negative thoughts and behaviors that students feel about the exam. Exam anxiety can range from a low level of anxiety to a level of dread and may occur before or during the exam (Blankstein et al., 1992; Zabun, 2011). The vast majority of students want to be successful in their education life. Exams are measurements that reveal whether students are successful or unsuccessful. For this reason, exams cause anxiety in students. It is thought that the exams that students have to take reveal the fear of failure in students. Exam anxiety negatively affects the efficiency and productivity of the individual and reduces life success (Zeidner, 1996; Liebert & Morris, 1967; Buchwald & Schwarzer, 2003).

The concept of resilience is explained as an effort to provide internal and external balance in difficult and bad processes (Sudom et al., 2014; Lee et al., 2004). When individuals face difficult conditions of life, they need to cope with these difficulties. Resilience undertakes a task that allows individuals to continue their lives and aims to hold on to life. Resilience is the power within the individual to overcome the problems encountered in life (Rutten et al. 2013). Psychological resilience is an individual characteristic that minimizes the undesirable consequences that occur with events such as stress, anxiety and worry, and can prevent the feeling of tension (Gürgân, 2006). People with high levels of psychological resilience are more committed to their ordinary and work lives, take control of their lives and turn unpredictable situations into an opportunity.

Decision-making is the determination of alternatives to take action to reach the goal and the selection of the appropriate alternative among the determined alternatives (Klein, 2008). Individuals are constantly faced with simple or very complex problems throughout their lives and have to make a decision (Eisenhardt, 1999; Fast et al., 2012). When the individual needs to make a decision, the concept of decision-making begins to emerge. Then, by determining a goal, alternatives are searched for it (Tatlılıoğlu, 2010). According to Marco et al. (2003), individuals in the decision-making phase are in an effort to meet their spiritual needs and social expectations.

Central exams have an important place in the process of continuing to a higher education level in our country. Questions about the science course have an

important place in these exams. Students make choices about their next educational institution according to their performance in these exams. Today, getting into a good high school is seen as the key to having a good profession. In the face of an element of pressure such as an exam, students should be able to maintain their calmness and cope with exam anxiety. This is a very difficult and grueling process for students. Factors such as the social environment in which the students live can develop a negative perspective towards the student or the high expectation of success from the students may increase the formation of anxiety in students. This situation may cause students to look at life from a negative perspective and to think that they cannot cope with the difficulties encountered. These situations affect the anxiety level and psychological resilience of the individual. Individuals with high psychological resilience and self-confident in decision-making can overcome the problem of test anxiety.

LITERATURE

Many studies have been conducted to determine how test anxiety affects students' performance. Some studies indicate that test anxiety arises as a result of inadequate preparation of students. As a result of these studies, it was revealed that some students process information irregularly and ineffectively, and therefore students performed poorly in tests (Trifoni, & Shahini, 2011; Naveh-Benjamin et al., 1987). Şahin et al. (2006), as a result of their research, determined that students' test anxiety levels were high and this anxiety started to increase before the individual took the exam. As a result of a study conducted by Yıldırım (2007), it was determined that 46% of the students had high test anxiety levels. Bay et al. (2004) found in a study they conducted that excessive test anxiety both affects the individual negatively and causes a decrease in school success. As a result of another study on test anxiety, it was determined that boys have lower levels of test anxiety than girls (Berengi, 1996). Aral and Başar (1998) found that there is a significant difference between the test anxiety scores of the children of divorced couples and the test anxiety scores of the children of normal family members. The test anxiety scores of the children living in a broken family were higher than the test anxiety scores of the children living in a normal family.

The number of scientific studies examining the science test anxiety levels of students and the factors affecting their test anxiety levels is quite limited (Kabalci, 2008). For this reason, it is very important to examine students' science course exam anxiety. It is very important for students, families and researchers to examine students' test anxiety, psychological resilience and decision-making skills within the scope of the current research. There are many studies on test anxiety alone. However, the number of scientific studies examining three variables together, such as test anxiety, resilience, and decision-making skills, is quite limited. Considering this aspect, it is obvious that the present study will be of great importance.

METHOD

Research Pattern

Since the main purpose of this research is to examine the science course exam anxiety, psychological resilience levels and decision-making skills of secondary school 7th and 8th grade students, the relational screening model was preferred in the research. Relational screening model is a statistical model that helps to determine whether there is a relationship between more than one variable, whether other variables are affected if one of the variables changes, and if there is an effect and change, how it happens (Ilhan, 2019; İlhan,2021; Karasar, 2011; Keçeci, 2018).

Population and Sample

The population of this research consists of 7th and 8th grade students who are enrolled in official public middle schools in Düziçi District of Osmaniye province in the 2020-2021 academic year. The sample of the study consists of 349 randomly selected students (7th and 8th grade students) enrolled in secondary schools in Düziçi district of Osmaniye province. The number of students enrolled in the 7th and 8th grades in the Düziçi district of Osmaniye province during the time the research was conducted was 1996. It is reported in the literature that a sample of 322 people is sufficient for a population of 2000 people (Krejcie and Morgan, 1970). Therefore, in this study, a sample was formed with the number of students representing the universe, or even more. For the research, both students and parents filled and signed the "Volunteer Participation Form".

Data Collection Tools

In this study, three different scales were used as data collection tools. These scales are "Friedben Test Anxiety Scale", "Adolescent Resilience Scale" and "Adolescent Decision Making Scale". Detailed information about these three scales is given below.

Friedben Test Anxiety Scale

The "Friedben Test Anxiety Scale" was developed in 1987 by Friedman and Bendas-Jacob (Friedman, & Bendas-Jacob, 1997; Bados and Sanz, 2005). The validity and reliability studies of the Turkish version of the scale were carried out by Akın and his/her colleagues (Akın et al., 2013). The scale was prepared to determine the test anxiety levels of the participants. Items 2, 3, 8, 10, and 24 of the scale, which consists of 23 items in total, are reverse items (Acar, 2019). While scoring the items in the scale, a six-point scoring system was used. There is a ranking from "I am absolutely not suitable for me (1 point)" to "Absolutely suitable for me (6 points)". Since studies on the validity of the scale were previously studied by both Akın (2013) and Acar (2019), and it was stated that the validity was high, no study was conducted regarding the validity of the scale in the research. Within the scope of this research, Cronbach Alpha analysis was performed to determine

the reliability coefficient of the scale. The Cronbach Alpha coefficient of the scale was found to be 0.858. While this scale was applied to the students in this study, the students were asked to understand the science exams from the word "exam" in the scale and to answer the questions in the scale by considering the science exams. Therefore, with this scale, it was tried to determine the anxiety levels of the participants about the science exams. If the scores obtained from the test anxiety scale were high, it was accepted that the test anxiety levels were also high. Similarly, if the scores obtained from this scale were low, it was accepted that the test anxiety levels were also low.

Adolescent Decision Making Scale

"Adolescent Decision Making Scale" was developed by Mann et al., (1989). Çolakkadioğlu and Güçray (2007) carried out the translation of the scale into Turkish and its validity and reliability studies. The scale, which mainly aims to collect data on self-esteem in decision making and methods of overcoming obstacles in decision making, consists of 30 items. Items 2,4 and 6 of the scale are reverse items. While scoring the items in the scale, a four-point scoring system was used. There is a ranking from "never true for me (1 point)" to "always true for me (4 points)". Since studies on the validity of the scale were previously studied by Çolakkadioğlu and Güçray (2007), and it was stated that the validity was high, no study was conducted regarding the validity of the scale within the scope of this research. Within the scope of this research, Cronbach Alpha analysis was performed to determine the reliability coefficient of the scale. The Cronbach Alpha coefficient of the scale was found to be 0.763. If the scores obtained from the Adolescent Decision-Making Scale are high, it is accepted that the decision-making levels are also high. Similarly, if the scores obtained from this scale were low, it was accepted that the level of decision making was low.

Adolescent Resilience Scale

"Adolescent Resilience Scale" was developed by Bulut, et al. (2012). The scale, which mainly aims to collect data on adjustment, empathy, family support, peer support, school support and determination to struggle, consists of 29 items. Items 7, 10, 11, 14, 15, 16, 17, 22, 23 and 26 of the scale are reverse items. While scoring the items in the scale, a four-point scoring system was used. There is a ranking from "not suitable for me at all (1 point)" to "very suitable for me (4 points)". Since studies on the validity of the scale were previously studied by et al. (2012), and it was stated that the validity was high, no study was conducted on the validity of the scale in this study. Within the scope of this research, Cronbach Alpha analysis was performed to determine the reliability coefficient of the scale. The Cronbach Alpha coefficient of the scale was found to be 0.768. An increase in the scores obtained from the scale indicates a high level of psychological resilience (Bulut, et al., 2012)

Data Collection

For the study, the scales mentioned above were prepared online via Google Forms, the web link of the forms was taken and saved. It is requested that the questions in the online survey be read carefully and answered honestly. It has been stated that the information in the questionnaire they answered online will not be shared with a third party and will only be used for research. In the explanation part before the survey, students were asked to understand the science exams from the word "exam" in the Friedben Exam Anxiety Scale and to answer the questions in the scale by taking the science exams into account. Therefore, with this scale, it was tried to determine the anxiety levels of the participants about the science exams. 349 students participated in the online survey study. In order to ensure that the items are not missing in the applied online survey form and that all the questions of the survey are answered, it has been adjusted via Google Forms to make it mandatory to answer the items. Thus, no item could be passed without being answered. In addition, the contact information of the researcher was written in the explanations section of the questionnaire in order for the students to be able to contact when they deem necessary. Data for the study were collected between April and July 2021.

Analysis of Data

The data collected online were stored in the computer environment and transferred to the SPSS program after this storage process. Descriptive statistical analyzes were made about the demographic characteristics and demographic thoughts of the participants, and the results of this analysis were presented as frequency and percentage. The independent samples t-test was used for the significance of the difference between two variables, and the One Way Analysis of Variance (ANOVA) was used for the significance of the difference between more than two independent variables. The mean and standard deviation values were calculated for each of the "Exam Anxiety Scale", "Psychological Resilience Scale" and "Decision Making Scale" completed by the students.

FINDINGS

Descriptive statistics about the demographic characteristics of the participants were made and the results are presented in Table 1 as frequency and percentage.

Table 1. Descriptive Statistics on the Demographic Characteristics of the Participants

Demographics (N=349)		**Frequency**	**Percentage (%)**
Gender	Male	146	41.8
	Female	203	58.2
Class	7th grade	178	51.0
	8th grade	171	49.0
Age	12	46	13.2
	13	165	47.3
	14	138	36.5
Is Mother Alive?	Yes	349	100.0
	No	000	000
Is Dad Alive?	Yes	347	99.4
	No	002	0.6
Are Parents Together?	Yes	329	94.3
	No	20	05.7
Mother Self?	Yes	346	99.1
	No	003	00.9
Father Self?	Yes	344	98.6
	No	005	01.4
Family Income Status	Very good	037	10.6
	Good	265	75.9
	Bad	042	12.0
	Too bad	005	1.4
Number of siblings	0-2	172	49.3
	3-5	158	45.3
	more than 5	019	05.4

In this study, in which a total of 349 students participated, 58.2% of the participants were female and 41.8% were male students. 51% of the students participating in the research are in the 7th grade and 49% are in the 8th grade. 13.2% of the students are 12 years old, 47.3% are 13 years old and 36.5% are 14 years old. The mothers of all participants are alive. The father of 0.6% of the participants is not alive. While the parents of 94.3% of the participants are together, the parents of 5.7% are not together. While the mother of 99.1% of the participants is their own mother, 0.9% of them are stepchildren. While the father of 98.6% of the participants is their own, 1.4% of them are stepchildren. The family income of 10.6% of the participants is very good, 75.9% of them have a good family income, 12% of them have a bad family income and 1.4% of them have a very bad family income. 49.3% of the participants had 0-2 siblings, 45.3% had 3-5 and 5.4% had more than five siblings.

Since the participants were determined on a voluntary basis, no effort was made to equalize the number of male and female students. For this reason, it is seen that the rate of female students is slightly higher than male students. Approximately half of

the participants are 7th grade students, while the other half are 8th grade students. In this sense, it can be said that there is a balanced distribution in terms of class level. The age of the participants is between 12-14 years. The number of siblings of nearly half of the participants is in the range of 0-2. When the demographic characteristics of the participants are examined carefully, the difference between the variability of "mother is alive", "father is alive", "mother is self" and "father is essence" is very high. For example, 99.1% of the participants are their mothers, while 0.9% are stepchildren. The difference between the proportion of participants whose mother is their own mother and the ratio of those whose mother is a stepmother is very large. The large difference between the variable groups, as in this example, makes it impossible to perform difference analysis. For this reason, difference analyzes were not performed for the cases/variables of "mother being alive", "father being alive", "mother being core" and "father being core".

Descriptive statistics about the demographic thoughts of the participants were made and the results are presented in Table 2 as frequency and percentage.

Table 2. Descriptive Statistics Regarding the Demographic Opinions of the Participants

Demographic Considerations (N=349)		**Frequency**	**Percentage (%)**
Does your family consent to you making your own decisions?	Yes	112	32.1
	Sometimes	214	61.3
	No	023	06.6
How do your parents treat you?	Democratic	226	64.8
	Authoritarian	117	33.5
	Irrelevant	006	01.7
What is your daily work hours?	2 hours or less	152	43.6
	3-5 hours	180	51,6
	more than 5 hours	017	04.9
With which document did you pass the class last year?	Undocumented	003	00.9
	Thanks	060	17.2
	Discretion	286	81.9

"Does your family consent to you making your own decisions?" 61.3% of the participants gave the answer "sometimes" to the question. While the rate of those who answered "yes" to this question was 32.1%, the rate of those who said "no" was 6.6%. While 61.3% of the participants described their parents' attitude towards them as "democratic", 33.5% described them as "authoritarian" and 1.7% as "irrelevant". 51.6% of the participants stated that they work between 3-5 hours a day. While the rate of participants stating that they work 2 hours or less a day is 43.6%, the rate of participants who state that they work more than 5 hours a day is 4.9%. 81.9% of the participants passed their classes with a certificate of appreciation in the previous year. While the rate of participants who passed their

class with a certificate of appreciation is 17.2%, the rate of participants who passed their class without a certificate is 0.9%.

The mean and standard deviation values for each scale were calculated based on the answers given by the students to the items/statements in the "Science Class Exam Anxiety Scale", "Psychological Resilience Scale" and "Decision Making Scale". The mean and standard deviation values of the scales used in the study are given in Table 3.

Table 3. Mean and Standard Deviation Values of the Scales

Scale	Average	Standard deviation	Minimum score	Maksimum score
Science Lesson Exam Anxiety	3,34	0,837	1	6
Psychological resilience	1,81	0,444	1	4
To decide	2,30	0,264	1	4

The items/statements of the Science Course Exam Anxiety Scale used in this study were scored between 1-6 points. The average of a score made in this way is 3. The average of the answers given by the students to the items of the "Science Class Exam Anxiety" scale was calculated as 3.34 (standard deviation 0.837). This means that students' science course test anxiety levels are higher than the average. Items/statements of the "Psychological Resilience" scale were scored between 1-4 points. The average of the answers given by the students to the items of the "Psychological Resilience" scale was calculated as 1.81 (standard deviation 0.444). This means that the psychological resilience levels of the students are lower than the average. Items/statements of the "Decision Making" scale were scored between 1-4 points. The average of a score made in this way is 2. The average of the answers given by the students to the items of the "Decision Making" scale was calculated as 2.30 (standard deviation of 0.264). This means that students' decision-making levels are higher than the average.

A t-test was conducted to understand whether the students' science lesson anxiety, psychological resilience and decision-making levels differ according to whether they are males or females. The t test analysis results are given in Table 4.

Table 4. The Status of Differentiation of the Perceptions of the Participants by Gender (t-Test)

Variable	Gender	Average	Standard deviation	t	Sig.
Science Lesson Exam Anxiety	Male	3.14	0.71	11.38	0.00
	Female	3.48	0.88		
Psychological resilience	Male	1.80	0.43	0.15	0.64
	Female	1.82	0.45		
To decide	Male	2.28	0.31	9.19	0.10
	Female	2.33	0.22		

When the p value (the value given as Sig. in the table) for the differentiation of students' science lesson anxiety levels according to the gender of the students is examined, it is seen that this value is less than 0.05 (p=0.00). Since p < 0.05, it was concluded that there is a significant difference between the science lesson anxiety level of female students and the science lesson anxiety level of male students. When the averages are examined, it is understood that the science lesson anxiety levels of female students are higher than the science lesson anxiety levels of male students. When the p value for the differentiation of students' psychological resilience levels according to the gender of the students is examined, it is seen that this value is greater than 0.05 (p=0.64). In this case, it was concluded that the gender of the students did not have an effect on the level of resilience and that there was no significant difference between the resilience levels of female students and the psychological resilience levels of male students. Considering the p value for the differentiation of students' decision-making levels according to the gender of the students, it is seen that this value is greater than 0.05 (p=0.10). In this case, it was concluded that the gender of the students did not have an effect on the decision-making level and that there was no significant difference between the decision-making levels of female students and male students.

A t-test was conducted to understand whether the students' science lesson anxiety, psychological resilience and decision-making levels differ according to the students' grade levels (being in the 7th or 8th grade). The t test analysis results are given in Table 5.

Table 5. Differentiation of Participants' Perceptions According to Grade Levels

Variable	Grade	Average	Standard deviation	t	Sig.
Science Lesson Exam Anxiety	7th grade	3.43	0.82	0.29	0.93
	8th grade	3.33	0.85		
Psychological resilience	7th grade	1.75	0.41	0.75	0.00
	8th grade	1.88	0.46		
To decide	7th grade	2.32	0.25	0.39	0.21
	8th grade	2.29	0.27		

Considering the p value for the differentiation of students' science lesson anxiety levels according to the grades of the students, it is seen that this value is greater than 0.05 (p=0.93). In this case, it was understood that the grade level of the students did not have an effect on the students' science lesson test anxiety level and there was no significant difference between the test anxiety levels of the 7th grade students and the 8th grade students' test anxiety levels. When the p value for the differentiation of students' psychological resilience levels according to the classes of the students is examined, it is seen that this value is less than 0.05 (p=0.00). Since p < 0.05, it was concluded that there is a significant difference between the psychological resilience level of the 7th grade students and the psychological

resilience level of the 8th grade students. Looking at the averages, it is understood that the psychological resilience levels of the 8th grade students are higher than the psychological resilience levels of the 7th grade students. Considering the p value for the differentiation of students' decision-making levels according to the grades of the students, it is seen that this value is greater than 0.05 (p=0.21). In this case, it was understood that the grade level of the students did not have an effect on the decision-making level of the students, and there was no significant difference between the decision-making level of the 7th grade students and the 8th grade students' decision-making level.

A t-test was conducted to understand whether the students' science lesson anxiety, psychological resilience and decision-making levels differ according to the state of being together with their parents. The t test analysis results are given in Table 6.

Table 6. Differentiation of Participants' Perceptions According to Their Parents' Being Together

Variable	Are parents together?	Average	Standard deviation	t	Sig.
Science Lesson Exam Anxiety	Yes	3.34	0.84	0.02	0.71
	No	3.27	0.76		
psychological resilience	Yes	1.80	0.44	0.03	0.18
	No	1.95	0.45		
To decide	Yes	2.29	0.24	43.07	0.04
	No	2.52	0.45		

When the p value for the differentiation of students' science lesson anxiety levels according to the state of being together with their parents, it is seen that this value is greater than 0.05 (p=0.71). In this case, it was understood that the coexistence of the students' parents did not have an effect on the students' science lesson test anxiety level, and there was no significant difference between the test anxiety levels of the students whose parents were together and the test anxiety levels of the students whose parents were not together. Considering the p value for the differentiation of students' psychological resilience levels according to the state of being together with their parents, it is seen that this value is greater than 0.05 (p=0.18). In this case, it was understood that the state of being together with the parents of the students did not have an effect on the level of resilience, and there was no significant difference between the psychological resilience levels of the students whose parents were together and the psychological resilience levels of the students whose parents were not together. When the p value for the differentiation status of the students' decision-making levels according to the state of being together with the parents of the students is examined, it is seen that this value is less than 0.05 (p=0.04). Since $p < 0.05$, it was concluded that there is a significant difference between the decision-making level of the students whose parents are together and the decision-making level of the students whose parents are not together. When the averages are examined, it is understood that the decision-making levels of the

students whose parents are not together are higher than the decision-making levels of the students whose parents are together.

A one-way ANOVA test was conducted to understand whether the science lesson anxiety, psychological resilience and decision-making levels of the students differ according to the age of the students, and if there is, to determine between which age groups there is a differentiation. One-way ANOVA test analysis results are given in Table 7.

Table 7. The Differences in Perceptions of the Participants by Age

Variable	Age	Average	Standard deviation	F	Sig.	Scheffe
Science Lesson Exam Anxiety	12	3,25	0.82	0.30	0.73	-
	13	3.34	0.81			
	14	3,36	0.87			
Psychological resilience	12	1.70	0.48	2.68	0.03	1-3
	13	1,80	0.43			
	14	1.87	0,43			
To decide	12	2.30	0.23	0.04	0.95	-
	13	2.31	0.24			
	14	2.30	0.29			

Considering the p value for the differentiation of students' science lesson anxiety levels according to the ages of the students, it is seen that this value is greater than 0.05 (p=0.73). In this case, it was understood that the age of the students did not have an effect on the science course test anxiety level of the students and there was no significant difference between the test anxiety levels of the students aged 12 and the test anxiety levels of the students aged 13 and 14.

When the p value is examined in order to determine whether the psychological resilience levels of the students differ according to the ages of the students, it is seen that this value is less than 0.05 (p=0.03). Since $p < 0.05$, it was concluded that there was a significant difference between the psychological resilience levels of students aged 12, 13 and 14. Scheffe test was performed in order to determine the significant difference between which age groups. The results of this test show that there is a significant difference between the resilience levels of 12-year-old students and the resilience levels of 14-year-old students. When the averages are considered, it is understood that the psychological resilience levels of 14-year-old students are higher than the psychological resilience levels of 12-year-old students. Considering the p value for the differentiation of students' decision-making levels according to the age of the students, it is seen that this value is greater than 0.05 (p=0.95). In this case, it was understood that the age of the students did not have an effect on the decision-making level of the students, and there was no significant

difference between the decision-making levels of the students aged 12 and the decision-making levels of the students aged 13 and 14.

A one-way ANOVA test was conducted to understand whether the science lesson anxiety, psychological resilience and decision-making levels of the students differ according to the income level of the students' families, and if there is, to determine between which income levels there is a differentiation. One-way ANOVA test analysis results are given in Table 8.

Table 8. Differentiation of Participants' Perceptions According to Their Families' Income Level

Variable	family income	Average	Standard deviation	F	Sig.	Scheffe
Science Lesson Exam Anxiety	Very good	3.03	0.71	8.14	0.00	1-3 1-4 2-3 2-4
	Good	3.29	0.82			
	Bad	3.74	0.82			
	Too bad	4,40	0.08			
Psychological resilience	Very good	1.58	0.44	5.34	0.00	1-2 1-3 1-4
	Good	1.82	0.43			
	Bad	1.94	0.46			
	Too bad	2.06	0.23			
To decide	Very good	2.39	0.26	2.71	0.04	1-3
	Good	2.31	0.26			
	Bad	2.22	0.25			
	Too bad	2.27	0.13			

When the p value is examined to determine whether the income level of the students' families has an effect on the science course exam anxiety level of the students, it is seen that this value is less than 0.05 (p=0.00). Since $p < 0.05$, it was concluded that there was a significant difference between the science lesson exam anxiety levels of the students whose families had very good, good, bad and very bad income levels. Scheffe test was used to determine the significant difference between which income levels. The results of this test show that there is a significant difference between the test anxiety levels of students with very good family income and students with bad and very bad family income levels. The results of the Scheffe test also show that there is a significant difference between the test anxiety levels of students with good family income and students with bad and very bad family income. When the averages are considered, it is understood that the test anxiety levels of the students with a very bad family income level are the highest, followed by the students with a bad, good and very good family income level, respectively. In other words, the worse the family's income level, the higher the test anxiety level of the students. When the p value is examined to determine whether the income level of the students' families has an effect on the psychological resilience levels of the students, it is seen that this value is less than 0.05 (p=0.00). Since $p < 0.05$, it was concluded that there was a significant difference between the

psychological resilience levels of students whose families had very good, good, bad and very bad income levels. Scheffe test was used to determine the significant difference between which income levels. The results of this test show that there is a significant difference between the psychological resilience levels of students with very good family income and students with good and bad family income levels. When the averages are examined, it is seen that the psychological resilience levels of the students with very bad family income levels are the highest. Similarly, the psychological resilience levels of the students with a low family income level are higher than the psychological resilience levels of the students with a high family income level. The averages also show that the psychological resilience levels of the students with a good family income level are higher than the psychological resilience levels of the students with a high family income level. When the p value is examined to determine whether the income level of the students' families has an effect on the decision-making levels of the students, it is seen that this value is less than 0.05 (p=0.04). Since $p < 0.05$, it was concluded that there was a significant difference between the decision-making levels of students whose families had very good, good, bad and very bad income levels. Scheffe test was used to determine the significant difference between which income levels. The results of this test show that there is a significant difference between the decision-making levels of students with very good family income and students with low family income. When the averages are examined, it is understood that the decision-making levels of the students with a very good family income level are higher than the decision-making levels of the students with a low family income.

A one-way ANOVA test was conducted to understand whether the science lesson test anxiety, psychological resilience and decision-making levels of the students differ according to the number of siblings of the students, and if there is, to determine in which number of siblings there is a differentiation. One-way ANOVA test analysis results are given in Table 9.

Table 9. Differentiation of the Perceptions of the Participants According to the Number of Siblings

Variable	Number of siblings	Average	Standard deviation	F	Sig.	Scheffe
Science Lesson Exam Anxiety	0-2	3.35	0.85	0.64	0.52	-
	3-5	3.29	0.82			
	more than 5	3.51	0.76			
Psychological resilience	0-2	1.79	0.43	3.54	0.03	1-3
	3-5	1.81	0.44			
	more than 5	2.07	0.47			

	0-2	2.31	0.26			
To decide	3-5	2.29	0.27	0.74	0.47	-
	more than 5	2.36	0.20			

Considering the p value for the differentiation of students' science lesson anxiety levels according to the number of siblings of the students, it is seen that this value is greater than 0.05 (p=0.64). In this case, it was found that the number of siblings of the students did not have an effect on the students' science course exam anxiety levels and there was no significant difference between the science course exam anxiety levels of the students who had 0-2 siblings, 3-5 siblings, and more than 5 siblings. It was concluded that there was no difference. When the p value for the differentiation of the psychological resilience levels of the students according to the number of siblings of the students is examined, it is seen that this value is less than 0.05 (p=0.03). Since $p < 0.05$, it was concluded that there was a significant difference between the psychological resilience levels of students with 0-2 siblings, 3-5 siblings, and more than 5 siblings. Scheffe test was used to determine which number of siblings there was a significant difference between levels. The results of this test show that there is a significant difference between the psychological resilience levels of students with more than 5 siblings and students with 0-2 siblings. When the averages are examined, it is understood that the psychological resilience levels of the students with more than 5 siblings are higher than the psychological resilience levels of the students with 0-2 siblings. Considering the p value for the differentiation of students' decision-making levels according to the number of siblings of the students, it is seen that this value is greater than 0.05 (p=0.64). In this case, it was concluded that the number of siblings of the students did not have an effect on the decision-making levels of the students and there was no significant difference between the decision-making levels of the students with 0-2 siblings, 3-5 siblings, and more than 5 siblings.

A one-way ANOVA test was conducted to understand whether the science course anxiety, psychological resilience and decision-making levels of the students differ according to the level of consent of the students' families to their own decisions, and if there is, to determine which levels of consent there are differences. One-way ANOVA test analysis results are given in Table 10.

Table 10. The Differences in the Perceptions of the Participants according to the Level of Consent of the Families to Their Own Decisions

Variable	Does your family consent to you making your own decisions?	Average	Standard deviation	F	Sig.	Scheffe
Science Lesson Exam Anxiety	Yes	3.04	0.72	10.79	0.00	1-2
	Sometimes	3.47	0.87			
	No	3.54	0.64			1-3

Psychological resilience	Yes	1.64	0.45	16.05	0.00	1-2 1-3
	Sometimes	1.87	0.40			
	No	2.09	0.43			
To decide	Yes	2.28	0.22	0.66	0.51	-
	Sometimes	2.32	0.28			
	No	2.29	0.23			

When the p value is examined to determine whether the science lesson anxiety levels of the students differ according to the level of consent of the students' families to their own decisions, it is seen that this value is less than 0.05 (p=0.00). Since $p < 0.05$, it was concluded that there was a significant difference between the science course exam anxiety levels of the students who answered "yes", "sometimes" and "no" to the question (Does your family consent to make your own decisions?). Scheffe test was used to determine which students had a significant difference in their test anxiety levels. The results of this test show that there is a significant difference between the test anxiety levels of the students who answered "yes" to the question and those who answered "sometimes" and "no". Looking at the averages, it is understood that the students who answered "no" to the mentioned question had the highest test anxiety levels, followed by the anxiety levels of the students who answered "sometimes" and "yes", respectively. When the p value is examined to determine whether the psychological resilience levels of the students differ according to the level of consent of the students' families to their own decisions, it is seen that this value is less than 0.05 (p=0.00). Since $p < 0.05$, it was concluded that there was a significant difference between the psychological resilience levels of the students who answered "yes", "sometimes" and "no" to the question. Scheffe test was conducted to determine which students had a significant difference between their psychological resilience levels. The results of this test show that there is a significant difference between the psychological resilience levels of the students who answered "yes" to the question and those who answered "sometimes" and "no". When the averages are examined, it is understood that the psychological resilience levels of the students who answered "no" to the aforementioned question were the highest, followed by the psychological resilience levels of the students who answered "sometimes" and "yes", respectively. When the p value for the differentiation of the students' decision making levels according to the level of consent of the students' families to their own decisions is examined, it is seen that this value is greater than 0.05 (p=0.51). In this case, it was concluded that the level of consent of the students' families to their own decisions did not have an effect on the decision-making levels of the students and that there was no significant difference between the decision-making levels of the students who answered "yes", "sometimes" and "no" to the question.

A one-way ANOVA test was conducted to understand whether the students' science lesson test anxiety, psychological resilience and decision-making levels

differ according to the parents' attitudes and, if there is, to determine between which attitude levels there is a differentiation. One-way ANOVA test analysis results are given in Table 11.

Table 11. The Differences in Perceptions of the Participants by Parental Attitudes

Variable	How do your parents treat you?	Average	Standard deviation	F	Sig.	Scheffe
Science Lesson Exam Anxiety	Democratic	3.16	0.83	14.59	0,00	1-2
	Authoritarian	3.65	0.76			
	Irrelevant	3.63	0.48			
Psychological resilience	Democratic	1.68	0.40	46.49	0,00	1-2 1-3 2-3
	Authoritarian	2.03	0.38			
	Irrelevant	2.74	0.31			
To decide	Democratic	2.29	0.44	1.67	0,19	-
	Authoritarian	2.32	0.27			
	Irrelevant	2.48	0.23			

Considering the p value for the differentiation of students' science lesson anxiety levels according to the attitudes of the students' parents, it is seen that this value is less than 0.05 (p=0.00). Since $p < 0.05$, it was concluded that there was a significant difference between the science course exam anxiety levels of the students who answered "democratic", "authoritarian" and "irrelevant" to the question about their parents' attitudes towards them. Scheffe test was used to determine which student groups had a significant difference in test anxiety levels. The results of this test show that there is a significant difference between the test anxiety levels of the students who answered the question "democratic" and those who answered "authoritarian". Looking at the averages, it is understood that the test anxiety levels of the students who gave the "authoritarian" answer to the aforementioned question were higher than the science course exam anxiety levels of the students who gave the "democratic" answer. When the p value of the students' psychological resilience levels differ according to the attitudes of the students' parents, it is seen that this value is less than 0.05 (p=0.00). Since $p < 0.05$, it was concluded that there was a significant difference between the psychological resilience levels of the students who answered "democratic", "authoritarian" and "irrelevant" to the aforementioned question. Scheffe test was used to determine which student groups had a significant difference in test anxiety levels. The results of this test show that there is a significant difference between the test anxiety levels of the students who answered the question "democratic" and those who answered "authoritarian" and "irrelevant". When the averages are examined, it is understood that the psychological resilience levels of the students who gave the "irrelevant" answer to the aforementioned question were the highest, followed by the psychological resilience levels of the students who gave the "authoritarian" and

"democratic" answers, respectively. Considering the p value for the differentiation of students' decision-making levels according to the level of students' parents' attitudes, it is seen that this value is greater than 0.05 (p=0.19). In this case, it was determined that the attitudes of the students' parents did not have an effect on the decision-making levels of the students.

A one-way ANOVA test was conducted to understand whether the science lesson test anxiety, psychological resilience and decision-making levels of the students differ according to the daily study hours of the students, and if there is, to determine how many hours of study there are differences. One-way ANOVA test analysis results are given in Table 12.

Table 12. Differentiation of Participants' Perceptions According to Daily Study Hours

Variable	how many hours do you study per day	Average	Standard deviation	F	Sig.	Scheffe
Science Lesson Exam Anxiety	2 hours or less	3.34	0.83	1.10	0.33	-
	3-5 hours	3.36	0.83			
	more than 5 hours	3.05	0.90			
Psychological resilience	2 hours or less	1.91	0.48	6.82	0.01	1-3
	3-5 hours	1.75	0.39			
	more than 5 hours	1.63	0.40			
To decide	2 hours or less	2.30	0.26	0.49	0.60	-
	3-5 hours	2.37	0.26			
	more than 5 hours	2.30	0.27			

When the p value of the students' science lesson test anxiety levels differ according to the daily study hours of the students, it is seen that this value is greater than 0.05 (p=0.33). In this case, it is understood that the daily study hours of the students do not have an effect on the students' science lesson exam anxiety levels. When the p value is examined in order to determine whether the daily study hours of the students have an effect on the psychological resilience levels of the students, it is seen that this value is less than 0.05 (p=0.01). Since $p < 0.05$, it was concluded that there is a significant difference between the psychological resilience levels of the students who work "2 hours or less", "between 3-5 hours" and "more than 5 hours" daily. Scheffe test was conducted to determine which student groups had a significant difference in their resilience levels. The results of this test show that there is a significant difference between the psychological resilience levels of the students who study "2 hours or less" per day and the psychological resilience levels of the students who study "more than 5 hours" daily. When the averages are considered, it has been concluded that the psychological resilience levels of the students who study "more than 5 hours" per day are higher than the psychological resilience levels of the students who study "2 hours or less" daily. Considering the p value for the differentiation of students' decision-making levels according to

the daily study hours of the students, it is seen that this value is greater than 0.05 (p=0.60). In this case, it is understood that the daily study hours of the students do not have an effect on the decision-making levels of the students.

DISCUSSION AND CONCLUSION

Students' science lesson test anxiety levels are higher than the average. The reason for this may be that the science course has an important place in the High School Entrance Examination (HSG), which is the exam that students will take at the end of the semester. In our country, new generation questions have been asked in HSG exams since the last few years. Since students are not accustomed to such questions, they have more difficulty in solving new generation questions. This situation may have caused the students' science course exam anxiety scores to be high. It was determined that the psychological resilience levels of the students were lower than the average. Students may have gained the habit of giving up the struggle when they encounter a problem from their childhood. Due to such situations, the psychological resilience levels of the students may have been lower than the average. The low level of psychological resilience of students may also be due to the student's own character or family. An individual who has always lived as a recessive character has difficulty in showing initiative and when faced with a problem, he may ignore the problem or become more shy rather than solving the problem. The level of psychological resilience of an individual with such a character will be low. Individuals who do not have a say in the family and who are brought up in an authoritarian family cannot put forward their own solutions, their own ideas, their own thoughts. Such individuals are guided by the thoughts and ideas of their families. This prevents the individual from taking responsibility for his own mistakes and problems. Because the decision maker is not an individual, the individual does not take any responsibility. As a result, the reasons for the low level of psychological resilience of the students may be the lack of self-confidence of the individual, the inability of the individual to make decisions independently of their families, and the authoritarian attitudes of the families towards the individual. Students' decision making levels are higher than average. The high level of decision making of the students shows that the students participating in the research generally do not avoid making decisions.

As a result of this study, it was found that the science course exam anxiety levels of female students were higher than that of male students. In our country, the education level of female students has remained lower than male students for many years. This fact may have put a general pressure on girls who want to increase their education level and may have increased their test anxiety. Even if boys are not successful in their education life, they are more advantageous than girls in terms of making a living through alternatives such as various industrial establishments or starting a business life. The fact that there are not many alternatives other than

having various job opportunities by increasing the level of education may be another reason why girls have more test anxiety than boys. In a study conducted by Gençdoğan (2002), similar to the results of the current study, it was determined that the test anxiety scores of female students were higher than that of male students. Similarly, Şahin (2006) et al., in a study they conducted on senior secondary school students, found that girls' test anxiety scores were higher than boys' test anxiety scores. Kısa (1996) also found a significant difference between the test anxiety scores of male and female students in his study. As a result of this research, it was determined that there was no significant difference between the psychological resilience levels of female students and the psychological resilience levels of male students. In today's conditions, all students, regardless of male or female students, struggle with their living conditions. Therefore, the psychological resilience levels of female and male students were close to each other. As a result of this research, it was determined that there was no significant difference between the decision-making levels of female students and the decision-making levels of male students. According to Deniz (2002), the decision-making skill, which begins with the formation of individuals in the early stages of their development, is continuous. The results of this study show that children, regardless of boys or girls, begin to gain decision-making skills in the family environment at an early age.

There is no significant difference between the science lesson test anxiety levels of the 7th grade students and the science lesson test anxiety levels of the 8th grade students. This may be due to the fact that 7th grade education is the basis for 8th grade and students see 7th grade as a preparation for 8th grade. The resilience levels of the 8th grade students are higher than the 7th grade students' psychological resilience levels. Regarding this situation, it can be commented that since 8th grade students are developmentally older than 7th grade students, the psychological resilience level of these students is higher. Another reason for this situation may be that 8th grade students will take the HSG exam at the end of the semester, and for this reason, students may try to motivate themselves more. These efforts may also have increased the resilience levels of 8th grade students. There is no significant difference between the decision making level of the 7th grade students and the 8th grade students' decision making level. Although 7th grade and 8th grade students have a developmental difference, they do not show a difference in terms of decision making. This situation shows that 7th grade and 8th grade students do not delay their decisions while making decisions and they make decisions in accordance with the problem they face.

There is no significant difference between the science course test anxiety levels of the students whose parents are together and the test anxiety levels of the students whose parents are not together. There is no significant difference between the psychological resilience levels of the students whose parents are

together and the psychological resilience levels of the students whose parents are not together. If the parents of children whose parents are not together, support the child separately, the development of the child can continue in its normal course. For this reason, a significant difference in psychological resilience levels may not have been observed. It was found that the decision-making levels of the students whose parents were not together were higher than the decision-making levels of the students whose parents were together. One of the reasons for the high decision-making levels of children whose parents are not together may be that children who are not accompanied by one of their parents have entered the maturation process earlier. Another reason for this situation may be that the parents of children whose parents are not together may respect and give importance to the child's decisions in order to make their children happy.

There is no significant difference between the Science course exam anxiety levels of the students aged 12 and the science course anxiety levels of the students aged 13 and 14. Children develop together with their friends in the classroom environment since primary school. This may have caused the children to experience the same level of anxiety in the same environment. The resilience levels of 14-year-old students are higher than the resilience levels of 12-year-old students. This may be due to the fact that students become more mature as their age increases. Students in adolescence can easily express their ideas and opinions about a subject, make decisions without being dependent on other individuals, and feel free (Köse, 2002). Therefore, as the age of the students increases, their level of psychological resilience also increases. However, no significant difference was found between the decision-making levels of the students aged 12 and the decision-making levels of the students aged 13 and 14.

Students with a very bad family income level have higher science course exam anxiety levels compared to others. Then, it is understood that the test anxiety levels of the students whose family income is bad, good and very good, respectively. A child with a low family income knows that the situation of his family is bad and thinks that he needs to work harder in order to change this situation in the future. This situation leads to an increase in exam anxiety in science lessons. However, this level of anxiety is not so high in families with good economic status and very well. Because the family does not have any financial problems, their children are accustomed to a relatively comfortable life. Therefore, they do not feel and experience much anxiety. We can also consider this situation for science course exam anxiety. The psychological resilience levels of the students whose family income level is very bad are higher than the others. The psychological resilience levels of the students with a low family income level are higher than the psychological resilience levels of the students with a very good family income level. The reason for the high psychological resilience of students whose families have a low income level may be due to the fact that the individual struggles with difficult life conditions from childhood and this struggle strengthens the individual.

Maşrabacı (1994), Aktaş (2011), Baybek & Yavuz (2005), Ceylan (2013) and İkiz (2000), who conducted research on family income and resilience, also found similar results to the results of the current study. Decision-making levels of students with a very good family income level are higher than those of students with a bad family income level.

The number of siblings in the family did not have an effect on the science course test anxiety. It has been determined that the psychological resilience level of students with more than 5 siblings is higher than the psychological resilience level of students with 0-2 siblings. As the number of members in the family increases, the problems experienced by each individual become different and varied. Since the family is together, they solve this problem together. This makes it easier to cooperate among individuals and to cope with difficulties. For these reasons, the psychological resilience level of individuals with more siblings may be higher than individuals with fewer siblings. There was no significant difference between the decision-making levels of students with 0-2 siblings, 3-5 siblings, and more than 5 siblings.

"Does your family consent to you making your own decisions?" There is a significant difference between the science course exam anxiety levels of the students who answered "yes" to the question and the students who answered "sometimes" and "no". Students who answered "no" to the aforementioned question had the highest level of anxiety in the science course. This is followed by the Science course exam anxiety levels of the students who answered "sometimes" and "yes", respectively. The decision of families on behalf of individuals may have caused an increase in science lesson exam anxiety in individuals. Basically, the decision of the parents on behalf of the child may cause the child to have a high level of test anxiety towards the science lesson, since the child is not given responsibility. Mothers and fathers who respect the decisions of the individual also had low anxiety levels in science lessons. There is a significant difference between the psychological resilience levels of the students who answered "yes" to the aforementioned question and those who answered "sometimes" and "no". Students who answered "no" to the aforementioned question had the highest levels of psychological resilience. This is followed by the psychological resilience levels of the students who answered "sometimes" and "yes", respectively. There is no significant difference between the decision-making levels of the students who answered "yes", "sometimes" and "no" to the aforementioned question.

"How do your parents treat you?" There is a significant difference between the science course exam anxiety levels of the students who answered "democratic" and the students who answered "authoritarian" to the question. The Science course exam anxiety levels of the students who answered "authoritarian" to the aforementioned question were higher than the Science course exam anxiety levels of the students who gave the "democratic" answer. As a result of different studies

in the literature, similar to the results of the current study, it was determined that the children of parents with authoritarian attitudes felt more anxiety than the children of parents with democratic attitudes (Akgün et al., 2007). The pressure of the families on the individual may have caused the students' science course exam anxiety levels to be high. There is a significant difference between the psychological resilience levels of the students who answered "democratic" to the aforementioned question and those who answered "authoritarian" and "irrelevant". When the averages are examined, it is understood that the psychological resilience levels of the students who answered "irrelevant" to the aforementioned question were the highest, followed by the psychological resilience levels of the students who gave the "authoritarian" and "democratic" answers, respectively. The reason for this situation may be that children who do not receive attention from their parents struggle against life to achieve something on their own and have a strong psychological resilience as a result of this struggle. There was no significant difference between the decision-making levels of the students who answered the question as "democratic", "authoritarian" or " irrelevant".

It has not been determined that the daily study hours of the students have an effect on the students' science lesson exam anxiety levels. The psychological resilience levels of the students who study "more than 5 hours" per day are higher than the psychological resilience levels of the students who study "2 hours or less" daily. The reason for this differentiation may be due to the fact that students who study more see more question types, encounter more question patterns by solving more questions, and experience how to solve these question patterns. The daily study hours of the students have no effect on the decision-making levels of the students.

SUGGESTIONS

With this research, psychological resilience levels, science lesson exam anxiety and decision-making skills of 7th and 8th grade students enrolled in 6 different schools in Düziçi district of Osmaniye province were examined. The results of this research will be an important resource for science teachers, parents, and guidance and psychological counseling teachers working in secondary schools. The results of this research are of great importance in terms of following both the personal and cognitive development of students. This study, which was conducted at the level of secondary school students, focused on the science course and examined three different dependent variables at the same time. Examination of more than one variable at the same time is very useful in obtaining information about the participants in different dimensions and in revealing the relationship between the variables examined. For this reason, we recommend increasing the number of similar studies for other courses. As a result of the research conducted within the scope of this research, it was determined that the science course exam anxiety levels of secondary school students were above the average. For this reason, we

suggest that some studies be carried out to reduce the levels of exam anxiety in science lessons. For example, by using group counseling or individual counseling, the effects of these methods on reducing exam anxiety in science lessons can be examined. The psychological resilience levels of the students remained below the average. For this reason, there is a need for more studies in which various methods are tried to increase and strengthen the psychological resilience levels of students.

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EXAMINING THE END OF CHAPTER QUESTIONS IN THE CHEMISTRY UNITS IN THE SCIENCE TEXTBOOKS ACCORDING TO THE REVISED BLOOM TAXONOMY

Burhan SİNCAR[1], Gülen ÖNAL KARAKOYUN[2], Erol ASİLTÜRK[3]

ABSTRACT

The aim of this research is to examine the questions at the end of the chemistry-related units of the 5th, 6th, 7th and 8th grade science textbooks published by the Ministry of National Education of the Republic of Turkey in 2020, according to the revised Bloom taxonomy. In this study, the document review method, one of the qualitative research methods, was used. The data source of the research is a total of 239 questions at the end of the chapters of the chemistry-related units of the science textbooks published by the Ministry of National Education in 2020. In this research, 239 science questions were analyzed based on the cognitive process dimension of the revised Bloom Taxonomy. Each of these questions was examined separately. It was determined that each question is related to which step in the cognitive process dimension. Each of these questions was examined separately. It was determined that each question is related to which step in the cognitive process dimension. It has been determined that the questions are generally stacked at the "remembering" level of Bloom's taxonomy. While the majority of the questions (92.88%) are related to low-level skills, only 7.12% are related to high-level skills.

Keywords: Cognitive skill, revised bloom taxonomy, science education, question analysis

1 TOKİ Kazım Karabekir Middle School, Batman, Turkey, ORCID: 0000-0002-7888-5385 e-mail: sincarburhan_0572@hotmail.com

2 Van Yuzuncu Yil University, Muradiye Vocational High School, Chemistry and Chemical Business Technologies Department, Van, Turkey, ORCID: 0000- 0002-7675-0006, e-mail: gulenonal@yyu.edu.tr

3 Corresponding author: Firat University, Faculty of Education, Science Education Department, Elazig, Turkey, ORCID: 0000-0001-8126-7812, e-mail: ecil@firat.edu.tr

INTRODUCTION

One of the most important steps in realizing the thinking event is to ask questions. The question asked to the person is a method that initiates the act of thinking. Learning occurs as soon as the act of thinking begins. Learning becomes more meaningful and faster when the individual's mind is conducive to thinking and especially when he tries to answer the questions he encounters (Robbins, 1995). Educators who prepare questions should pay attention to producing questions that prompt and stimulate thinking. Some of the benefits of teachers' use of questions more effectively are as follows: Teachers can more easily determine their students' knowledge gains and understanding levels. Students' understanding will be at a higher level. Students' interest in the lesson and their motivation increase. Students are more willing to answer questions and generate questions. With the increase in teacher-student interaction, in-class dialogue also develops (Amer, 2006). A good science education starts with carefully prepared questions (Marbach-Ad, 2000). Questions that can be answered easily do not require much use of thinking skills. High-level questions enable students to access information, test their own knowledge, become aware of problems, and develop all cognitive skills of students. Thus, students are directed to creative and scientific thinking, which is essential for the meaningful realization of science education (Feldhusen, 1985). It is stated in the literature that questions related to both low-level cognitive levels and high-level cognitive levels should be included in the exams in order to determine the real success levels of students during the assessment and evaluation studies (Colletta & Chiappetta, 1989; Demir, 2011).

In its broadest definition, measurement is defined as showing the results of observations related to whether a certain object or objects have a certain feature, with numbers or other symbols (Turgut, 1995; Demir, 2011). Evaluation is defined as the process of making a decision about the measured quality by comparing the measurement results with a criterion (Tekin, 1996; Demir, 2011). In our country, the success of students is generally measured with multiple choice tests and written exams (Şimşek, 2001; Demir, 2011). It is very important to determine the qualifications of the questions used in multiple choice tests and written exams. Because, it has been revealed by the researches that the thinking skills of the students depend on the characteristics of the questions asked in the exams (Brualdi, 1998; Selçuk, 2000; Demir, 2011). While students who are asked questions with high cognitive level are inclined to think multi-dimensionally, students with low level questions are generally inclined to think with low level (Martin, et al., 1998; Demir, 2011).

A classification system developed by Bloom et al and frequently used in educational research is known as Bloom's taxonomy. Bloom's taxonomy provides classification of questions in relation to low-level and high-level thinking skills.

According to Bloom's taxonomy, low-level thinking skills consist of knowledge, conception and application steps. High-level thinking skills are explained with the steps of analysis, synthesis and evaluation (Şahinel, 2002). Bloom's taxonomy is used to adjust the cognitive level of the questions to be asked to the students and to determine the comprehension levels of the students (Amer, 2006). The 6 levels of Bloom's Cognitive Domain Taxonomy and the learning outcomes at these levels are presented in Table 1 (Demir, 2011).

Table 1. Bloom's Taxonomy and Learning Outcomes.

Cognitive Domain Levels	Key words describing learning outcomes
Knowledge: Goals at the knowledge level require the student to remember. With knowledge-level goals, students are asked to recognize and remember information.	Recognizes, lists, matches, recalls, names.
Conception: Conception-level goals require understanding. Conception goals include restating what the student has read, seeing the connections and relationships between parts, or drawing conclusions from the information.	It transforms, defends, expresses differently, distinguishes, explains, guesses, and generalizes.
Application: Objectives at the application level require the student to use previously learned knowledge.	Transfers, develops, calculates, prepares, organizes, uses, solves, relates.
Analysis: Objectives at the analysis level require establishing cause-effect relationships and dissecting the whole in order to understand the whole. The analysis step includes the explanation of the parts, the analysis of the relationships between the parts, and the definition of the holistic principles.	It disassembles, supports, analyzes, and gathers evidence.
Synthesis: Objectives at the synthesis level require the creation of a new whole with the knowledge gained from observations and experiences.	Suggests, combines, develops, organizes, arranges.
Evaluation: Objectives at the evaluation level require that information be judged for the given purpose. Assessment is the highest level of learning outcomes in the cognitive domain.	Compares, concludes, proves and guesses.

The original Bloom taxonomy has been revised in order to adapt to the information flow of the developing world. The steps in the cognitive field of the revised Bloom Taxonomy are as follows; remembering, understanding, applying, analyzing, evaluating and creating (Bümen, 2006; Cangüven, et al., 2017). A slightly more flexible sorting has been created in this revised taxonomy. With this revision, it has become easier to write goals. Thanks to this revision, performance evaluations were also included in the scope of the evaluation step (Arı, 2013; Cangüven et al., 2017). The revised version of Bloom's taxonomy was prepared by Anderson and Krathwohl (Anderson and Krathwohl, 2001; Cangüven, et al., 2017). The reasons for the renewal of the Bloom taxonomy are as follows; renewing the programs, approaching learning in a constructive way, examining the achievements in the old Bloom taxonomy from a single dimension, and asking high-level skills to be measured more easily (Anderson & Krathwohl, 2001; Tutkun & Okay, 2012; Cangüven, et al, 2017).

LITERATURE

In a study they conducted, Cangüven, et al. (2017) examined the 2017 Science course draft curriculum achievements according to the cognitive domain steps of the revised Bloom Taxonomy. Within the scope of the study, they tried to determine which of the achievements of the science course corresponds to the steps in the revised Bloom Taxonomy. As a result of their research, they determined that the gains are generally concentrated in the understanding step of the cognitive domain. In addition, they determined that the least achievement was in the evaluation step. Zorluoğlu et al. (2020) examined 14 studies conducted between 2001-2018 years and related to the field of science and the revised Bloom Taxonomy. They stated that these 14 studies were generally conducted in order to examine the questions or achievements according to the Revised Bloom Taxonomy. In addition, they determined that the questions or achievements were generally at the lower level skills level of the revised Bloom Taxonomy, the distribution of the questions or achievements according to the revised Bloom Taxonomy levels was not homogeneous, and also that high level skill level was not given much importance. Güven and Aydın (2017) examined a total of 156 questions according to the revised Bloom taxonomy in a study they conducted. As a result of their research, they determined that the questions in the curriculum were stacked in the stages of understanding (48.72%) and analysis (23.72%). In addition, they found that there were very few questions about the steps of applying (13.46%), remembering (12.18%), evaluation (0.64%) and creation (1.28%). Güven and Aydın (2017) also concluded that the questions in the program generally belong to the lower level cognitive domain steps.

METHOD

Research Pattern

In the research, the document analysis method, one of the qualitative research methods, was used. The document analysis method is a method that aims to analyze the written items containing information about the subject to be examined in detail (Yıldırım & Şimşek, 2008). In the document analysis method, the obtained documents are examined in a theory-oriented and systematic way (Bowen, 2009; Sağlamöz & Soysal, 2021).

Data Source

The data source of the research is a total of 239 questions at the end of the chapters of the chemistry-related units of the science textbooks published by the Ministry of National Education in 2020. The books mentioned are secondary school 5., 6.,7., and 8th grade books, these books can be accessed at https://www.mebders.com.

The distribution of the questions examined within the scope of the research according to grades and units is given in Table 2.

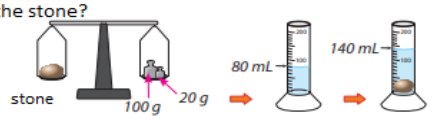
Table 2. The Distribution of the Questions According to Grades and Units.

Grade	Unit	Number of Question	%
5	Matter and Change	48	20.08
6	Matter and Heat	87	36.40
7	Pure Substance and Mixtures	35	14.64
8	Substance and Industry	69	28.87
	Total	239	100

Analysis of Data

Within the scope of the research, 239 science questions were analyzed based on the cognitive process dimension of the revised Bloom Taxonomy. In the cognitive process dimension, there are the following levels, respectively; remembering, understanding, applying, analyzing, evaluating and creating (Amer, 2006). Each of the mentioned questions was evaluated separately by three researchers and it was determined which levels they belong to in the cognitive process dimension of the revised Bloom Taxonomy. The questions that all three researchers coded the same were accepted as "consensus", and the questions that they coded differently were accepted as "disagreement". The formula suggested by Miles and Huberman (1994) was used for the reliability of the research conducted as mentioned below. The formula is: reliability = consensus / (consensus + disagreement) x100. According to this formula, the reliability of the research was calculated as 93%. The questions on which there was a difference of opinion were re-negotiated by three researchers and a consensus was reached by taking expert opinions, and thus the coding was given its final shape. In order to better understand how the analysis and classification of the questions are made, an example is given below.

Examine the drawings given below. According to these drawings, how many g/cm³ is the density of the stone?



A. 1
B. 2
C. 3
D. 4

In this question, there is an image of weighing a stone on an equal-arm balance. The question also illustrates placing the stone in a glass container with a certain amount of water (to visualize the measurement of the volume of the stone). In the question, students are asked to calculate the density of the stone using the available data. The application step of the revised Bloom's taxonomy is related to the ability to use the learned information and to include it in different situations.

In the question, students were asked to use the relationship between weight and volume, which they had learned before, in a new situation. In order to solve the problem, students must also perform mathematical operations. For these reasons explained, the question mentioned is about the application step.

FINDINGS

As a result of the analyzes and coding on the questions, it was determined which of the levels of "remembering", "understanding", "application", "analyzing", "evaluating" and "creating" each question belonged to. In order to facilitate the presentation of the findings, the results of the analysis according to the revised Bloom's taxonomy of the questions are presented in the tables below for each unit separately. The distribution of the 5th grade "matter and change" unit questions in the context of cognitive process dimension is given in Table 3.

Table 3. The Distribution of the 5th Grade "Matter And Change" Unit Questions in the Context Of Cognitive Process Dimension.

	Cognitive Process Dimension	Number of Questions	%
Low level cognitive skills	remembering	35	72.92
	understanding	02	4.17
	application	07	14.58
High level cognitive skills	Analysis	03	6.25
	Evaluation	00	0.00
	Creating	01	2.08
Total		48	100.00

When Table 3 is examined, it is understood that 44 out of 48 questions (91.67%) are related to low-level cognitive skills. Of these questions, 35 are about remembering, 2 are about understanding and 7 are about the application step. Only 4 of the questions (8.33%) are related to high-level cognitive skills. While 3 of these questions are related to the analysis step, 1 of them is related to the creation step. There are no questions related to the evaluation step.

The distribution of the 6th grade "matter and heat" unit questions in the context of cognitive process dimension is given in Table 4.

Table 4. The Distribution of the 6th Grade "Matter and Heat" Unit Questions in the Context of Cognitive Process Dimension.

	Cognitive Process Dimension	Number of Questions	%
Low level cognitive skills	remembering	45	51.72
	understanding	24	27.59
	application	09	10.34
High level cognitive skills	Analysis	08	09.20
	Evaluation	01	01.15
	Creating	00	00.00
Total		87	100.00

When Table 4 is examined, it is understood that 78 out of 87 questions (89.65%) are related to low-level cognitive skills. Of these questions, 45 are about remembering, 24 are about understanding and 9 are about the application step. Only 9 of the questions (10.35%) are related to high-level cognitive skills. While 8 of these questions are related to the analysis step, 1 of them is related to evaluation the step. There are no questions related to the creation step.

The distribution of the 7th grade "pure substance and mixtures" unit questions in the context of cognitive process dimension is given in Table 5.

Table 5. The Distribution of the 7th Grade "Pure Substance and Mixtures" Unit Questions in the Context of Cognitive Process Dimension.

	Cognitive Process Dimension	Number of Questions	%
Low level cognitive skills	remembering	28	80.00
	understanding	03	08.57
	application	02	05.71
High level cognitive skills	Analysis	01	02.86
	Evaluation	01	02.86
	Creating	00	00.00
Total		35	100.00

When Table 5 is examined, it is understood that 33 out of 35 questions (94.28%) are related to low-level cognitive skills. Of these questions, 28 are about remembering, 3 are about understanding and 2 are about the application step. Only 2 of the questions (05.72%) are related to high-level cognitive skills. While 1 of these questions are related to the analysis step, 1 of them is related to evaluation the step. There are no questions related to the creation step.

The distribution of the 8th grade "substance and industry" unit questions in the context of cognitive process dimension is given in Table 6.

Table 6. The Distribution of the 8th Grade "Substance and Industry" Unit Questions in the Context of Cognitive Process Dimension.

	Cognitive Process Dimension	Number of Questions	%
Low level cognitive skills	remembering	34	49.28
	understanding	21	30.43
	application	11	15.94
High level cognitive skills	Analysis	01	01.45
	Evaluation	01	01.45
	Creating	01	01.45
Total		35	100.00

When Table 6 is examined, it is understood that 66 out of 69 questions (94.65%) are related to low-level cognitive skills. Of these questions, 34 are about remembering, 21 are about understanding and 11 are about the application step.

Only 3 of the questions (04.35%) are related to high-level cognitive skills. There is one question for each of the analysis, evaluation and creation steps.

DISCUSSION AND CONCLUSION

There are a total of 48 questions about chemistry in the 5th grade science textbook. While 91.67% of these questions are about low-level cognitive skills, 8.33% of them are related to high-level cognitive skills. There are a total of 87 questions about chemistry in the 6th grade science textbook. 89.65% of these questions are about low-level cognitive skills, while 10.35% of them are about high-level cognitive skills. There are 35 questions related to chemistry in the 7th grade science textbook. While 94.28% of these questions are about low-level cognitive skills, 5.72% are related to high-level cognitive skills. There are a total of 69 questions about chemistry in the 8th grade science textbook. While 95.62% of these questions are about low-level cognitive skills, 4.35% are about high-level cognitive skills. When all questions are evaluated collectively, it is seen that 92.88% of 239 questions are related to low-level cognitive skills and 7.12% are related to high-level cognitive skills. These results show that the rate of questions about high-level cognitive skills is quite low. When the textbooks were compared among themselves, it was determined that the rate of questions related to high-level cognitive skills was in the 6th grade science textbook. It is reported in the literature that skill-based questions are prepared to determine whether students have acquired certain skills, and that questions related to high-level skills should be given importance while preparing these questions (Ayvacı & Türkdoğan, 2010). However, when the results of the current research are examined, it is seen that more importance is given to questions about low-level skills such as recognizing and knowing concepts and symbols and establishing relationships between different concepts in the process of determining whether students have acquired some skills. Questions about lower-level skills often encourage students to memorize. Memorizing limits scientific thinking skills (Sanca et al. 2021). In order to increase students' scientific and creative thinking skills, Bloom's taxonomy should be taken into account during the preparation of the questions, and questions related to high-level skills should be given importance (Akanngbe & Enero, 2015; Nayiroglu et al. 2021, İlhan et al. 2021). Turkey has a large number of students enrolled middle schools. An exam called "High School Entrance Exam" (HSEE) is held for middle school students in Turkey. Only 10% of the students who take the exam have the right to be placed in one of the high schools of their choice. 90% of students are placed in one of the schools closest to their addresses. The HSEE exam is a type of exam that includes skill-based questions. The questions in the HSEE exam are mostly related to high-level skills (Karaman, 2005). For this reason, in order for students to adapt to HSEE exams more easily, questions related to high-level skills should also be given importance in the process of preparing the questions in the

secondary school textbooks. In science education, valid and reliable measurement tools are needed in order to determine the extent to which students have attained the targeted achievements in the education-teaching process and to reveal the success levels related to the determined subject in a concrete way (Keçeci et al., 2019; Gönen, et al., 2011). For this reason, it is of great importance to prepare questions that can measure high-level skills in the targeted acquisitions.

As a result of a study conducted by Gündüz (2009) in which secondary school science course written exam questions were examined according to Bloom's Taxonomy, he concluded that 92.19% of the questions were related to low-level cognitive skills and only 7.81% of the questions were related to high-level cognitive skills. As a result of another study, in which the secondary school science course written exam questions were examined according to Bloom's Taxonomy, it was determined that the questions examined within the scope of the research did not lead students to higher-level mental thinking, but rather focused on remembering skills (Tanık & Saraçoglu, 2011). Ayvacı and Türkdoğan (2010), in a study in which they evaluated science written exam questions according to the revised Bloom taxonomy, concluded that 55% of the questions were related to the steps of remembering and understanding. As a result of another study, the questions asked by the teachers in the exams were examined and it was determined that 78% of the questions were related to the remembering step (Çalışkan, 2011). Similar to the studies given as examples above, there are many studies in the literature in which questions are evaluated according to the revised Bloom's taxonomy, and it has been determined that the rate of questions about high-level cognitive skills is generally low in the results of these studies (Dalak, 2015; Güven & Aydın, 2017, Zorluoğlu et al., 2017; Lee vd., 2015). As a result of the current study, it was concluded that, similar to the results of the studies in the literature, the rate of questions about low-level cognitive skills is considerably higher than the rate of questions about high-level cognitive skills.

According to Jean Piaget, the development process of people takes place in four periods. These four periods are: sensory-motor period, preoperational period, concrete operational period and formal operational period. Individuals aged 11 and over are in the formal operational period. Individuals in this period are at an age where they can acquire high-level mental thinking skills. For this reason, experts who will prepare questions should consider this issue and give more importance to questions related to high-level scientific process skills.

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MATHEMATICS SC AND MATHEMATICS ACHIEVEMENT

Fatma ERDOĞAN[1], Eren KARAKAYIŞ[2]

INTRODUCTION

One of the most important aims of educational reform studies is to create a system that can help students learn mathematics by understanding it (Franke and Kazemi, 2001). However, mathematics is seen by many students as a difficult field to learn. There are many factors in the formation of this negative attitude of students towards mathematics. Investigating these factors may play a role in the development of individuals' mathematical skills (İlhan and Tutak, 2021; Yenilmez and Duman, 2008). The main factors affecting the mathematics achievement of the students apart from the ability level; previous mathematics achievement is explained by different variables such as home environment, motivation, interest in mathematics, quality of mathematics teaching, time allotted to mathematics lesson, classroom environment. In addition, it is known from studies that there are affective variables that affect students' mathematics achievement (Reynolds and Walberg, 1992). An important dimension of these affective variables is self-concept (SC).

Self-perceptions are of great interest in educational research. One of the most important reasons for this is that children with different self-beliefs show different levels of cognitive, social and emotional involvement at school. Children's school experiences make up a large part of their lives and are instrumental in shaping their way forward in life. Therefore, educational researchers try to grasp the meaning of self in students' minds. Among the various models and theories of self-related cognition in the context of school learning, one of the remarkable self-constructs is SC. SC can be defined as individuals' self-perceptions shaped by their own experiences and interpretations of their environment (Marsh et al., 2019). Mathematics SC, which is under the academic SC, is explained as the individual's confidence in his/her individual abilities to understand mathematics (Shavelson et al., 1976). In this study, after giving literature-based information about the SC and its structure, a field-specific structure will be constructed and the mathematical SC and its role in mathematics achievement will be explained.

1 Fırat University, Faculty of Education, Elazığ, Türkiye, fatmaerdogan83@gmail.com, ORCID: 0000-0002-4498-8634
2 Fırat University, Faculty of Education, Elazığ, Türkiye, erenkarakas23@gmail.com, ORCID: 0000-0002-0615-5412

SC and DIMENSIONS

According to Mead (1967), the self shows a feature that does not exist when we are born and develops over time. Self is formed by social experiences and activities as a result of the interaction of individuals with the individuals around them. Individuals' self-perceptions are of great interest in educational research (Byrne, 1984). One of the most important reasons for this is that children with different self-beliefs show different levels of cognitive, social and emotional involvement in school. Children's school experiences make up a large part of their lives and are instrumental in shaping their way forward in life. Therefore, educational researchers try to grasp the meaning of self in students' minds. Among the various models and theories of self-related cognition in the context of school learning, one of the remarkable is (Bong and Skaalvik, 2003). Researchers have different definitions of SC. Accordingly, Marsh et al. (2019) defined SC as individuals' self-perceptions shaped by their own experiences and interpretations of their environment. Parker et al. (2018), SC is the sum of individuals' mental and physical characteristics and their own evaluations of them. According to Sumartini (2015), SC is how a person perceives himself, how he sees his shortcomings and strengths, including planning a vision and life mission.

There are different views on the definition of the SC, as well as on the determination of its characteristics. The multidimensionality, hierarchical structure and changeability of the SC are the main reasons for the discussions. When the literature on SC is examined, some researchers (e.g., Byrne, 1984; Wylie, 1989) have taken the SC as a whole and accepted it as the sum of the individual's self-perceptions. Some other researchers (e.g., Bracken and Lamprecht, 2003; Marsh, 1988, 1990a; Marsh et al., 1988) explain the SC as the general SC and claim that the general SC is multidimensional and gradual. The model put forward by Shavelson et al. (1976) is the most accepted model regarding the characteristics of SC. Accordingly, Shavelson et al. (1976) listed the SC characteristics as follows:

1) The SC shows an organized and structured character.

2) SC has a multidimensional and hierarchical structure and forms a categorical system by combining dimensions.

3) At the top of the hierarchical structure of the SC is the "general essence". The general SC is divided into "academic" and "non-academic" SCs.

4) General SC is stable.

5) SC has a developmental feature.

6) SC is evaluative.

Shavelson et al. (1976) grouped SC under two basic dimensions as academic and non-academic. General SC continues gradually by being divided into academic (such as mathematics, science, verbal) and non-academic (such as social, physical, sports) components (Yıldız and Fer, 2008). Studies have shown that there is a

reciprocal relationship between academic SC and student achievement (Lau et al., 1998; Valentine et al., 2004). As a result of the studies carried out to develop the Shavelson model, academic SC has been handled in two dimensions as mathematical SC and verbal SC (Marsh and Hocevar, 1985; Marsh and Shavelson, 1985). First of all, after presenting information about academic SC, mathematics SC, which is a sub-dimension of academic SC, will be explained.

ACADEMIC SC

An individual's perception of their academic competence is called "academic SC" (Hattie, 1992). Academic SC is important in terms of influencing student learning and is one of the critical variables in the education process (Marsh, 1990a). Academic SC is one of the most powerful and decisive indicators of affective student characteristics that determine many important behaviors such as the student's learning effort, determination when faced with difficulties, and participation in the lesson (Bloom, 1979).

Academic SC, which is seen as a student's general attitude towards learning, reflects the student's perceptions of their academic ability (Bong and Skaalvik, 2003; Mullis and Martin, 2013). Marsh and Craven (1997) argue that improving a student's academic SC is not only a desirable goal, but also likely to increase academic achievement. It has been determined that a student who develops a high academic SC in a particular field attaches more importance to his success in the relevant field, spends more effort to learn, has higher academic interests and outcome expectations (Marsh and Hau 2003; Marsh et al., 2005). One of the dimensions of academic SC is mathematical SC.

Not all students have the same ability when learning math at school, solving math problems. SC has a direct and significant impact on math ability as schools target not only cognitive aspects but also motivational aspects such as task focus (Cai et al., 2018). Mathematics SC, which is under the academic SC, is explained as the individual's confidence in his/her individual abilities to understand mathematics (Shavelson et al., 1976). Accordingly, mathematics SC is associated with the individual's sense of confidence in learning new concepts and developing ideas. Reyes (1984) defines mathematics SC as students' perceptions of their ability to learn concepts related to mathematics and to solve problems. Marsh (1992) defined mathematics SC as the self-evaluation of whether the student likes the lesson about mathematics, whether he can learn the subjects easily, his interest and skills in the subjects, and whether he is successful. Mathematics SC is a student's perceptions of their mathematical abilities (Organization for Economic Cooperation and Development, 2016; Vandecandelaere et al., 2012). According to Marsh and O'Neill (1984), the structure of the mathematical SC is multifaceted and hierarchical, and the aspects become more pronounced with age.

THE RELATIONSHIP between MATHEMATICS SC and MATHEMATICS ACHIEVEMENT

Marsh and Shavelson (1985) and Lee (2009) concluded that the subject in which students' SCs affect their academic performance the most is mathematics. According to these researchers, positive math SC can help math performance. In other words, if the student truly believes that he can solve a mathematical problem, he will be determined to demonstrate the necessary SC until the problem is solved (Moliner, 2020). In this direction, students with high SC may see unsuccessful attempts as exciting challenges and new opportunities, while students with low SCs may doubt their own abilities and give up after a few tries (Colmar et al., 2019; Sewasew and Schroeders, 2019).

According to Cai et al. (2018) showed that SC plays a larger role than computational problems when solving word problems. One suggested explanation for this is that students who believe in their ability to complete difficult problems also tend to put more effort into solving them. However, higher SC may be less important in simpler math tasks where most children perform relatively well.

Looking at the literature, the results of the study show that there is a positive relationship between mathematics achievement and mathematics SC (Dermitzaki et al., 2009; Gerardi, 1990; Guay et al., 2003; House, 1993; Ireson and Hallam, 2009; Manger and Eikeland, 1998; Marsh, 1992; Marsh and Hau, 2004; Marsh and Yeung, 1997; Meelissen and Luyten 2008; Trautwein et al., 2006; Wheat et al., 1991; Wilkins, 2004; Yıldız and Fer, 2013). According to the results of the study, it was determined that students with a high level of mathematics SC had more interest and desire to learn mathematics. For example, Wheat et al. (1991) found that students' math SCs were significantly associated with high grades in a college algebra course.

Students with higher motivations and beliefs about mathematics such as SC have higher mathematics achievement (Ireson and Hallam, 2009; Viljaranta et al., 2009). When we look at the literature, it is seen that the reciprocal effects model between mathematics SC and mathematics achievement in different sample groups, ages and models is examined. According to the mutual influence model examining the relationship between mathematics SC and mathematics achievement, there is a reciprocal causality relationship between SC and academic achievement in primary school years (Guay et al., 2003). In addition, there is a positive and significant relationship between students' mathematics self-efficacy and SCs and their mathematics performance (Pietsch et al., 2003). In addition, Marsh (1990b) emphasized that the effect of SC is higher on school achievement performance compared to standardized tests.

Sürmeli and Ünver (2017) examined the relationship between 9th grade students' academic SCs and mathematics achievement. As a result of the research, it was seen that mathematics achievement was significantly predicted by academic

SC (10%). Similarly, Ouda's (2021) study results show that mathematics SC positively and significantly predicts academic achievement. Lee and Kung (2018), on the other hand, discovered the mathematics learning of Taiwanese students at secondary school level in their study. The relationships between mathematics SC and mathematics achievement were examined with longitudinal data. According to the findings, longitudinal effects were all significant: (a) prior math achievement significantly predicted later math SC (skill enhancement model), (b) prior math SC significantly predicted later math achievement (self-improvement model), and (c) reciprocal effects model was supported and the effects of success became stronger and more systematic. In addition to these, Verna (1996) determined that mathematics SC had no effect on mathematics achievement, but previous mathematics achievement was the main factor affecting future mathematics achievement.

CONCLUSION

SC is formed as a result of experiences with human behavior and enables each individual to engage in a more positive, more developed self-development effort. It has been stated that individuals with positive SC are more successful in interpersonal relations and intellectual competence, while individuals with negative SC are in personal and social dissonance (Wong et al., 2019). Therefore, the influence of school environment and academic life is important in this process. Since being academically successful, feeling valuable, and being popular among friends strengthen positive SC, SC perception is positively related to school success (Shunk, 2012).

Mathematics is seen as a difficult subject for many students and students struggle with both complex calculations and verbal problems (Merenluoto and Lehtinen, 2004). However, math skills are associated with achievements in adult life. Therefore, students' learning and understanding of mathematics should be improved. Although the influence of students' previous mathematical skills and cognitive factors in this development and comprehension process is stated, the importance of some malleable factors such as motivation, engagement and persistence is emphasized (Isik et al., 2020; Kikas et al., 2020). Motivation-related variables such as SC have a direct and significant effect on students' math abilities (Cai et al., 2018).

Mathematics SC, which can be explained as the student's confidence in his own abilities to understand mathematics, is seen as an important structure in mathematics education. So much research into the concept of SC is due to its association with various motivational variables whose major influence on achievement is known. In this context, the relationship between academic SC, academic achievement and many other variables that affect it has been an important research topic. Researchers (e.g., Cai et al., 2018) who found evidence for the view that the mathematics SC affects success in a specific subject argued that success can be improved by adding learning motivational supporters to the curriculum for the development of mathematics SC.

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METACOGNITION ANDMATHEMATICAL PROBLEM SOLVING

Fatma ERDOĞAN[1], Miraç YILDIRIM[2]

INTRODUCTION

Problem solving constitutes an important part of mental behaviors (Schoenfeld, 1987). The reason why so much emphasis is placed on problem solving skills, which has an important place in mathematics education, is to find solutions to problem situations encountered in daily life (Özsoy, 2014). The fact that thinking skills play an active role in all stages of problem solving indicates the importance of high level awareness in the individual (Soylu and Soylu, 2006), which contributes to the formation of a permanent and effective problem solving ability (Korkut, 2002). In this process, the individual can overcome the difficulties they face by using their previous knowledge. Problem solving does not have a certain rule, but it has a systematic (Altun, 2008).

When the word problem is mentioned, the first thing that comes to mind is the mathematical problems given in mathematics textbooks (Mayer, 1998). Problems can be divided into two groups, routine problems and non-routine problems. Routine problems are problems that are frequently encountered in textbooks, that will ensure students' participation and interest in the course, whose solutions are obvious, and whose solution does not require high-level knowledge. Non-routine problems, on the other hand, are problems that are not frequently encountered, the solutions are not clear, and the students reach their conclusions by making mathematical reasoning (Schoenfeld, 1999).

Problem solving has been used in a variety of meanings, from "working rote exercises" to "doing mathematics as a professionally" (Schoenfeld, 2016). One of the most accepted problem solving approaches in mathematics education is Polya's problem solving approach. The reason why Polya is so common in mathematics education is that Polya tries to explain problem solving with mathematical problems by supporting it with examples from mathematics. The steps Polya followed in

1 Fırat University, Faculty of Education, Elazığ, Türkiye, fatmaerdogan83@gmail.com, ORCID: 0000-0002-4498-8634
2 Ministry of National Education, Malatya, Türkiye, miraç.yildirim7@gmail.com, ORCID: 0000-0003-1951-4709

problem solving can be explained as follows (Polya, 1957): understanding the problem, making plans for the solution, implementing the plans and evaluating the solutions.

Although the problem solving steps put forward by different researchers differ, the processes that emerge in general are composed of similar stages (Scholenfeld, 1992). These are understanding the problem in a way that can be expressed, creating ideas for the solution, choosing the appropriate one, applying these solutions and evaluating the result (Tertemiz and Çakmak, 2002).

Kilpatrick (1985) and Lester (1983) stated that problem solving in the field of mathematics education has been examined only according to cognitive processes for many years. Again, Van Someren (1994) expressed problem solving as a cognitive process that requires concentration. However, over time, mathematics educators have realized that the contributions of cognitive processes to problem solving strategies and skills are not sufficient (Artzt and Armour-Thomas, 1992; Goos et al., 2000; Schoenfeld, 1985, 1992).

In order to increase mathematical achievement, it is not sufficient to examine problem solving only in the cognitive dimension, because it is necessary to raise awareness of knowledge for success (Schoenfeld, 2016). For this reason, mathematics educators stated that focusing only on the cognitive process would not increase awareness of problem solving (Artzt and Armour-Thomas, 1992). Lester (1994) stated that the most important difference that distinguishes unsuccessful students from successful students in the problem solving process is metacognitive skills such as monitoring and regulation. Again, Artzt and Armour-Thomas (1992) and Schoenfeld (1985) expressed problem solving as a complex process in which cognition and metacognition interact.

METACOGNITION and DIMENSIONS

The concept of metacognition first emerged in the early 1970s as a result of studies on mental activities (Mayer, 1998). Metacognition includes the thoughts that an individual has with his own cognition. At the same time, it provides the emergence of mental activities in the face of an event and the conscious realization of these activities (Gama, 2000; Livingston, 1997).

While Flavell (1976) defined metacognition as being aware of one's own cognitive processes or cognitive knowledge on any subject, he also expressed it as the individual's awareness of his own processes by performing activities such as monitoring and regulating his thinking skills while performing these cognitive processes. In other words, metacognition means that a person is aware of his thinking processes and controls these processes (Brown, 1978; Flavell, 1979). Schoenfeld (2016) defined metacognition as thinking about our thoughts. In other words, it is expressed as the individual's awareness of his own knowledge.

There are different views on the classification as well as the definition of metacognition. Flavell (1976) mentions two components when describing metacognition: metacognitive knowledge and metacognitive abilities. In his revised classification, Flavell (1979) addressed metacognition in four dimensions: metacognitive knowledge, metacognitive experiences, actions (or strategies), and goals (or tasks). While Brown (1978) discussed metacognition in four groups as planning, monitoring, evaluation and prediction, some researchers such as Vaidya (1999) defended only other classifications without taking the prediction. Wilson (2001) examined metacognition in three components: awareness, evaluation and regulation.

Although metacognition has a multidimensional structure, the components of metacognition are mostly divided into two headings: metacognitive knowledge and metacognitive regulation (Brown, 1977; Flavell, 1979; Pintrich, 2002; Schraw and Moshman, 1995; Veenman et al., 1997). Flavell (1979) explained metacognitive knowledge in terms of experience. He stated that these experiences are an important factor affecting metacognitive activities. He divided these activities into three as individual, task and strategy. As an alternative classification to Flavell's classification, metacognitive knowledge is divided into three as declarative, procedural and conditional knowledge (Brown, 1987; Desoete, 2001; Jacobs and Paris, 1987; Temur et al., 2019). Descriptive knowledge is the knowledge of the factors that affect one's own performance and abilities (Scraw and Moshman, 1995). Operational knowledge is the knowledge of how to use the skills and actions required to reach the desired situation in a problem (Hıdıroğlu, 2018). Conditional knowledge, on the other hand, expresses timing and causality (Panaoura et al., 2003). Metacognitive regulation, on the other hand, is related to metacognitive skills and strategies, and represents the processes by which an individual will control and regulate cognition and behavior (Lucangeli and Cornaldi, 1997; Pintrich et al., 2000).

Metacognition is a very important element that contributes to successful problem solving, as it enables strategic work (Pugalee, 2001). Therefore, the role of metacognition in the mathematical problem solving process will be discussed.

METACOGNITION in MATHEMATICAL PROBLEM SOLVING

The concept of metacognition has attracted the attention of mathematics educators who have been researching in the field of problem solving since the early 1980s (Özdemir-Yetkin and Sarı, 2016). In some studies conducted before this period, it was revealed that although students had sufficient knowledge to solve a problem, they were unsuccessful in reaching a solution (Mayer, 1998; Lester, 1982; Schneider and Artent, 2010).

Problem solving requires using appropriate cognitive and metacognitive activities as well as content knowledge (Senemoğlu, 2013). Cognition is one

of the most fundamental elements in learning and problem solving, and in this process, metacognition is an element that supports the use of existing cognition in the individual. Metacognitive knowledge provides a versatile and effective perspective on events (Hıdıroğlu, 2018). According to Flavell (1979), if a strategy used in problem solving is carried out with mental operations, it is grouped as cognitive, if the operations are controlled, monitored and evaluated, it is grouped as metacognitive strategy. In addition, cognitive strategies in problem solving help in the use and processing of information, and metacognitive strategies help an individual to organize and evaluate his/her learning (Livingston, 1997).

According to Mayer (1998), the solution of routine problems is similar to each other. The solutions of non-routine problems differ from the previous problems and students have difficulty in solving non-routine problems. If the problem solver is unsuccessful despite using different strategies to solve the problem, this may be due to the lack of both metacognitive and reasoning skills while solving the problem. Successful students plan, monitor, organize and evaluate the problem solving process more effectively than unsuccessful students (Schoenfeld, 1985).

In the mathematical problem solving process, metacognition is an important variable in learning performance (Artzt and Armor-Thomas, 1992; Desoete and Veenman 2006; Goos and Galbraith, 1996). Brown (1987) claimed that metacognitive awareness is a prerequisite for any efficient problem-solving system. Metacognition in the problem solving process; It is used in the stages of monitoring and controlling the solution steps, organizing the analysis and examination stages of the problem solving task, planning for the solution, implementing the plan and verifying the solution reached (Schoenfeld, 1992).

Researchers have described the process of solving mathematical problems with different metacognitive models (Artzt and Armor-Thomas, 1992; Blum and Niss, 1991; Veenman et al., 2000; Verschaffel et al, 2000). Schoenfeld (1992, 1994), who is one of the pioneers of studies in this field, mentions the importance of metacognitive activities at every stage in the problem solving process. Polya, problem solving steps; defined the problem as understanding, planning, implementing and controlling. Schoenfeld (1985) rearranged Polya's problem solving steps by considering cognitive and metacognitive processes. Schoenfeld (1985) described the cognitive and metacognitive behaviors expected in the problem solving process as shown in Table 1.

In the cognitive/metacognitive problem solving model put forward by Artzt and Armour-Thomas (1992), this process is divided into eight categories as reading, understanding, analyzing, researching, planning, implementing the plan, validating and monitoring. According to Verschaffel et al. (2000), these steps are (1) understanding the situation described in the problem and creating the situational model, (2) creating the mathematical model, (3) implemeting the mathematical

operations and finding the result, (4) interpreting, evaluating and making sense of the results. Although it is not said that the problem solving process proceeds completely and in these steps respectively; individuals can go forward and backward through the specified steps of the model. Meijer et al., (2006) developed a model for the operations carried out in problem solving and learning activities. This model examines it under six phases: orientation, planning, execution, monitoring, evaluation and elaboration. Veenman (2007), on the other hand, stated that in order to develop effective solution strategies, metacognitive activities seen in problem solving can be grouped under three headings: the problem orientation section, where the problem is defined and analyzed, and the processing performance and evaluation headings. The successful implementation of metacognitive processes depends on the structure of the problem, the problem solver and the environment in which the problem is presented (Davidson et al., 1994).

Table 1: Cognitive and Metacognitive Behaviors in Problem Solving Process

Cognitive and Metacognitive Processes	Explanations	
Reading	Cognitive	Reading the problem aloud or silently
Analysis	Metacognitive	Restate the problem mathematically and choose an appropriate perspective, identify the relationship between the desired and the given
Exploration	Metacognitive	Searching for and finding information that will lead him/her to a solution and then separating them, deciding whether she can solve the problem or not giving up
Planning	Metacognitive	Determining the method and strategy needed to solve the problem
Implementation	Cognitive / Metacognitive	Implementing planning accurately and without errors
Verification, or Transition	Cognitive / Metacognitive	Checking the actions taken, checking whether the correct result is reached

Montague (2003), another researcher working in the field of problem solving in mathematics, modeled students' mathematical problem solving processes as a seven-stage self-controlled problem solving process. According to this model, problem solving processes proceed in the order of reading, paraphrasing, visualizing, assuming, estimating, calculating and controlling. One of the metacognitive-focused teaching programs carried out in the recent past and still being studied is the study called IMPROVE, which was designed by Kramarski and Mevarech (1997). The program is composed of seven different teaching steps. The name of the program emerged by arranging the initials of these steps side by

side: Introducing new concepts, metacognitive questioning, practicing, reviewing and reducing difficulties, obtaining mastery, verification,and enrichment.

CONCLUSION and RECOMMENDATIONS

The primary purpose of problem solving education in mathematics classrooms is to enable individuals to think for themselves (Kükey and Tutak, 2019; Lester, 1985, p. 66). In addition, problem solving requires various skills, including making sense of information, planning and determining the method, performing operations, controlling the result, and trying alternative strategies (Muir et al., 2008). The learning speed of people with different metacognitive knowledge and skills is also different (Woolfolk, 1993). In this process, if teachers support students' learning and improve their metacognitive skills, students also produce different solutions and question these solutions (Blake and Spance, 1990; İlhan et al., 2021).Therefore, while problem solving expresses the meaningful transitions between cognition and metacognition (Wilson and Clarke 2001), it is emphasized that metacognition is as important as cognition in this process. Developing metacognitive skills improves students' problem-solving skills, mathematical reasoning, ability to relate mathematical concepts, and self-confidence (Van De Walle et al., 2016).

In the studies conducted in the last two decades, it has been observed that research trends on how metacognitive skills affect the problem solving process and how metacognitive skills are used in the problem solving process have increased considerably (e.g., Güner and Erbay, 2021; Kuzle, 2018, 2019; Lioe et al., 2006; Pugalee, 2004). The results of the research generally show that metacognitive skills play an active role in successful problem solving. In addition, research results show that metacognition is one of the most important predictors of mathematical performance (e.g., Depaepe et al., 2010; Kuzle, 2018).

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THE RELATIONSHIP BETWEEN THE SOCIOECONOMIC STATUS OF SECONDARY SCHOOL STUDENTS AND THEIR ATTITUDES TO THE MATHEMATICS COURSE AND THEIR SUCCESS

Büşra NAYIROĞLU

ABSTRACT

The aim of this study is to determine the attitudes and achievements of secondary school students towards mathematics according to their socioeconomic status. The study was carried out with 12 students from 5th, 6th, 7th and 8th grades studying in secondary schools with 3 different socioeconomic levels in the province of Mardin in the second semester of the 2021-2022 academic year. This research was carried out using the phenomenology method. "Semi-structured Student Interview Form" prepared by the researcher was used to collect the data. In addition, 1st semester mathematics course grade point averages and socioeconomic status information from the "Socioeconomic Information and Achievement Form" from the e-school system were used as data to investigate student achievement status. According to the results of the research, it is thought that socioeconomic status affects attitudes and achievements in mathematics courses in direct proportion, and that improving the opportunities of students with low socioeconomic status will also positively affect their success and attitudes.

Keywords: Secondary School Student, Socioeconomic Status, Mathematics Attitude

INTRODUCTION

Adapting to developing and changing technological and scientific developments is possible by raising creative thinking individuals, and this is provided by education (Tutak & Günder, 2014). Education is the most important element in the process of realizing the desired behavioral change in the individual and in increasing the qualifications of individuals and in the formation of the human capital of countries (Kılıç & Haşıloğlu, 2017). In order to understand how individuals use information, reasoning processes should be examined in detail (Karakoyun ve Asiltürk, 2020). Students may have acquired the habit of solving problems by using different strategies (Karakoyun & Asiltürk, 2021). Therefore, many factors directly or indirectly affect the education process. The child's educational opportunities at home, the socioeconomic level of the family, environmental factors, learning-teaching opportunities at school, and educational environments can be shown among these factors. It is important that these characteristics are positively regulated in order to contribute to the success of children. Along with the ones mentioned here, there are various studies that show that many variables affect student achievement (MEB, 2006; MEB, 2007). Therefore, education is not an abstract concept; It should be considered as a concept that covers the whole life of the individual. Education plays a leading role in the psychological, economic and social progress of the individual (Kırkkılıç & Maden, 2009).

In intelligence diversity, there is no difference in intelligence between children of any race, or children born under normal conditions (Smith, 1984). The difference between people is only the geographical and cultural position of birth and sociological status differences. According to Smith (1984), the difference between dissimilar people is not due to creation, but to habit, tradition and education. In the studies carried out, the lower and upper limits of an individual's intelligence and abilities have been determined genetically, but within these limits, the environmental factors that the individual will develop their intelligence and abilities at a certain level; depends on the experiences he has had and the education he has received (Ville, 1979).

It reveals that the academic achievement of individuals is affected by many factors such as personality and family qualities, parent education, profession, average monthly income of the family, number of siblings, as well as intelligence. Factors associated with low achievement that contribute to social tragedy generally include perceived lack of parental interest, lack of education, personality mismatch, cultural deprivation, and the existence of social groups that individuals can accept or accept (Yılmaz, 2000; Aysan, Tanrıöğen, & Tanrıöğen, 1996; Hoge, Smit & Crist, 1997, Erdoğan, 2020). It is observed that there is a relationship between intelligence test scores and socioeconomic levels of individuals in every society (Niesser, 1979). According to studies, there is a relationship between

socioeconomic status and success, and socioeconomic status affects intelligence and therefore academic achievement. According to Koçer (2006), individuals with higher intelligence than normal benefit from educational opportunities and get better results. Children of families with high socioeconomic status have more learning opportunities. In education, only talents are not enough for school success. Success is affected by many factors such as ability and environment. It is known that the social and economic situation of the individual affects the development and behavior of the individual (Bacanlı, 2005). The difference in socioeconomic status also changes and differentiates the expectations of families from education.

These studies show that the characteristics such as the socioeconomic status of the family, personal characteristics, the school or class of the children of the well-educated and well-educated family can be effective. Therefore, it is necessary to consider these features that may be related to the academic success of students together. In addition, the situation of students taking private lessons, going to private school or private teaching institution, the number of people in the family, and home facilities are effective on the success of the students (Guvendir, 2014). Tutak, Emül, & Gün (2010) stated that if the students› learning levels and their ability to convey what they learned were the same, there would be no exams. Therefore, there are many variables that affect an individual›s academic success. These variables, which are also referred to as learning variables, are almost entirely related to physiological, psychological and social situations and conditions. Learning variables affect the individual›s learning status and thus the success level positively or negatively (Uluğ, 1999). It is known that how learning occurs and the form in the mind is closely related to the environment in which the knowledge is learned (Aydoğdu, Erşen, & Tutak, 2014).

Socioeconomic status is important for a child's success at school and in life (Arslan, 2008). Although low school success is not always the result of a disadvantaged socio-economic background, it is an undeniable fact that socioeconomic background and school have a strong impact on learning outcomes (OECD, 2011); Education Reform Initiative (ERG, 2009). Income and education levels of families are also very important in terms of students' success, especially in mathematics. Students who are successful in mathematics, which have a significant impact on the development of thinking (Kükey, Aslaner, & Tutak, 2019), also increase the probability of higher income in the future (OECD, 2013). In the study of Budak, Budak, Tutak, and Dane (2009), it is seen that the increase in the class level increases the rate of teacher's participation, motivation, and response to the student, while the rate of asking questions to student's decreases. In the studies conducted by Veenstra and Kuyper (2010) and Demir, Kılıç and Ünal (2010), it was concluded that the children of families with high socioeconomic and cultural levels have higher mathematics achievement. In the study of Tomul and Çelik (2009) on

the effects of family characteristics of 15-year-old children in 5 different regions of Turkey on the academic achievement of students in mathematics, reading skills and science, it was determined that especially their education and income levels were lower. It has been concluded that the academic achievement of the students in Eastern and Southeastern Anatolia is generally lower than in other regions. Yetkiner Özel, Özel, and Thompson (2013) examined their socioeconomic levels and mathematics achievement in their study with high school students in Turkey and EU countries (except Hungary) and concluded that the difference is huge.

The aim of this research is to determine whether there is a relationship between the socioeconomic status of secondary school students and their attitudes and achievements towards Mathematics. When the researches were examined, the current study was carried out because many studies were conducted from different perspectives on socioeconomic status, but especially for the secondary school level mathematics course, the views and achievements of the students on the mathematics course according to their socioeconomic status were examined and the studies were limited and the studies were mostly quantitative.

Purpose of the research

The aim of this study is to determine whether there is a relationship between the socioeconomic status of secondary school students and their attitudes and achievements towards Mathematics. In line with this purpose, the problem statement of the study is, "Is there a relationship between the socioeconomic status of the students studying at secondary school and their attitudes and achievements towards the Mathematics lesson?" formed in the form.

METHOD

In this study, the phenomenological model, which is one of the qualitative research designs, was used. Phenomenological studies are carried out in order to determine how individuals perceive an event by looking at their perspectives and to interpret their experiences.

Working group

The sample of the study consists of 12 students from the 5th, 6th, 7th and 8th grade levels, studying in secondary schools with 3 different socioeconomic levels in the province of Mardin in the second semester of the 2021-2022 academic year.

Data collection tool

In the research, "Semi-Structured Student Interview Form" and "Socioeconomic Knowledge and Achievement Form", which were prepared to determine the mathematics attitudes and achievements of secondary school students according to socioeconomic status, were used. The Semi-Structured Student Interview Form consists of three open-ended questions and was prepared by the researcher by scanning the relevant literature. At the same time, in order to test the forms, two teachers were interviewed and checked, and then the interview form was finalized.

To ensure the internal validity of the interview questions; It was examined by 2 teachers who are experts in their fields, and necessary corrections were made on the questions in line with their opinions.

Data Collection and Analysis

Descriptive analysis was used in the research. Findings were obtained by arranging the data obtained as a result of the analysis and making quotations. The answers given by all participants to each question in the interview form were analyzed. All the answers obtained in the interview questions and the socioeconomic status and achievement form were evaluated together and the analyzes were completed in this way.

FINDINGS

The data obtained from the study are given in tables below. The socioeconomic status and achievement information of the students are shown in Table 1 below.

Table 1. Socioeconomic Status and Success Information of Students

Interviewed Student	Grade Level	Gender	Mother Education	Father Education	Mother's Profession	Father's Profession	Monthly Income	Math Achievement Average
Ö1-Province	5	Female	University	University	Other	Polis	Over 4000	70
Ö2- Province	6	Female	University	University	Other	Teacher	Over 4000	84
Ö3- Province	7	Male	High School	University	Other	Teacher	Over 4000	93
Ö4- Province	8	Male	University	University	Housewife	Doctor	Over 4000	51
Ö5- District	5	Male	High School	High School	Housewife	Small Business	Below 4000	73
Ö6- District	6	Male	High School	High School	Other	Small Business	Below 4000	40
Ö7- District	7	Female	Middle School	High School	Housewife	Not Working	Below 4000	45
Ö8- District	8	Female	High School	High School	Housewife	Employee	Below 4000	60
Ö9-Village	5	Female	High School	Middle School	Housewife	Small Business	Below 4000	82
Ö10- Village	6	Male	Middle School	Middle School	Housewife	Employee	Below 4000	63
Ö11- Village	7	Male	Middle School	Elemantary School	Housewife	Small Business	Below 4000	40
Ö12- Village	8	Female	Elemantary School	Elemantary School	Housewife	Not Working	Below 4000	65

Looking at Table 1, students with different socioeconomic characteristics and success averages from 3 different schools participated in the research, one at the 5th, 6th, 7th and 8th grade levels in a secondary school in each province, district

and village. In addition, when we look at the gender of the students participating in the study, it consists of 6 male and 6 female students. When we look at the mother education of the students, it consists of 3 universities, 5 high school, 3 secondary school and 1 primary school. When we look at the father's education of the students, it was determined that 4 of them were educated at university, 4 at high school, 2 at secondary school and 2 at primary school. When we look at the mother's profession, 8 housewives consist of 3 students in the province and 1 in the district, and the mother education of 4 students is in the other category. When we look at the education of fathers, it is stated that 1 policeman, 2 teachers, 1 doctor, 4 tradesmen, 2 workers and 2 do not work. When we look at the monthly income of the students at home, it is seen that the income of the remaining families above 4000, 4 of which are in the province, is below 4000. Mathematics achievement averages were found to be between this range, with the lowest being 40 and the highest being 93. The themes created according to the answers of the students in the interview form are given in Table 2.

Table 2. Themes Created According to the Answers of the Students in the Interview Form

Themes	Students at the City Center School		Students at the District Center School		Students at the Village Center School	
	N	%	N	%	N	%
Interest in Math	4	%75	2	%75	2	%50
Worry in Math Class	3	%50	4	%75	4	%100
Regular Mathematics Study	4	%100	1	%50	1	%50
Necessity of mathematics lesson/its place in daily life	4	%75	1	%75	1	%25

When Table 2 is examined, it is seen that the themes formed as a result of the opinions are "being interested in the mathematics lesson", "Don't worry in the mathematics lesson", "working regularly in the mathematics lesson", "The necessity of the mathematics lesson / its place in daily life". In these themes, the results of 3 different schools in general can be seen as in Table 2. As can be seen from Table 2, most of the students in the city center and with good socioeconomic status stated that they are interested in mathematics, that mathematics lesson has an important place in our lives and that they study mathematics regularly. Students with low socioeconomic status stated that they were not interested in the lesson and that they had concerns about the lesson. Below are examples of student statements.

S1-Province: I like the math lesson very much, I do my repetitions regularly. Depending on the working conditions of my parents, I sometimes have to be absent from the classes, I fall behind in classes, and I also lack supplementary books. I think I would be more successful if these situations did not affect me.

S3-Province: Mathematics is everywhere in our lives, when we shop in the time account, in the measurement of any produced object, in our exams. That's why I'm interested in math class.

S5-District: I do my homework regularly and work every day. But I am afraid of the lesson.

S10-Village: I get very excited when the math lesson starts.

S7-District: I like the mathematics lesson, but I am afraid if my teacher asks questions and I cannot do it.

S12-village: I am not interested in the lesson because I cannot study regularly.

According to the findings, it is seen that the differentiation of socioeconomic status affects success and attitude in mathematics in direct proportion. However, it is thought that improving the opportunities of students with low socioeconomic status will affect their mathematics achievement status. In addition, it has been observed that the attitudes of students with different socioeconomic statuses who are successful in mathematics are positive, while the attitudes of students with low mathematics achievement are negative.

CONCLUSION AND RECOMMENDATIONS

In this study, it was investigated how the socioeconomic status of the students affected their mathematics attitudes and achievements. According to the results of the findings, it is seen that the differentiation of socioeconomic status affects mathematics achievement and attitude in direct proportion. However, it is thought that improving the opportunities of students with low socioeconomic status will affect their mathematics achievement status. In addition, it has been observed that the attitudes of students with different socioeconomic statuses who are successful in mathematics are positive, while the attitudes of students with low mathematics achievement are negative. According to OECD (2012), one of the countries with the highest relationship between success and socioeconomic status is Turkey.

According to Şirin (2005), in the studies conducted in the context of the relationship between socioeconomic status and education, it is stated that there is a significant relationship between these two variables. According to these studies, it is seen that the success status of the students with a bad socioeconomic status is negative, and the success status of the students with a good socioeconomic background is positive.

It has been stated that the cultural and socioeconomic characteristics of the families are one of the most important factors affecting the success of the student (Tural, 2002). The economic status of the family, the number of siblings, the income status of the family and the educational and occupational status of the parents; Due to the fact that it affects the success of students, inequality occurs in the education given at school. However, students' success should not affect their socioeconomic status. According to the social state understanding, this situation should be prevented. In this case, the Turkish Education System should provide support for students with socioeconomic status.

In this study, it was investigated due to the limited number of studies on the relationship between mathematics achievements and attitudes according to socioeconomic status. According to the study, it is seen that the differentiation of socioeconomic status affects mathematics achievement and attitude in direct proportion. Since the results obtained within the scope of the research were obtained on a small sample, this situation can be considered as a limitation of the research, and a larger sample can be studied. In addition, when the literature related to the study is examined, it can be said that there are few qualitative studies on the subject, and future studies can be done in the field of qualitative research.

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APPENDIXS

Appendix1. Socioeconomic Information and Success Form of the Interviewed Students

Interviewed Student	Grade Level	Gender	Mother Education	Father Education	Mother's Profession	Father's Profession	Monthly Income	Math Achievement Average

APPENDIX 2. INTERVIEW FORM

STUDENT INTERVIEW FORM

In this study, I would like to investigate the attitudes and achievements of secondary school students towards the mathematics lesson according to their socioeconomic status, with your contributions. In this context, you can support my work by answering the questions I will ask you on a voluntary basis with all sincerity. I would like to state that your identity will be kept confidential throughout the study and will not be shared with anyone. Thanks in advance for your valuable contributions.

1. What do math classes mean to you and how do you feel about math? Please explain.
2. Does what you learn in math classes have an impact on your life? Please explain.
3. What is your frequency of studying mathematics? Please explain.
4. Do you worry in math class? Please explain.

DETERMINING THE ATTITUDES OF 8th GRADE SECONDARY SCHOOL STUDENTS EDUCATION IN RURAL AREA TOO MATHEMATICS COURSE

Esma Nur BOSAT, Büşra NAYIROĞLU

ABSTRACT

Students' attitudes towards mathematics are related to many different variables such as curricula, teachers, individual lives, family, and economic factors. In addition to these variables, the environment is one of the most important variables that are thought to be affected by the behavior of students in mathematics lessons. The aim of this research is to determine the attitudes of secondary school 8th grade students studying in rural areas towards mathematics. The study was designed using both quantitative and qualitative research methods and techniques. The phenomenological model, one of the qualitative research designs, was used to examine the attitudes of the students studying in rural areas towards the mathematics course together with the survey model. The universe of the study consisted of 312 8th grade students studying at secondary school in the 2021-2022 academic year in rural settlements outside of Bingöl province and district centers. Two different sample groups were used for both qualitative and quantitative models of the study. The first sample group consisted of 312 secondary school 8th grade students, and the second sample group consisted of nine 8th grade students. As a data collection tool, the "Attitude Scale Towards Mathematics" prepared by Önal (2013) for the survey model was used for the 8th grade students, and the Clinical Interview Form prepared by the researcher for the phenomonological model was used.

Keywords: Mathematics Education, Secondary School Students, Mathematics Attitude, Rural Region

INTRODUCTION

Mathematics, which is a universal language, is as important as other science fields in terms of reaching the desired level of development in a developing society (Taşdemir, 2009). The discipline of mathematics contributes to the technological and scientific developments that are advancing today, and therefore, the position of mathematics research in our lives is considered important (Tutak, İlhan, İç, & Kılıçarslan, 2018). It is known how important mathematics lessons are in every aspect of human life, especially from pre-school education to university education. Scientists in many countries have made different definitions for mathematics, which shows how universal a science is mathematics (Aydoğdu, Tutak, & Göçük, 2020, Erdoğan, 2020). It is seen that the importance of mathematics in our rapidly developing world has increased over time with the influence of science and technology. Mathematics plays an important role in improving living standards; It is one of the basic components of science and technology. It has also been stated that mathematics has an important contribution to the development of thinking (Kükey, Aslaner, & Tutak, 2019). In order to understand how individuals use information, reasoning processes should be examined in detail (Karakoyun & Asiltürk, 2020). Students may have acquired the habit of solving problems by using different strategies (Karakoyun & Asiltürk, 2021).

Therefore, modern life seems unthinkable without mathematical thinking (Orton, 1994). For this reason, it increases the importance that families and students give to mathematics education (Tutak, Emül & Gün, 2010). However, it is said that mathematics, which has a great contribution to the development of society and needs to be learned, is still seen as difficult, boring and abstract by many people (Aydoğdu, Tutak, & Erşen, 2014; Köğce, Yıldız, Aydın, & Altındağ, 2009, Erdoğan, Kırmızıgül & Gökhan, 2021). Although many people accept that mathematics education is extremely important and necessary, it is also accepted by many that the expected level of success is not achieved. Although there are many reasons for this failure, it is stated that one of the biggest ones is attitudes and prejudices towards mathematics according to Eldemir (2006). The positive and negative thoughts that students produce about the lessons determine how students perceive these lessons, that is, their attitudes towards the lesson. Therefore, attitudes can be either positive or negative. These positive or negative attitudes remain students' unchanging beliefs.

It is seen that one of the important factors affecting mathematics performance is the attitude towards mathematics. Emotional reactions of students to mathematics lessons are one reason for this attitude. In addition, according to Sırmacı (2010), it is stated that teachers' activities and abilities, social and psychological classroom environment, classroom management and many other reasons are effective in shaping students' attitudes towards the lesson. According to Peker and

Mirasyedioğlu (2003), it is said that these developed attitudes negatively affect the success of the individual in mathematics. Ünlü (2007) pointed out that it is important for primary school first grade students to develop positive or negative attitudes towards mathematics, which will affect their learning of mathematics in their future school life. Mathematics occupies such an important place in personal and educational life that the desire to be successful in mathematics is a desire of every student (Karadeniz, 2014). There are many studies showing that mathematics anxiety of students affects mathematics performance as well as attitudes towards the mathematics lesson (Şentürk, 2010; Yenilmez & Özabacı, 2003; Yenilmez & Özbey, 2006).

The reasons why students do not perform at the desired level in mathematics stem from many different variables such as curriculum, teachers, personal experiences, family and economic factors. In addition to these variables, one of the most important variables that is thought to affect students' math performance is the environmental factor. Studies show that there may be differences in the success of students studying in different regions and draw attention to environmental conditions.

According to Kaplan (2010), in the education and human resources report of Tübitak (2005), the continuation of big-city-small-city and urban-rural education quality differences in educational institutions is an education problem. In developed countries, acquiring two basic skills in rural education or education curricula is seen as a strategic issue. One of them is mathematics education and the other is language education. This situation suggests that there may be regional differences in students' learning success rates and the importance of environmental conditions should be considered. It is seen that students living in rural areas are deprived of many opportunities, their mathematics achievement is lower than urban students, the understanding of information society is still far away, and their understanding of information technology is insufficient (Çiftçi, 2010; Garan, 2005). As Silver and Castro (2003) argue, there will be no equal opportunity for students if the problem of teaching mathematics in rural areas continues to be ignored. Webster and Fisher (2000) showed in their TIMSS report that mathematics achievement is associated with students living in rural areas or urban centers.

Williams (2005) conducted a study using PISA 2000 data, and it was determined that the mathematics scores of rural students were significantly lower than those in urban and medium-sized settlements. In order to improve the welfare level of societies, it is necessary to improve rural areas and apply appropriate policies to schools in these regions. However, some obstacles are encountered in policy making and implementation for schools. One of these obstacles stems from the fact that the word rural is not understood by everyone (Haas, 1990). Considering the OECD 2007-2008 and PISA 2009 reports in our country, Aydın et al. (2012), it was

observed that the difference between the scores of the students in the last quarter sociocultural and the scores of the students in the top quarter was high.

The fact that the difference is high indicates that there are regional differences in terms of education opportunities and quality in Turkey, and that the quality of education is low, especially in rural areas. (Gedikoğlu, 2005; Lazarus, 2005; Eraslan, 2009). In our country, it has been observed that the lack of equipment and infrastructure for teaching, the lack of teachers, and the success of students gradually decrease as we move from cities to rural areas (Gökçek and Toker, 2015).

Webster and Fisher (2000) stated that if progress is to start somewhere, it should be rural, and they draw attention to rural areas while education systems are being restructured. The mobilization towards rural education observed in the second half of the twentieth century in science and mathematics education research in the world has seen an accelerated increase in Turkey in the last decade of this century and in the 2000s (Tatar and Tatar, 2008). Enabling students to develop positive perceptions and attitudes towards science is among the most important goals of mathematics curriculum in most countries. Despite this, studies are mostly focused on students in urban areas and mathematics achievement, and it is seen that studies evaluating mathematics education in rural areas are not frequently encountered (Çiftçi, 2010). D'Ambrosio (2004) likened mathematics to the "spine" and stated it as the organ that enables us to communicate with the world. This situation shows how important mathematics and mathematics education are for societies.

For this reason, determining the purpose of mathematics education in rural areas correctly will guide rural societies (Çiftçi, 2010). In the study that acts on these inadequacies; In this study, it was tried to find an answer to the question of how the attitudes of eighth grade students studying in rural areas towards mathematics lesson. In this study, the mathematics attitudes of eighth grade students studying in rural areas were examined in terms of interest, anxiety, study and necessity, and how these students' attitudes were. It will reveal the environmental conditions, the socio-economic and educational level of the family, the level of student success and influence on the education service in the rural areas, and will shed light on the healthier education of the students and the increase in their academic success. In addition, the fact that very few studies have been carried out in our country on the relationship between the mathematics anxiety of rural secondary school students and their attitudes towards mathematics course constitutes the idea that the results of this study will shed light on future research.

Purpose of the research

The most important investments in countries are investments in the education of people. For this reason, it is important for the future of our country to develop rural areas, which are one of the basic building blocks in our country, and to address education issues in these areas. For this reason, determining the education

policies to be followed in rural areas and making the necessary arrangements will contribute to the development of both rural areas and cities (Gökçek and Toker, 2015). Although there are many studies on mathematics education in urban areas in our country, insufficient attention has been paid to the problems in rural areas and researches in education, and studies have not been carried out. For this reason, the aim of this study is to support the researches to be conducted in rural areas by determining the attitudes of 8th grade secondary school students studying in rural areas towards mathematics.

METHOD

This research was structured by using quantitative and qualitative research methods together. In the research, first of all, the survey model, which is a quantitative research model, was used to determine the attitudes of students studying in rural areas towards mathematics. Scanning designs are research approaches that aim to describe a past or present situation as it is. The event, individual or object that is the subject of the research is tried to be defined in its own conditions and as it is. There are two main limitations of a research conducted with scanning design. These are data finding and control difficulties (McMillan & Schumacher, 2006). In the research, the phenomenological model, one of the qualitative research designs, was used in order to examine the attitudes towards the mathematics lesson in rural areas. Because if the teacher is aware of the understanding of the students about a particular phenomenon, it has been stated that he will probably play an active role in preventing their misunderstanding or structuring their understanding better (Çepni, 2009). Phenomenology is an appropriate research for studies that aim to investigate phenomena that are not foreign to us but that we cannot fully comprehend (Yıldırım & Şimşek, 2008). It has been stated that phenomenology is a qualitative research method that allows people to express their understanding, feelings, perspectives and perceptions about a particular phenomenon or concept and is used to describe how they experience this phenomenon (Rose, Beeby & Parker, 1995).

Participants

Since the research is aimed to investigate the problems of mathematics education in rural areas in Turkey, the universe of this research is 8th grade students in secondary schools studying in rural areas in Turkey. The universe of the study consisted of 312 8th grade students studying at secondary school in the 2021-2022 academic year in rural settlements outside of Bingöl province and district centers. Two different sample groups were used in the study. The first sample group consisted of 312 secondary school 8th grade students determined by the random sampling method, and the second sample group consisted of nine 8th grade students.

Data collection tool

In this study, the 'Attitudes Towards Mathematics Scale' (see Appendix A) developed by Önal (2013) was used to examine students' attitudes towards the mathematics lesson. The scale consists of 22 items. It is a 3-point Likert-type scale consisting of 'I agree', 'I am undecided' and 'I do not agree'. At the same time, clinical interview technique was used to determine students' attitudes towards mathematics and to collect in-depth information. For this purpose, questions prepared by the researcher were asked to the students within the scope of clinical interviews. After the questions were prepared, they were shown to the experts in the field, and their validity was received and the questions were finalized after necessary corrections were made.

Data Collection and Analysis

In order to evaluate the attitudes of secondary school 8th grade students studying in rural areas towards mathematics, the data were obtained by applying the Attitudes Towards Mathematics Scale to the students in the sample group in the 2021-2022 academic year by the researcher. It was observed that the response time of the scale took approximately 15-20 minutes. In addition, in the in-depth evaluation of the attitudes of 8th grade secondary school students studying in rural areas towards mathematics, the data were obtained by using the most frequently encountered interview in the qualitative research process. In this direction, the data were obtained through the Clinical Interview Form, the interviews made by the researcher with the students in the sample group in the 2021-2022 academic year.

In order to determine the attitudes of secondary school 8th grade students towards the mathematics lesson, the 'Attitude Scale Towards Mathematics' prepared by Önal (2013) was used. The scale consists of 22 items. It is a 3-point Likert-type scale consisting of 'I agree', 'I am undecided' and 'I do not agree'. The answers given for each item in the attitude scale used in the research were scored as "I agree=3", "I am undecided=2", "I do not agree=1" and according to this scoring, arithmetic mean and standard deviations were found. When the scale items are examined, items 1, 3, 4, 5, 7, 8, 9, 10, 16, 17, 19 are positive, 2, 6, 11, 12, 13, 14, 15, 18, 20, 21, It is seen that the 22nd items are negative items. In the analysis of data about students' attitudes towards mathematics lesson, frequency (f) and percentage (%) were used. SPSS package program was used in the analysis of the data.

For the interviews and observations collected in the research, the data were recorded and checked. During the transcription, each speech was written on a form prepared by the researcher, in the order of the interviewer-interviewer, without any corrections. One-to-one interviews were conducted with the students in the study group and the interviews were recorded on a voice recorder. While recording the audio, the students were informed about the purpose of the research and additional

questions were asked when there were questions that could not be understood. In the next step, descriptive analysis, one of the qualitative data analysis types, was used to analyze the data in question.

FINDINGS

In this part of the study, the findings obtained from the data are included.

1. Findings Regarding the Attitudes Towards Mathematics Scale

The distribution of the answers given by the students according to the answers in the attitude scale was analyzed by taking the percentage, frequency, and arithmetic averages, and the frequency, percentage, arithmetic mean and standard deviations of the answers given by the students according to the answer options are given in Table 1 below.

Table 1. n, X and SD values for positive judgments about mathematics dimension scores

Matter	n	x	SS
1. Mathematics is an easy subject.	312	2,0	0,56
3. Mathematics is one of my favorite subjects.	312	2,5	0,68
4. I feel comfortable in math classes.	312	1,95	0,82
5. I enjoy solving math problems.	312	2,35	0,58
7. Mathematics lesson gives people creative thinking ways.	312	2,7	0,47
8. Solving math problems increases my self-confidence.	312	2,45	0,75
9. I would be happy to use mathematical concepts in other lessons.	312	2,2	0,83
10. I enjoy solving math puzzles.	312	2,65	0,67
16. At the end of the day of the math class, I regularly repeat the topics covered.	312	2,15	0,67
17. I listen carefully to my teacher in math class.	312	2,65	0,58
19. I repeat the topic before the math exams.	312	2,8	0,52
Total	312	2,4	0,64

In Table 1, the arithmetic mean and standard deviation of each item constituting the Positive Judgments on Mathematics dimension of students studying in rural areas are presented. The arithmetic averages of the items that make up the dimension of positive judgments about mathematics vary between 1.95 and 2.8. Accordingly, the lowest quality score is “I feel comfortable in mathematics lessons.” [X = 1.95; SS=0.82], item 4; The highest proficiency score is “I repeat the subject before the mathematics exams.” [X=2.8; It was calculated for the 19th item containing the expression SS=0.52]. The general arithmetic mean of the positive judgments about mathematics dimension of the scale is 2.4.

The scores for the negative judgments of the students about mathematics are given in Table 2 below.

Table 2. n, X and SD values for negative judgments about mathematics dimension scores

Matter	n	x	SS
2. I get bored when I study math.	312	1,8	0,95
6. I don't like math class.	312	1,3	0,65
11. Math exams are a major source of stress for me.	312	2,65	0,67
12. Solving questions on the board in math class worries me.	312	2,05	0,88
13. I'm afraid of math exams.	312	1,75	0,85
14. I think my friends are better at math than me.	312	1,95	0,88
15. I think I can't understand math.	312	1,75	0,78
18. I don't mind getting low grades on math exams.	312	1,2	0,61
20. Math teachers make lessons boring.	312	1,6	0,68
21. I wouldn't want to learn math class if I didn't have to.	312	1,25	0,63
22. I do not use mathematics in any area of my social life.	312	1,05	0,22
Total	312	1,66	0,70

In Table 2, the arithmetic mean and standard deviation of each item in the Negative Judgments on Mathematics dimension of students studying in rural areas are presented. The arithmetic averages of the items that make up the dimension of negative judgments about mathematics vary between 1.05 and 2.65. Accordingly, the lowest quality score is "I do not use mathematics in any area of my social life." [X:1.05; Article 22, which includes the expression SS=0.22]; the highest proficiency score is "Math exams are an important source of stress for me." [X=2.65; It was calculated for the 11th item containing the expression SS=0.67]. The general arithmetic mean of the negative judgments about mathematics dimension of the scale is 1.66.

The scores for the positive judgments of the students about mathematics are given in Table 3 below.

Table 3. Frequency and percentage values for positive judgments about mathematics dimension scores

Matter	I agree		I am undecided		I do not agree	
	f	%	*f*	%	*f*	%
1. Mathematics is an easy subject.	3	13,6	14	63,6	3	13,6
3. Mathematics is one of my favorite subjects.	12	54,5	6	27,3	2	9,1
4. I feel comfortable in math classes.	6	27,3	7	31,8	7	31,8
5. I enjoy solving math problems.	8	36,4	11	50,0	1	4,5
7. Mathematics lesson gives people creative thinking ways.	14	63,6	6	27,3	0	0
8. Solving math problems increases my self-confidence.	12	54,5	5	22,7	3	13,6
9. I would be happy to use mathematical concepts in other lessons.	9	40,9	6	27,3	5	22,7
10. I enjoy solving math puzzles.	15	68,2	3	13,6	2	9,1
16. At the end of the day of the math class, I regularly repeat the topics covered.	6	27,3	11	50,0	3	13,6
17. I listen carefully to my teacher in math class.	14	63,6	5	22,7	1	4,5
19. I repeat the topic before the math exams.	17	77,3	2	9,1	1	4,5

In item 1, among the items containing positive statements in Table 3, 63.6% of the students, that is, a large part of them, chose the option “I am undecided” and did not determine whether mathematics is an easy course or not. In addition, 13.6% answered positively, while 13.6% gave a negative answer. Among the items, the item with the highest number of ‘undecided’ answers was given. 54.5% of the students answered positively to item 3 and stated that mathematics is among their favorite courses. While 31.8% of the students answered “I am undecided” to item 4, 31.8% gave a negative answer and 27.3% gave a positive answer. It has been observed that among the items, the option frequencies are closest to each other and the answers to the statement “I feel comfortable in mathematics lessons” were given close to each other in terms of numbers. In item 5, 50% of the students were undecided about enjoying solving mathematical problems. 63.6% of the students answered positively to item 7 and stated that mathematics provides ways of creative thinking. It is seen that none of the students gave a negative answer to this item. In item 8, 54.5% of the students gave the answer “I agree” as the majority. Again, in the 9th item, 40.9% of the students gave a positive answer. In the 10th item, 68.2% of the respondents gave a positive answer to the question “I like solving math puzzles”. 50% of the students answered indecisive to the expression of regular repetition of the mathematics course in the 16th item. 63.6% of the respondents answered positively to item 17 and stated that they listened to the teacher in the mathematics lesson. In item 19, 77.3% of the students answered “I agree” and it was seen that the subject was repeated before the mathematics exams. It is seen that this item is the most accepted item among the positive items among the students.

The scores for the negative judgments of the students about mathematics are given in Table 4 below.

Table 4. Frequency and percentage values for negative judgments about mathematics dimension scores

Matter	I agree		I am undecided		I do not agree	
	f	%	*f*	%	*f*	%
2. I get bored when I study math.	7	31,8	2	9,1	11	5,0
6. I don't like math class.	2	9,1	2	9,1	16	72,7
11. Math exams are a major source of stress for me.	15	68,2	3	13,6	2	9,1
12. Solving questions on the board in math class worries me.	8	36,4	5	22,7	7	31,8
13. I'm afraid of math exams.	5	22,7	5	22,7	10	45,5
14. I think my friends are better at math than me.	7	31,8	5	22,7	8	36,4
15. I think I can't understand math.	4	18,2	7	31,8	9	40,9
18. I don't mind getting low grades on math exams.	2	9,1	0	0	18	81,8
20. Math teachers make lessons boring.	2	9,1	8	36,4	10	45,5
21. I wouldn't want to learn math class if I didn't have to.	2	9,1	1	4,5	17	77,3
22. I do not use mathematics in any area of my social life.	0	0	1	4,5	19	86,4

In Table 4, 50% of the students gave a negative answer to the item 2, one of the items containing negative statements, to the statement "I'm bored while studying mathematics", while 31.8% gave a positive answer. It was observed that 72.7% of the students liked the math lesson as they answered negatively to the 6th item. 68.2% of the students answered positively to item 11 and stated that mathematics exams are a source of stress for them. To item 12, 36.4% of the students answered positively, 31.8% negatively, and 22.7% as undecided. 45.5% of them gave a negative answer to item 12 and stated that they were not afraid of mathematics exams. It was observed that 81.8% of the students gave a negative answer to the 18th item, and they cared about getting low grades in the mathematics exams. In other words, it can be said that students are afraid of getting low grades in mathematics. No student gave an undecided answer to this item. According to the 22nd item, 86.4% of the students gave an answer of disagree and none of the students gave a positive answer. Students stated that they use mathematics in their social lives with this item. In the study, it was observed that this item was the one that received the most negative response.

2. Findings Regarding the Clinical Interview Form

In this section, the opinions of the 8th grade students in the rural areas about the mathematics lesson and the comments on these views are given. In order

to determine the perceptions of students in rural areas about mathematics and mathematics education, questions were asked about how mathematics affects the future of students, the role of mathematics education in preparing them for the future and increasing job opportunities, and whether good knowledge of mathematics provides an advantage to students. It was observed that the majority of the students (n=9) had positive judgments about mathematics and mathematics education. The basis of these views is that mathematics can positively affect students' future professions and future living conditions. In this direction, some of the opinions of the students are as follows:

S5: If I learn mathematics, I will understand everything better. It will be advantageous for me in every sense. I can have the best of everything in my life, I can live in a better place. I will have a good job; I will have more money.

The students stated that they think that mathematics is important in their daily lives and that they use mathematics. However, it seems that it is very simple for them to associate mathematical subjects with their daily life.

S1: Mathematics is important in our daily life; it is present in every part of our lives. For example, in shopping, we can calculate the weight when we buy the product or calculate the price when we buy it.

S9: I get excited in the math class. If my teacher asks a question, I am afraid that I will not be able to solve it.

who experienced an excitement that did not seem to be caused by fear or anxiety, actually had a positive perception towards mathematics and mathematics education.

S2: When I am successful in mathematics, I feel more confident and happier. Compared to other courses, I like mathematics more and I am more successful, so I am more interested in mathematics. I can relate the events that I experience in my daily life with mathematics.

S2's being more successful in mathematics than other courses, liking the course and self-confidence increase his self-confidence. In addition, his ability to associate everything with mathematics outside of school shows that he has taken mathematics out of a lesson and carried it to a different dimension for himself.

S8: Mathematics is in every area and every part of our lives. Painting, music and physical education classes may be enjoyable for me, but the place and importance of mathematics is more.

According to these data, it was seen that most of the students liked the mathematics lesson. It is estimated that they hesitate to feel comfortable in mathematics lessons.

CONCLUSION AND RECOMMENDATIONS

Updating the education system and reaching the desired level of success are important in terms of determining the extent to which the goals and objectives can be achieved. Based on this importance, this study sheds light on the mathematics

perceptions of secondary school students studying in rural areas, which have a significant weight in the Turkish education system. The most important finding of the study is that the students studying in rural areas have positive views towards mathematics despite their low mathematics achievement in general. This is also seen in different studies and in different groups. In the study by Peker (2003), the finding that students have a positive attitude despite their low mathematics achievement is in line with the result obtained in the study by Lucas & Fugitt (2007) that students in rural areas have a high attitude towards mathematics. When the relevant literature is examined, one of the reasons underlying the failure of students in mathematics lessons in developed countries is the negative attitudes and perceptions developed towards the lesson, and many studies emphasize the positive relationship between success and attitude and perception (Pusluoğlu, 2002; Saracaloğlu, 2000; Tekindal, 1988).

From the research data, it can be said that rural students like the mathematics lesson, but they do not have enough self-confidence in this lesson. In addition, the fear of getting low grades in exams causes them to shy away from mathematics and not show the necessary interest. It has been revealed that fear and anxiety about mathematics exams also cause negative attitudes. Especially when students are stressed while solving questions in math class and getting up to the blackboard, most of them are not able to solve the question even when they can solve it, causing them to move away from the math course. It can be said that this anxiety and stress are major factors that reduce success in mathematics. Finally, it is obvious that the subject repetition in mathematics lessons is not done regularly, but before or close to the exam. For this reason, it can be said that students have made them students who aim not to make mathematics a way of life, but only to pass the exams.

According to the findings, it is clear that approximately 80% of the students have a positive attitude towards mathematics. In addition, it has been determined by the data that mathematics exams are a cause of stress for the majority of students. It is seen that solving questions on the board in mathematics class is also a cause of anxiety for students. It was determined that there was no positive response from most of the class regarding the regular repetition of the mathematics course. However, it was determined that the majority gave a positive answer to the item to repeat the subject before the exam. In line with these results, it was revealed that the anxiety and stress felt towards mathematics should be eliminated. For this reason, mathematics can be made more fun by changing the techniques used in teaching mathematics. Stress reduction can be achieved by using life-oriented activities in the mathematics lesson. By making the mathematics lesson more concrete, it can be ensured that students make mathematics a way of life.

In this study, the attitudes of 8th grade students studying in rural areas towards mathematics were investigated. Attitude studies can also be done for other grade

levels. In order to improve the study, an achievement test can also be applied together with the attitude scale. Thus, it is shown with concrete data whether test anxiety also affects success. The relationship between the attitude towards mathematics and success and the effect of the attitude on success can also be investigated. Other factors affecting mathematics achievement should also be explored more broadly. By applying this research to other grade levels, the degree to which the high school entrance exam affects mathematics achievement can also be investigated. In addition, the level of success between the two groups can be examined by applying it to students at the same grade level studying in city centers.

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AN EXAMINATION OF GRADUATE THESIS MADE WITH THE RELATING OF MATHEMATICS AND MUSIC EDUCATION IN TURKEY

Sena TEMİZER, Büşra NAYIROĞLU

ABSTRACT

Compared to the definitions for maths and music, there are two disciplines that are different from each other. Mathematics, order, the way it is counted and computable, and music is characterized by its artistic and expressive aspects. Rules and esthetics are available in both areas. These two branches, which seem independent, have shown parallels since they existed in history. The aim of this research is to study graduate thesis in Turkey through the association of Mathematics and Music education. For this purpose, the research is a scan pattern and the data has been analyzed through document analysis. The study consists of thesis published on the website of the higher Education Institution (YÖK), which includes the association of Mathematics and Music education. The research found 11 teas in thesis titles or keywords. In the process of examining graduate thesis within the scope of the research, the thesis type (master's degree, doctorate), the year of publication, the university where the thesis was conducted, the discipline in which the research was carried out (maths education/music education), the research method was examined in terms of sample type variables. The study found that the most graduate thesis was prepared, and the thesis was conducted in 2013 and 2019, and the most relevant universities were Gazi University and Dokuz Mayıs University. The results of the research were found in the area of the impact of music on mathematics education, where quantitative research method was generally adopted and the model of sample was used.

Keywords: Mathematics Training, Music Training, Mathematics and Music, Graduate Thesis

INTRODUCTION

Art and science are seen as two separate fields. Science expresses truth, art expresses beauty. The science section includes theories and evidence, and the arts section includes personal considerations. Mathematics, which is one of the cornerstones of science, aims to be true, and music, which is an art branch, aims to be beautiful (Karsal, 2005 cited in: Tan, 2016). According to Kükey, Aslaner, and Tutak (2019), both fields emerged as a result of the effort to understand the life of human beings since birth.

The more important education is in the world, the more important it is in our country (Tutak, İç, Gün, & Emül, 2009). Mathematics is very important in raising students as individuals who solve the problems they encounter by using their creative thinking skills and associating them with daily life (Tutak & Günder, 2014). It is necessary to raise individuals who can use mathematics efficiently in our lives and understand its relationship with other disciplines (Dinçer, 2008). In order to understand how individuals use information, reasoning processes should be examined in detail (Karakoyun ve Asiltürk, 2020). Students may have acquired the habit of solving problems by using different strategies (Karakoyun & Asiltürk, 2021). The use of more than one sense organ enables individuals to develop their interests and abilities, ensure quality learning, and enjoy learning (Saygı, 2009). In addition, it is important to benefit from the relationship between mathematics and other disciplines in order to increase the permanence of the learned knowledge and skills and to raise individuals with positive attitudes towards mathematics (MEB, 2009). Music is thought to have an important place in education as well as embodying cultural features and providing intercultural interaction. According to Toraman (2013), music education; It is reported that it has the function of adopting social and cultural characteristics as well as providing individuals with musical knowledge, talent and appreciation.

The relationship between music and mathematics is one of the factors affecting educational learning. As an individual, everyone is innately acquainted with music and mathematics without realizing it. It starts with feeling the rhythm of a baby's heartbeat for the first time. Since mathematics is a discipline that is also effective in daily life and that everyone should know to a certain extent, the fact that it is one of the most important branches of science, the methods of achieving success in mathematics and the factors affecting mathematics have been cared for and investigated by researchers (Tutak, Gün, & Emül, 2010). Another situation is that it is known that many famous mathematicians are interested in music and musicians are interested in mathematics. One of the main areas of interest of the famous composer Bach was mathematics, and one of the mathematicians, Pythagoras, is known as the person who discovered the concept of octave in music. From Pythagoras to the present, the relationship between mathematics and music draws attention. defines it as 'mathematics of sounds' (Esi, 2017; Çuhadar, 2017).

By looking at these examples, the relationship between music and mathematics can be discussed and studied in various ways. In fact, a relationship between mathematics and music can be established on the basis of neurological and talent. As seen in many neurological studies examining brain activities related to music and mathematics, there are also studies that reveal the relationship between mathematics and musical ability (Karsal, 2004). When students actively participate in music education, the effects of the nerves going to the brain increase and the abilities that manage mathematics, spatial perception and complex perceptions develop. Researchers have found that rhythm and melody in music help memorize learned information, and even exposure to music contributes to academic success (Yağışan, Köksal, & Karaca, 2014).

In order to sustain education and training activities, it is necessary to appeal to different senses. Having more than one stimulant in the classroom environment increases motivation and supports continuous learning. Environments that are supported by various activities, evoke positive emotions and engage the senses in various ways, including teaching elements through music, drama, practice and experience, are called the best learning environments because they accelerate continuous learning (Cengiz, 2004). Since mathematics is an abstract discipline, it has been determined in research that this scientific discipline facilitates learning through music and improves students' mathematics skills by embodying the problems that students encounter in learning and understanding. (Booth, 2001; Social, 2012; Snyder, 1997; Şendurur & Akgül Barış, 2002; Yağısan, Köksal & Karaca, 2014).

Soysal (2012) stated that with the use of music in education, students' learning becomes easier and this learning is effective for the continuation of students' lives. It has been determined that students who are educated in a musically nurturing environment are more likely to remember what they have learned and talk more about what they have learned. With the use of music in education, it has also been observed that students are more successful in mental functions such as problem solving, understanding, attention and decision making. Education with music becomes fun and easy; There are many studies showing that music can improve repetition and listening skills, extend attention by increasing perception, and that the resulting sense of satisfaction and pleasure motivates students to learn (Yağışan, Köksal, & Karaca, 2014, Erdoğan, 2020). As a result of music education, children's problem solving and critical thinking skills and academic and personal skills in collaborative activities develop.

In addition, music education strengthens students' ability to use notation, analyze, synthesize and evaluate information. After four months of piano training for second year students, it was determined that students were more successful in learning ratios and fractions (Bales, 1998). Şendurur and Akgül Barış (2002) stated that when children understand abstract concepts such as number and proportion,

they need more concrete and clear meanings and they understand these concepts more easily when given to them in music education. In mathematics lessons that aim at meaningful and permanent learning compared to previous learning, skills and competencies related to other disciplines are prioritized (MEB, 2018).

Considering the emphasis placed in the curriculum, it is thought that current research involving mathematics and music will contribute to the field. In the light of all these reasons, it is aimed to examine the postgraduate theses made by associating Mathematics and Music education in Turkey.

Purpose of the Research

The aim of this research is to analyze the postgraduate thesis researches conducted in Turkey by associating mathematics and music in the field of education, by thesis type (master, doctorate), publication year, university where the thesis was made, the discipline (mathematics education/music education), research method, sample type. perspective to examine. In line with the purpose of the research, answers to the following questions were sough

1.What is the distribution of postgraduate theses that relate mathematics and music in education by type?

2. What is the distribution of graduate theses relating mathematics and music in education by years?

3. What is the distribution of postgraduate theses that relate mathematics and music in education according to the university?

4. What is the distribution of postgraduate theses that relate mathematics and music in education according to the discipline (mathematics education/music education) in which the research is conducted?

5. What is the distribution of postgraduate theses that relate mathematics and music in education according to research method?

6. What is the distribution of postgraduate theses linking mathematics and music in education according to sample type?

METHOD

In line with the objectives, the research is a scanning model design among qualitative research and the data was examined through document analysis. Qualitative research; It represents the process of examining events and phenomena in a holistic way in a realistic environment, and examines human and social behavior. Document analysis, on the other hand, is a qualitative research method used to analyze the content of written documents meticulously and systematically (Yıldırım & Şimşek, 2013).

Participants

The universe of the research consists of all the theses published on the website of the Higher Education Council (YÖK), which includes the subject of music and mathematics in Turkey. In the research, theses containing mathematics and music

education as a title or as a keyword were handled as documents and analyzes were made in this direction. 11 graduate theses, selected to find answers to the questions we mentioned, constitute the sample of the study. The thesis numbers of the theses in the study are given in the appendix.

Data Collection Tools

In this research, the data; Thesis studies were scanned from Yök Thesis Search database and reached through document review. Document review and analysis of the document; It is a data collection method that is used to support the information obtained either on its own or through interview and observation (Yıldırım & Şimşek, 2016). The "Research Evaluation Form" prepared by the researchers was used during the examination of the postgraduate theses within the scope of the research. The Research Evaluation Form included in the study is attached. The main purpose of creating this form is to examine the postgraduate theses to be examined within the scope of the research according to a certain systematic. Accordingly, it was aimed to increase the validity and reliability of the research (Silverman, 2015). In this form; research number, research title, research year, research type, university type, research model, study group, study group size, data collection tool used, analyzes and variables. Opinions were received from 2 experts for this form. In this context, necessary arrangements were made by the researcher and the data collection phase was started.

Data Collection and Analysis

The data obtained in this study were coded according to the coding method in document analysis. Under six sub-headings, there is information about the study identity and study content of the studies. These were named as the type of thesis (master's, doctorate), publication year, university where the thesis was made, the discipline in which the research was conducted (mathematics education/ music education), research method, and sample type. A form consisting of all sub-titles was prepared and 11 thesis studies were examined using this form. The data obtained from the form were entered into the SPSS package program and the data obtained for each subheading were presented in a descriptive form by converting into graphs, frequency and percentage tables.

Findings

Within the scope of the research, a descriptive analysis was made based on the questions determined in the research. Obtained findings are shown in tables.

First Sub-Problem: What is the distribution of postgraduate theses that relate mathematics education and music education by type?

The distribution of postgraduate theses linking mathematics education and music education according to postgraduate types is shown in Table 1.

Table 1: Distribution Table of Graduate Theses by Types

Distribution of Graduate Theses by Types	*f*
Master	9
Doctorate	2
Total	11

When the findings of Table 1 were examined, it was found that the number of studies conducted at the master's level (9 theses) among a total of 11 theses was very high.

Second Sub-Problem: What is the distribution of postgraduate theses, which relate mathematics education and music education, by years?

Table 2 shows the distribution of postgraduate theses linking mathematics education and music education by postgraduate years.

Table 2: Distribution of Graduate Theses by Years

Dates of Theses	Type of Theses	
	Master	**Doctorate**
2007	1	-
2008	1	-
2010	1	-
2013	1	1
2015	1	-
2017	1	-
2018	-	1
2019	2	-
2022	1	-

When Table 2 is examined, it is seen that the theses, which are accessed from YÖK Thesis in pdf format and which meet the criteria of the research, were prepared between 2007 and 2022. It was found that the highest number of theses were prepared in 2013 (1 master's degree, 1 doctorate total 2) and 2019 (2 master's degree).

Third Sub-Problem: What is the distribution of postgraduate theses related to mathematics education and music education according to the university?

The distribution of postgraduate theses linking mathematics education and music education by postgraduate university is shown in Table 3.

Table 3: Distribution of Graduate Theses by University

Distribution by University where the Graduate Thesis was Prepared	Master	Doctorate
Abant İzzet Baysal University	1	-
Siirt University	1	-
Gazi University	1	-
Dokuz Eylül University	1	-

Marmara University	1	-
Dicle University	1	-
Ondokuz Mayıs University	2	-
Kırıkkale University	1	-
Gazi University	-	2
TOTAL	**9**	**2**

When the findings in Table 3 were examined, it was seen that the most postgraduate theses were prepared at Ondokuz Mayıs University (2 master's theses) and Gazi University (2 doctoral theses). When the distribution of the theses according to the university where the theses are made is examined; It has been published in Abant İzzet Baysal University, Siirt University, Gazi University, Dokuz Eylül University, Ondokuz Mayıs University, Marmara University, Dicle University and Kırıkkale University.

Fourth Sub-Problem: What is the distribution of postgraduate theses linking mathematics education and music education according to the discipline (mathematics education/music education) in which the research is conducted?

Table 4 shows the distribution of postgraduate theses linking mathematics education and music education by discipline (mathematics education/music education).

Table 4: Distribution of Graduate Theses by Discipline

Thesis Title	The Effect of Music on Mathematics	The Effect of Mathematics on Music	Relationship between Music and Mathematics
Examination of Teachers' Views on Associating the Mathematics Lesson with Different Lessons	+		
Relationships Between Mathematical-Logical Ability and Rhythmic Ability			+
The Effect of Song Usage in Elementary Mathematics Teaching on Some Variables	+		
The Effect of Teaching with Musicized Mathematics Games in Primary Schools on Academic Achievement and Attitude	+		
The Effect of a Music-Related Instruction on Reach and Attitude on Fractions and Ratio	+		
The Effect of Music Education Program Applied to Pre-School Children on Readiness for Primary School in terms of Mathematics Skills	+		
Examining the use cases of mathematics in different disciplines	+		
The Effect of Music Listening Activities on the Academic Achievement of Primary School Students	+		

Investigation of Applied Researches in the Common Field of Mathematics and Music between 2002-2018 in Turkey			+
The effect of using songs as teaching material in primary school Turkish, mathematics and life studies lessons on students' achievement and attitude development.	+		
The effect of piano supported music activities on the mathematical reasoning skills of 60-72 months old children attending kindergarten		+	

When the findings in Table 4 were examined, it was seen that the thesis related to "The Effect of Music on Mathematics" (8) was prepared at the graduate level. It has been observed that 1 thesis on "The Effect of Mathematics on Music" and 2 theses on "The Relationship between Music and Mathematics" have been prepared.

Fifth Sub-Problem: What is the distribution of postgraduate theses relating mathematics education and music education according to research method?

The distribution of postgraduate theses relating mathematics education and music education according to the method of research is shown in Table 5.

Table 5: Distribution Table of Graduate Theses by Method

Method Types	Research Models	Number of Studies
Quantitative	***Scanning***	***1***
	Experimental	***7***
	Total	***8***
Qualitative	***Case Study***	***3***

When the findings in Table 5 were examined, it was seen that the most quantitative research method (8 theses) was used. Among the quantitative studies, the survey model and the experimental model were used. According to the table, it was seen that the most used model was the experimental research model (7), the least scanning model (1). When the findings were examined, it was seen that at least qualitative research was used as research methods, and all of them were used as a model (3 of them) case studies.

Sixth Sub-Problem: What is the distribution of postgraduate theses linking mathematics education and music education by sample type?

The distribution of postgraduate theses linking mathematics education and music education according to the sample type of the research is shown in Table 6.

Table 6: Distribution Table of Graduate Theses by Sample Type

Sampling Type	Number of Studies
Purpose	5
Simple Random	6
Total	11

When the findings in Table 6 were examined, it was reported that the most used sampling type in the thesis studies on mathematics education and music education was with 6 studies and purposive sampling. In purposive sampling, information-rich situations are selected depending on the purpose of the study (Büyüköztürk et al., 2013). Samples were determined in 5 studies using the simple random method.

CONCLUSION DISCUSSION AND RECOMMENDATIONS

In this research, open-access graduate theses were discussed by scanning from the Yök thesis scanning database related to mathematics education and music education. The obtained data were examined through document analysis. In this context, a total of eleven theses, including 2 doctoral theses and 9 master's theses, were observed and included in the research in accordance with their purpose. The research reached the results by examining it within 6 sub-problems in the findings and comment section. According to these results, it is concluded that the most studies in the related field were carried out in 2013 and 2019. When the theses are examined as the university in which they are made; It is seen that most of them are from Gazi University and On Dokuz Mayıs University. When the graduate theses are examined according to the discipline area; While the relationship between mathematics and music is observed in 2 theses, the effect of music, which is researched the most, on mathematics is observed in 8 theses. In this context, it is among the remarkable results that there is a research on the effect of mathematics on music in at least one thesis. When theses are examined according to the method; 8 While quantitative research methods (1 thesis scanning model, 7 thesis experimental models) were observed in 8 thesis studies, qualitative research methods were observed in 3 thesis studies (3 case studies), it was concluded that they were mostly conducted with an experimental research model (7 theses). When the theses are examined according to the sample; it is concluded that 6 thesis studies were chosen with purposeful sampling and 5 thesis studies were selected with simple random sampling.

As a result; Supporting mathematics teaching with music in Turkey has become a positive model for students. When the literature is examined, studies support that music education has a positive effect on students' mathematics achievement (Bütüner, 2010; Courey, Balogh, Siker, & Paik, 2012; Dikici, 2002; Dinçer, 2008; Gardiner, Fox, Knowles, & Jeffrey, 1996; Georgehan et al. Mitchelmore, 1996; Gouzouasis, Guhn, & Kishor, 2007; Göğüş, 2008; Haley, 2001; Helmicrh 2010; Işıtan, 2013; Johnson & Memmott, 2006; Kıvılcım, 2015; Şendurur & Akgül Barış, 2002; Whitehead, 2001, Erdoğan, Kırmızıgül, & Gökhan, 2021). Students learn by having fun with mathematics education with music, and at the same time, it is seen that their success increases. In the study of Kükey and Tutak (2019), it was stated that explaining mathematics with other disciplines and teaching mathematics in a way that relates the subjects to other courses will be effective in learning. In addition, students' mathematics achievements increase and they are

willing to participate in the lesson. In particular, children in preschool, primary and secondary education overcome their math anxiety at this age and participate in a more understandable way. While researches in the field of mathematics and music can be carried out in pre-school, primary and secondary education, as well as high school and higher education institutions, it is noteworthy that the researches are carried out only at pre-school, primary and secondary education levels. It is among the results that new researches can be made by creating other music methods that can be used apart from the methods used.

The number of studies on the effect of mathematics on music should be increased and the methods that can be used in education should be used actively and widely. In this case, new research should be created by interacting with different approaches in music for different mathematical disciplines. Most studies show the effect of music on mathematics, and the effect of mathematics on music should also be examined. In addition to teaching the lesson directly, researches can be created to make the lesson more interesting and increase student participation by using the cheapest and available music methods.

Suggestions

Based on the results, the recommendations for the study are summarized as follows:

1. It is recommended to increase scientific research by finding new research topics related to mathematics and music.
2. In addition to the musical methods used, it is recommended to conduct new research using different musical instruments and to create different methods and techniques through interaction with parents.
3. In addition to looking at the effect of music on mathematics, it is recommended to conduct research on the effect of mathematics on music.
4. Studies in the field of music education are recommended to be increased by researches conducted by experts in the mathematics department.
5. It is recommended to conduct such studies for students with learning difficulties.
6. Considering the results of the research, it is seen that more experimental research models are used, and it is recommended to increase the number of studies conducted in qualitative and mixed research models in future studies.

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APPENDIX-1

RESEARCH EVALUATION FORM

A- THE THESIS IDENTIFICATION

1. Thesis Title:
2. Author:
3. University where the thesis was made:
4. Year:
5. Type of Thesis: Master ( ) Doctorate ( )

B- DISCIPLINE OF RESEARCH

Mathematics Education ( )
Music Education ( )

C-METHOD OF RESEARCH

1. QUANTITATIVE ( )
Experimental ( ) Descriptive/Scanning ( ) Comparative (Causal/Comparison) ( ) Correlationel ( ) Other …..
2. QUALITATIVE ( )
Culture Analysis ( ) Phenomenology ( ) Theory Building ( ) Case Study ( ) Action Research ( ) Document Review ( ) Other …..
3. MIXED METHOD
4. FIELD LITERATURE REVIEW
Meta Analysis ( ) Type Field Compilation ( )
5. THEORETICAL STUDY (no application aimed at explaining a theoretical subject)
6. TEST /SCALE DEVELOPMENT: …….

D- SAMPLE TYPE

Universe ( ) Purpose ( ) Simple Random ( ) Appropriate ( ) Group ( ) Stratified ( )

APPENDIX-2

NUMBERS OF THESES INCLUDED IN THE STUDY

Thesis Number	Thesis Title
710216	Examination of Teachers' Views on Associating the Mathematics Lesson with Different Lessons
205422	Relationships Between Mathematical-Logical Ability and Rhythmic Ability
265529	The Effect of Song Usage in Elementary Mathematics Teaching on Some Variables
241811	The Effect of Teaching with Musicized Mathematics Games in Primary Schools on Academic Achievement and Attitude
363169	The Effect of a Music-Related Instruction on Reach and Attitude on Fractions and Ratio
414413	The Effect of Music Education Program Applied to Pre-School Children on Readiness for Primary School in terms of Mathematics Skills
583639	Examining the use cases of mathematics in different disciplines
471981	The Effect of Music Listening Activities on the Academic Achievement of Primary School Students
602133	Investigation of Applied Researches in the Common Field of Mathematics and Music between 2002-2018 in Turkey
349020	The effect of using songs as teaching material in primary school Turkish, mathematics and life studies lessons on students' achievement and attitude development.
526122	The effect of piano supported music activities on the mathematical reasoning skills of 60-72 months old children attending kindergarten

OPINIONS OF TEACHERS WORKING IN DIFFERENT SETTLEMENT AREAS ON STUDENTS ATTENDİNG SUPPORT AND TRAINING COURSES (DYK)

Kübra GÜL, Büşra NAYIROĞLU

ABSTRACT

In this study, it was planned to take the opinions of the teachers about the participation of the students who are studying in the settlements such as provinces, districts and villages, to the support training courses (DYK) given at schools and whether they benefit from these courses sufficiently. The study group of the research consists of 15 secondary school teachers from different branches who work in courses in different settlement areas (province, district center and village schools) in the 2021-2022 academic year. The research was carried out as a case study in qualitative research and a semi-structured interview form was used to collect data. For the analysis of the data, the descriptive analysis technique was used. After the interview form consisting of 5 structured questions was prepared, the interview form was applied to the students after the opinions of 3 teachers were taken. According to the data obtained as a result of the research, it has been concluded that the students studying in the city center attend the courses more regularly and the willing students get sufficient efficiency from the courses.

Keywords: Different Settlements, Support and Training Courses, Teacher Opinions

INTRODUCTION

Education is defined as the process of changing the life of the individual in the desired direction and aims to raise innovative, creative, productive, analytical, respectful and sensitive individuals and to be able to approach events critically. Education not only is the process of changing the individual in the desired direction, but also improves the quality of life of the individual (Korkmaz & Tutak, 2017). Education is divided into two as non-formal and formal educations. While non-formal education is gained unsupervised without any program, formal education is given in schools within the framework of a certain program and for a purpose (Timur, Kahraman, Timur, İşseven, 2020). The purpose of formal education is to enable schools that continue to fulfill their responsibilities, to provide students with literacy, questioning and problem-solving skills, and to make students successful individuals beneficial to society (Berberoğlu, & Kalender, 2005). In order to understand how individuals use information, reasoning processes should be examined in detail (Karakoyun ve Asiltürk, 2020). Students may have acquired the habit of solving problems by using different strategies (Karakoyun & Asiltürk, 2021).While fulfilling these responsibilities, the school acts in accordance with the education program.

The training program covers the entire training process. In other words, it plans the skills that students want to acquire and how they are taught and evaluated in the process. The role of the teacher here is to prepare the learning and teaching environment and to guide the students about the activities (Birgin, Tutak, & Türkdogan, 2009). Although the curriculum in our developing countries is adapted and organized according to contemporary theory, there are problems in students' access to learning outcomes (Ünsal & Korkmaz, 2016). When we look at the level of our country in international exams such as PISA and TIMSS, it is seen that this is confirmed (Berberoğlu & Kalender, 2005).

Overcrowded classrooms, poor physical conditions, lack of materials and inefficient use, family indifference, low student motivation and individual learning differences in public schools do not allow students to be successful just by attending classes (Köse, 1990; Ünsal & Korkmaz, 2016). Thus, the waste of state resources is caused by the wasted effort and the motivation of educator students and parents. In addition, the low education level of the parents of the students and the inability to provide a suitable working environment for their children due to socioeconomic reasons can be counted as factors that decrease the success rate (Özabacı & Acat, 2005). In order to eliminate all these negative effects, there was a need to apply for additional education services, and this need was met by private teaching institutions at first. Parents applied to private tutoring schools to make up for their children's shortcomings, to increase their success in exams, and to gain qualified schools. According to Garipağaoğlu (2016), he stated that the process regarding the enactment of a law regarding the closure of private teaching institutions or their transformation into private course centers began in 2014.

Supportive trainings, also known as additional lessons, courses, private lessons in our country, are not unique to our country. All the out-of-school education activities that Stevenson and Baker (1992) call "shadow education" can be evaluated in this context. Bray (2006) examines the shadow education theme in foreign literature from different dimensions, stating that additional courses have been offered for a long time in many parts of East Asia such as Korea, Hong Kong, Japan and Taiwan.

With the closure of private teaching institutions that do not comply with the social state understanding and prevent equality of opportunity and opportunity in education, support and training courses (DYK) are provided free of charge in the 2014-2015 academic year, within the scope of the Ministry of National Education, Formal and Non-formal Education Support and Training Courses Directive dated 23.09.2014 and numbered 4145909. started to be given. The main purpose of these courses is to prepare secondary and high school students for exams, to make up for their deficiencies, to alleviate the financial burden of families, and to provide equality of opportunity in education (Tutak, Emül, & Gün, 2010). In addition, the online education platform EBA 'Education and Informatics Network' module was established, and with this module, helpful resources and assessment exams were provided to help teachers and students. These courses are planned as annual and summer terms and can be held on weekdays and weekends (MEB, 2019).

In the literature review, it is seen that there are studies focusing on different aspects of the support and training courses that have been implemented in our country since the 2014-2015 academic year. In these studies; Issues such as the effect of support and training courses on the success of TEOG, the problems encountered and their positive contribution to the stakeholders, the methods used, the materials used, their contributions to the teacher, their contributions to the students and the negative aspects of the courses, the attitudes of the teachers towards the support courses of the students and school administrators (Göksu & Gülcü, 2016; Akkaya, 2017; Bozbayındır and Kara, 2017; Canpolat and Köçer, 2017; Aküzüm and Saraçoğlu, 2018; Yaşam, 2019, Erdoğan, 2020).

In this study, it is planned to take the opinions of the teachers about the participation of the students who are studying in the settlements such as provinces, districts and villages, to the support training courses (DYK) given at schools and whether they benefit from these courses sufficiently.

Purpose of the research

The aim of this research is to get the opinions of the teachers about the participation of the students who are studying in the settlements such as provinces, districts and villages, to the support training courses (DYK) given at schools and whether they benefit from these courses sufficiently. For this purpose, data on the level of participation of teachers and students in the course and the efficiency obtained from the courses were collected in the structured interview forms prepared by the researcher. In this context, answers to the following questions were sought:

Do you think that students' participation in courses is related to their place of work? Please explain.

- Do support and training courses have an impact on the education life of the students? Please explain.
- Did you encounter any problems in the support and training courses? Please explain.
- What are these problems, if any? What are your suggestions for solutions to these problems? Please explain.
- Does participation in support training courses differ according to grade level? Please explain.
- Do students' participation rates in support training courses differ according to the courses? Please explain.

METHOD

The case study design, one of the qualitative research designs, was used in the research. Case studies try to examine one or more events in depth and investigate the variables that affect a situation holistically, and try to reveal how they affect and are affected by this situation (Yıldırım & Şimşek, 2006). In addition, a structured interview form was used to collect the data and descriptive analysis was used to analyze the data.

Participants

In the study, all secondary school teachers working in DYK constitute the universe in order to learn the views of teachers working in different settlements towards students who participated in DYK. The sample of the study consisted of 15 teachers working in provincial, district center and village schools. In determining the sample of the study, criterion sampling technique was preferred. The fact that the teachers took part in the courses was taken as a criterion. 15 teachers in the study group were tried to be selected from different branches. Thus, it is aimed to provide data diversity. Of the 15 teachers in the research group, 10 are female and 5 are male. These teachers were given codes as (T1,T2,T3…T15). Information about the participating teachers is given in the table 1 below.

Tablo 1. Codes and Characteristics Participants

Participant	Gender	Professional Seniority	Subject	Post
T1	Male	7	Science	Province
T2	Female	7	English	Province
T3	Female	4	Math	Province
T4	Female	6	English	Province
T5	Female	9	Math	Province
T6	Male	14	Math	District
T7	Female	6	Math	District

T8	Male	8	Math	District
T9	Male	10	Turkish	District
T10	Male	14	Science	District
T11	Female	3	Math	Rural
T12	Female	2	Religion Culture	Rural
T13	Female	9	Math	Rural
T14	Female	7	Turkish	Rural
T15	Female	3	Science	Rural

As seen in Table 1, a total of 15 teachers participated in the study. 5 (35%) of the participants are male and 10 (65%) are female. Of the participants, 2 (15%) are Turkish, 7 (45%) are mathematics, 3 (20%) Science and Technology 2 (15%) are English, 1 (5%) is religious culture.

Data Collection

A semi-structured form consisting of five questions was prepared in order to determine the opinions of the teachers about Dyk. During the preparation process, the literature was researched and the questions were prepared with the help of the information obtained. For the internal validity of the form, corrections were made by taking the opinions of three field experts and pre-application of the form was made with two teachers who were not included in the research. As a result of the pre-application, it was proved that the questions in the form were understood, and when the result obtained was compared with the literature, the final version of the form was given after the control. During the research, five different interview questions were directed to the teachers working in different settlements in accordance with the purpose of the research, and the data were collected.

Analysis of Data

Descriptive analysis, one of the qualitative data analysis, was used for the data analysis of the research. In this analysis design, the data collected according to the predetermined themes are separated and interpreted. While collecting the data, direct quotations of the interviewed participants are included. The purpose of this analysis is put forward by organizing and interpreting the collected data. Afterwards, the descriptions are explained and the results are revealed (Yıldırım & Şimşek, 2011). When the data were examined, the common views were gathered under the same theme, and if there were different opinions, the teachers who expressed their views by directly quoting were numbered.

FINDINGS

In this part of the study, the frequency and percentage values of the data obtained are given and explained in tables.

The results of the opinions related to the participation of the students in the support and training courses and the place of duty are presented in Table 2.

Table2. Frequency and Percentage Values of Students' Participation in Courses and Opinions Related to Position

Opinions	**f**	**%**
Positive	14	5
Negative	1	95
Total	15	100

According to Table 2, "Do you think that the participation of the students in the courses is related to the place of duty? Please explain." 14 teachers answered, "Yes, I think." While 1 teacher answered, "No, I do not think it is related to the place of duty, I think it is related to academic success." gave the answer. 8 of the teachers who gave a positive answer stated that the participation was high in the center, 3 teachers stated that the participation was high in the villages, 2 teachers stated that the participation was high in the regions where there were conscious parents, and 1 teacher stated that the participation was high in the regions that were not disadvantaged (low socioeconomic level, deteriorated family structure, etc.). Below are some quotations from the answers of the teachers who think that they are related to the place of duty:

T4: "Yes. Participation in courses is higher in central schools."

T6: "Yes. Transportation is an important factor. Transport students cannot attend the courses."

T8: "While participation in courses is high in settlements with educated and conscious families…"

T11: "Yes. Students do not care about school, lessons and courses because less emphasis is placed on education in rural areas."

T13: "Yes. Since there is mostly transported education in village schools, participation in the course is low…"

The results of the opinions related to the effect of support and training courses on the educational life of the students are presented in Table 3.

Table3. Frequency and Percentage Values of Opinions Related to the Effects of the Courses on the Educational Life of the Students

Opinions	**f**	**%**
Positive	15	100
Negative	-	-
Total	15	100

According to Table 3, all participating teachers answered the second question, "Yes, it has an impact on their education life." replied as. Teachers mostly stated that DYK's students' incomplete learning was eliminated, the subject was reinforced by solving questions, and it provided an opportunity to complete the activities that could not be trained in the lesson. Below are excerpts from the answers of some teachers:

T2: "It is very useful academically. We complete the missing points. I think it is even more useful after the pandemic."

T7: "....Students have the opportunity to reinforce what they have learned in the lesson. It provides an opportunity to complete incomplete learnings."

T8: "While the courses are carried out in harmony with the new exam system, it ensures that the student is prepared for the exam. A good high school is a stepping stone to a good university."

T11: "Useful. Because the activities that cannot be done during the school period are given to the students by DYK."

The results of the opinions related to the Problems Encountered in the support and training courses are presented in Table 4.

Table 4. Frequency and Percentage Values of Opinions Related to Problems Encountered in support and training courses

Opinions	**f**	**%**
Positive	12	80
Negative	3	20
Total	15	100

According to Table 4, "Did you encounter any problems in the support and training courses? If so, what are these problems? What are your suggestions for solutions to these problems? 12 teachers answered "Yes" to the question. Teachers who gave positive answers counted students' reluctance, absenteeism, resource shortage and transportation problem as problems. Below are the answers given by some teachers:

T2: "I find the resources to be used are limited. This year, the deficiencies were tried to be eliminated with sample question booklets sent to schools throughout the province. Resources should be increased."

T5: "Students attend the courses reluctantly. During the weekdays, the students are tired. Courses should be held on the weekend and the lesson start time should not be early."

T9: "The reluctance of the students, their participation in the course with the force of their families. Necessary guidance should be given."

T10: "The main problem is that students and parents are not taken seriously because of absenteeism and free courses. Students and parents should be made aware."

T14: "Due to the transportation problem, it is not possible to attend the courses. Service problem should be solved by MEB."

The results of the participation status of the support and training courses according to the grade level are presented in Table 5.

Table 5. Frequency and Percentage Values of Opinions Regarding the Status of Participation in Support and Training Courses by Class Level

Opinions	f	%
Positive	15	100
Negative	-	-
Total	15	100

According to Table 5, "Does the participation in support training courses differ according to grade level?" All teachers answered "Yes" to the question. While 3 of the teachers stated that the younger ones attended the courses more willingly, the other teachers stated that the students in the group preparing for the exam participated more in the courses. Below are excerpts from the answers of some teachers:

T1: "It differs according to the grade level. Eighth graders attend more because it is the exam year."

T5: "Yes, it differs. While there was more participation in the fifth grade, I observed that the rate of participation in the course decreased in the following years as the student's success decreased."

T7: "The participation rate of the students in the exam group is high"

T11: "Yes. Participation is higher in the younger ones than in the exam level students."

The results of the participation rates of the support and training courses according to the courses are presented in Table 6.

Table 6. Participation Rates of Support and Training Courses, Frequency and Percentage Values of Opinions Related to Their Situation According to Courses

Opinions	f	%
Positive	10	70
Negative	5	30
Total	15	100

According to Table 6, "Do the participation rates of the students in the support training courses differ according to the courses? Please explain." 5 teachers "No", 9 teachers "Yes" and 1 teacher "I did not observe, but I think so. Every student's needs and preferences are different." gave the answer. Some of the teachers' answers are given below:

T1: "...the course that they have difficulty with is chosen more."

T5: "Participation in the courses they like is high, and participation in the courses they dislike is low."

T7: "Participation in main courses is higher due to LGS."

T8: "Since the courses are held at the end of the weekdays, the students do not have a choice of course. They attend all classes."

T12: "…the attendance to the classes they can do is low."

T14: "Yes. The rate of participation in oral classes is low. They get bored because they are less active."

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

In this section, the results of the study were presented by making use of the findings obtained from the study, and comments were made by comparing with similar studies.

The problem of the research is that the rate of students' participation in the course varies according to the regions. Considering the opinions expressed about this problem, the number of opinions stated that the rate of participation in the course is high in the city center and regions where conscious families are the majority. Among the reasons for this, it has been determined that families living in rural areas give less importance to education, and parents do not care enough for after-school students. In their study, İncirci, İlğan, Sırem and Bozkurt (2017) stated that there are differences in the opinions of the students who attend the course in different residential areas about DYK, and that awareness is needed by explaining the importance and benefits of the course to the students studying at DYK. The teachers in this study also stated that guidance should be provided and the awareness level of families and students should be increased. In addition, all of the teachers think that the courses contribute to the education life of the students. It is among the opinions that it provides an opportunity to eliminate missing learning, to repeat the subject, and to solve plenty of questions. When the literature is examined, it has been stated that DYK contributes to student success in some studies, but in these studies, it is stated that students in DYK have absenteeism problems (Bozbayındır & Kara, 2017; Canpolat & Göçer,2017; Nartgün & Dilekçi,2016; Ünsal & Korkmaz, 2016, Erdoğan, Kırmızıgül & Gökhan, 2021). Among the problems encountered in the courses, student absenteeism, indifference, lack of motivation and attention, lack of resources and transportation problem were the most frequently mentioned situations. Teachers stated that participation in the courses varies according to the grade level. According to Budak, Budak, Tutak, and Dane (2009), it is stated that a factor affecting success in learning and teaching environments depends on teacher-student interaction. The majority of the participants stated that exam level students had higher participation in the courses. It can be thought that students have difficulties in solving the questions in the new exam system, and they prefer courses to prepare for the exam in order to get good scores from these exams, which have become an important part of their lives. Various ideas were also presented about whether the participation rate of the students in the courses changed according to the courses. While there are teachers who stated that they preferred difficult lessons that could not be done, that they attended the lessons they liked, and that there was a high level of participation in the lessons in which questions asked in LGS, there were also teachers who stated that such a choice could not be made in the village schools where bussed education was provided because the courses were held at the end of the lesson. However, they

stated that the courses should be held on the weekends because it causes fatigue, and therefore the transportation problem should be solved. Similarly, in the studies conducted, teachers stated that they experience fatigue and low performance due to the intensive course of their classes (Göksu & Gülcü, 2016; Ünsal & Korkmaz, 2016). According to Aydoğdu, Erşen and Tutak (2014), the success of the students in the course; can affect the attitude towards the teacher. As a result, it was stated that the rate of participation in the courses was higher in the center and less in the rural areas. Among the reasons, less emphasis on education by the parents, their unconscious approach and the problem of carrying were shown. As a result of this study, the following recommendations are presented:

Participation can increase if the awareness of the parents is raised, the necessary guidance works are carried out and the transportation problem is solved by the ministry.

- Since absenteeism and indifference are among the biggest problems encountered, attendance should be made compulsory in courses and students who wish can enroll in the course on a voluntary basis.
- In order to prevent family pressure, the necessary guidance service can be given to families at the beginning of the year and at certain intervals throughout the year to ensure continuity.
- This study was limited to 15 teachers. It can be studied with a larger sample group.
- In addition, the study was conducted by taking the opinion of secondary school teachers. Obtaining the opinions of teachers working in high schools may be the subject of another study.

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