Kastamonu Education Journal, 2023, Vol. 31, No:2, 305-319
doi: 10.24106/kefdergi.1274140

| Research Article / Araştırma Makalesi |

Investigation of the Relationship Between Middle School Students' Attitudes Towards Geometry and Perceived School Experiences[1]

Ortaokul Öğrencilerinin Geometriye Yönelik Tutumları İle Algıladıkları Okul Yaşantıları Arasındaki İlişkinin İncelenmesi [1]

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Keywords

1. Attitude
2. Middle school students
3. Attitude towards geometry
4. Perceived school experiences

Anahtar Kelimeler

1. Tutum
2. Ortaokul öğrencileri
3. Geometriye yönelik tutum
4. Algılanan okul yaşantıları

Received/Başvuru Tarihi
02.09.2022

Accepted / Kabul Tarihi
30.03.2023

Abstract

This study was carried out to determine the relationship between 5th, 6th, 7th and 8th grade middle school students' perceived school experiences and attitudes towards geometry in the Southeastern Anatolia Region. The study also explored middle school students' perceived school experiences and attitudes towards geometry based on various demographic variables. The study, which was carried out using the relational screening model, was conducted with 607 middle school students selected by convenient sampling method. "Personal Information Form", "Scale of Attitude towards Geometry" and "Perceived School Experiences Scale" were used as data collection tools in the research. A moderate, positive and significant relationship was found between perceived school experiences and attitudes towards geometry as a result of the findings obtained in the research. Students' attitudes towards geometry were at "moderate" level and it was concluded that their attitude scores towards geometry significantly differed according to their achievement scores. In addition, students' perceived school experiences were at "high" level; differing based on gender and achievement scores. It was concluded that as the students' positive school experiences increased, their attitudes towards geometry increased as well. The research is unique in terms of determining the relationship between perceived school experiences and attitudes towards geometry.

Öz

Bu araştırmada, Güneydoğu Anadolu Bölgesinde resmi ortaokullarda öğrenim gören 5., 6., 7. ve 8. sınıf öğrencilerinin algıladıkları okul yaşantıları ile geometriye yönelik tutumları arasındaki ilişkinin belirlenmesi amacı ile yapılmıştır. Ayrıca ortaokul öğrencilerinin geometriye yönelik tutumları ile algıladıkları okul yaşantıları, demografik bilgilerde yer alan değişkenler açısından incelenmesi amaçlanmıştır. İlişkisel tarama modeli kullanılarak yapılan bu araştırmanın örneklemini, uygun örnekleme yöntemi ile seçilmiş 607 ortaokul öğrencisi oluşturmaktadır. Araştırmada veri toplama aracı olarak "Kişisel Bilgi Formu", "Geometriye Yönelik Tutum Ölçeği" ve "Algılanan Okul Yaşantıları Ölçeği" kullanılmıştır. Araştırmada elde edilen bulgular sonucunda; algılanan okul yaşantıları ile geometriye yönelik tutum arasında orta düzeyli, pozitif yönlü ve anlamlı bir ilişki bulunmuştur. Araştırma sonucunda öğrencilerin geometriye yönelik tutumları "orta" düzeyde bulunmuş olup; geometriye yönelik tutum puanlarının; başarı puanı değişkenine göre anlamlı farklılık gösterdiği sonucuna ulaşılmıştır. Ayrıca öğrencilerin algıladıkları okul yaşantıları "yüksek" düzeyde bulunmuş olup; öğrencilerin okul yaşantılarına yönelik algılarının cinsiyet ve başarı puanı değişkenleri açısından farklılaştığı tespit edilmiştir. Araştırma sonucunda öğrencilerin olumlu algıladıkları okul yaşantıları arttıkça geometriye yönelik tutumlarının arttığına ulaşılmıştır. Sonuçlardan yola çıkılarak önerilerde bulunulmuştur. Algılanan okul yaşantıları ile geometriye yönelik tutumları arasındaki ilişkinin belirlenmesi yönünden araştırma özgün nitelik taşımaktadır.

[1] This article was produced from the master's thesis titled "The Relationship between Secondary School Students' Attitudes towards Geometry and Their Perceived School Experiences" prepared at the Social Sciences Institute of Çankırı Karatekin University in 2022.

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Citation/Alıntı: Uysal, F., & Dogruoz, E. (2023). Investigation of the relationship between middle school students' attitudes towards geometry and perceived school experiences, *Kastamonu Education Journal, 31*(2), 305-319. doi: 10.24106/kefdergi.1274140

INTRODUCTION

Geometry associates the nature and the environment with mathematics in daily life. Geometry, which deals with concrete shapes, helps us to make sense of mathematics (Altun, 2015). Geometry is a field that helps the individual to make sense of abstract concepts while providing the development of thinking processes (Duatepe, 2000). Geometry teaching has been included in the curriculum since primary education. Based on the studies, it was determined that factors such as the teacher, teaching methods, material use, students' physical-psychological characteristics, school-classroom environment and students' attitudes towards geometry affect the students' understanding of geometry and their achievements in geometry (Altun, 2015; Aydoğdu, 2003, Olkun and Aydoğdu, 2003; Sarıaslan and Küçük Demir, 2019). Studies provide suggestions such as planning the teaching process, developing new materials, teaching by making students aware of the environment instead of directing them to use only formulas, correcting misconceptions in geometry, increasing student attitudes towards geometry, improving physical and psychological conditions (Akman, 2002; Başışık, 2010).

Affective characteristics are emotional tendencies such as love, interest, commitment, belief, and attitude (Bloom, 1995). The individuals decide their behavior with the effect of their affective characteristics. In this respect, affective characteristics have an important place in education to ensure that the behaviors are at the desired level and the goals are obtained. There are affective features in the curriculum, and besides knowledge and skills, it also includes expressions such as curiosity, attitude, self-confidence and transferring values (MoNE, 2018). While the family affects the individual's affective characteristics such as attitude and belief from birth to school life; factors such as peers, training and the mass media start to be influential from the beginning of school life. Considering that schools that shape the future are the settings where individual spend their most critical periods, it is necessary to improve affective characteristics such as interest, attitude and motivation, which affect the realization of target behaviors.

Schools are educational environments where individuals develop and change cognitively, emotionally and behaviorally. Starting from primary school, the school environment includes critical periods for students, and in this respect, in-school experiences are important in students' psychological development and academic achievement. Students have expectations in their school life such as observing affection between teacher and student, reaching a wide range of opportunities at school, having administrators and teachers as guides, and learning useful information at school (Aydoğdu, 2008; Balcı, 1999; Inbar, 1996; Saban, 2011). Students' attitudes towards geometry and their perceived school experiences direct their feelings and thoughts and thus affect their behavior.

İnceoğlu (1993) defined attitude as the emotional, cognitive and behavioral tendency shaped by an individual's experiences, motivation, environment and knowledge. An attitude is not a direct behavior but indicates a tendency towards specific behaviors. In addition, the attitude is not innate, but occurs as a result of experiences and may continue through a certain process. Attitudes which create bias and partiality are effective in the formation of positive or negative situations in relation to behaviors (Tavşancıl, 2014). Factors such as family, environmental effects, social environment of the individual, mass media, personality traits, education and beliefs are effective in shaping attitudes (Güney, 2000).

Based on the definition of attitude, attitude towards geometry is defined as the emotional, cognitive and behavioral tendencies of the individual regarding the geometry lesson, the geometry teacher, the geometry activities and the use of geometry (Bindak, 2004). Attitudes have functions such as adaptation, provision of benefits, creation of value, identification of personal characteristics and development of behavior (Hogg and Vaughan, 1995). Yenilmez and Özabacı (2003) stated that the factors affecting the attitude towards mathematics, and therefore, geometry are teachers, emotions, self-image and behaviors. Based on these factors, the teacher's professional knowledge and field knowledge, teacher-student relations, positive or negative reactions from the student's circle of friends, and the student's participation in the lesson, fulfilling his duties and responsibilities affect the attitude towards geometry.

Examination of geometry teaching programs in terms of affective features presents several objectives such as acquisition and improvement of attitudes by students (MoNE, 2018). Positive or negative attitudes are formed by comparing two situations (Tavşancıl, 2014). Positive attitudes are towards desired emotions and behaviors, while negative attitudes are towards undesirable emotions and behaviors. When considered in terms of education, while having a fondness for the lesson, motivation towards the lesson and feelings of enjoyment indicate a positive attitude; feelings such as dislike for the lesson or feelings of boredom during the lesson indicate a negative attitude. Cockcroft (1982) reported that positive attitudes facilitate learning while negative attitudes inhibit learning. Negative attitudes may also cause students to be closed to learning because they continue for a period of time.

Technology has become a vital need today so much so that some processes cannot even be performed without technological tools and newly developed methods. The use of technology in the classroom has become an important requirement at schools since schools are expected to facilitate daily life and be up-to-date within the bounds of the needs of the era. The literature review points to studies in which technology-supported learning contributes to the formation of positive attitudes (Göksu, 2020; Orçanlı, 2015; Önal and Demir, 2012; Sarıaslan and Küçük Demir, 2019, Topraklıoğlu, 2019). With its positive effect on attitudes, technology use in the teaching environment also contributes to the development of educational environments and the creation of desired behaviors.

School is an educational environment where information, necessary skills and habits are taught to individuals in line with the objectives and within the framework of a certain program. Schools are places where the individual's feelings and thoughts are

shaped in addition to the family training, and where the individual receives education in line with selected objectives from a young age. The fact that many factors affecting attitudes, such as peer circle, education, teacher and school environment are included in the school environment shows that schools are an important area of emotional and psychological development (Güney, 2000). In addition, the fact that the critical periods which are the most emotionally intense periods for the students are experienced within the school age show that the school environment is an important structure.

Experiences are defined as things that remain with the person after what is heard or seen (TDK, 2011). School experiences, on the other hand, can be defined as the things that remain in the students after what they experience, see and hear at school. Practices and experiences shape attitudes (Tavşancıl, 2014). On the other hand, since attitudes direct behaviors, identification, regulation and development of school experiences contribute to the formation of desired behaviors.

Students with positive school experiences fulfill their course and homework responsibilities. Positive school experiences improve the school and classroom environment, relieve students psychologically and increase students' academic achievement (Baytemir et al., 2015; Güler, 2019; Ma, 2007). In addition to cognitive levels, affective levels and experiences should be examined at schools which are among the environments most affected by the changing conditions (Anderson-Butcher et al., 2012). This examination will help determine the factors that affect experiences and therefore behaviors so that measures can be taken and the aspects of school environments that need to be improved can be identified.

School experiences include the elements such as teachers, students, staff, administrators and the environment where the school is located. In addition, school experiences also incorporate activities that focus on academic monitoring such as feedback provided by teachers and administrators, monitoring student learning, and involving students in decision making as well as emotions and motivations towards school work and school and the sense of belonging to school and peers (Anderson-Butcher et al., 2012). Libbey (2004) stated that school connectedness is the way students perceive school relations. Studies showed that the students' academic achievement increased when their school commitment was high (Finn, 1993). Middleton and Midgley (2002) stated that academic monitoring has a shaping effect on students' self-efficacy beliefs and academic beliefs. Academic motivation, defined as energy towards academic goals, was found to reduce anxiety and increase achievement (Bozanoğlu, 2004; Gottfield, 1990).

There are studies examining the effect of material use on attitude in the framework of the research on attitudes towards geometry (Yemen, 2009; Budak, 2010; Önal and Demir, 2012; Şeker, 2014; Orçanlı, 2015; Sarıaslan and Küçük Demir, 2019; Topraklıoğlu, 2019; Özmen, 2019 ; Göksu, 2020; Frazier, 2020) and studies on determining the attitude towards geometry and whether it differed in terms of demographic characteristics (Bulut et al., 2002; Bindak, 2004; Aktaş and Aktaş, 2012; Mahanta, 2012; Hızlı, 2013; Sunzuma, Masocha and Zezekwa, 2013; Avcı et al., 2014; Melo and Martins, 2015; Kaba Daymaz and Boğazlıyan, 2016; Bora and Ahmed, 2018; Özdişçi, 2019; Ylano and Tayaben, 2019; Auliya and Munasiah, 2020; Bulut et al., 2020;Sevgi and Gürtaş, 2020; İlhan, Gemcioğlu and Poçan, 2021; Yücel and Koç, 2021) while studies on perceived school experiences usually centered on metaphor studies on school life (Aydoğdu, 2008; Özdemir and Yüner, 2017; Arslan, 2020), on factors such as academic motivation and commitment to school (Finn, 1993; Arastam, 2009; Middleton and Midgley, 2002; Bozanoglu, 2004; Dogan, 2014; Fan and Williams, 2018) and on perceived school experiences in terms of demographic characteristics (Güler, 2019). Based on the relevant literature review, no research was found on the relationship between middle school students' attitudes towards geometry and their perceived school experiences. The research is believed to be distinctive in this respect.

This research aimed to examine the relationship between 5th, 6th, 7th and 8th grade middle school students' perceived school experiences and their attitudes towards geometry in the Southeastern Anatolia Region. In addition, the sub-objectives in this study included the examination of whether the variables of gender, school type, grade level, age, parent education status and mathematics achievement score created a significant difference on students' perceived school experiences and attitudes towards geometry.

In line with these purposes, answers were sought to the following problems;

1. What is the students' attitude towards geometry?

2. Do the students' attitudes towards geometry show a statistically significant difference regarding gender, school type and mathematics achievement scores?

3. What is students' perceived school experiences?

4. Does the students' perceived school experiences show a statistically significant difference regarding gender, school type and mathematics achievement scores?

5. Is there a significant relationship between students' attitudes towards geometry and their perceived school experiences?

6. Do students' perceived school experiences significantly predict their attitudes towards geometry?

METHOD/MATERIALS

Research Model/Design

The research was carried out with the relational survey model to examine the relations between the attitudes and perceived school experiences of middle school students in the Southeastern Anatolia Region and to explore the relationship of these concepts with the identified variables.

Study Group/Universe and Sample

The universe of the study consisted of 975043 middle school students studying in the Southeastern Anatolia Region in the 2021-2022 academic year. The proportional cluster sampling method, one of the random sampling methods, was used to determine the distribution to the provinces in the study. The required sample for the study was calculated as 600 by sampling from the population based on accessibility, cost effectiveness and time saving. The simple random sampling method was used to select the schools to be included in the research sample.

Table 1 presents the distribution of the information regarding students' gender, school type and mathematics achievement in the study.

Tablo 1:The demographic characteristics of the students

Variable	Sub Groups	Frequency (N)	%
Gender	**Female**	317	52,2
	Male	290	47,8
School Type	**Middle School**	465	76,6
	Imam Hatip Middle School	142	23,4
Mathematics Achievement Score	**0-49,99**	172	28,3
	50-59,99	163	26,9
	60-69,99	103	17,0
	70-84,99	79	13,0
	80-100	90	14,8
Total		607	100

Table 1 shows that 52.2% of the study participants were male and 47.8% were female. According to Table 1, 317 female students and 290 male students participated in the research. The majority (76.6%) of the students participating in the research attended Basic Education Middle Schools. Examination of the frequency information of student distribution in the study by mathematics achievement score showed that 55.2% of the students scored below 60. It was found that the participation of students with low achievement levels was high.

Data Collection Tools

Data were collected in this study which aimed to present the relationship between middle school students' perceived school experiences and attitudes towards geometry with the help of "Personal Information Form", "Scale of Attitudes towards Geometry" and "Perceived School Experiences Scale". Scale of Attitudes towards Geometry, a five-point Likert-type scale with 24 items, was developed by Özdişçi and Katrancı (2019) to determine middle school students' attitudes towards geometry. The scale consists of three factors: "Positive attitudes", "Negative attitudes" and "Technology". Özdişçi and Katrancı (2019) declared the Cronbach alpha internal consistency of the entire scale to be 0.886. The "positive" (1, 3, 6, 8, 11, 14, 16, 18, 20), "negative" (5, 9, 12, 22, 24) and "technology" (2, 4, 7, 10). , 13, 15, 17, 19, 21, 23) sub-factors of the scale were calculated as 0.924, 0.728 and 0.909, respectively. Özdişçi and Katrancı (2019) concluded that the scale is valid and reliable.

Confirmatory Factor Analysis and Cronbach's Alpha coefficient were recalculated to determine whether the scale was a valid and reliable scale for this study. As a result of the validity analysis, the *t* values were found to be significant (t> 2.56, p>0.01) and fit intervals and validity coefficients showed that the scale was valid (r>0.30). When the Cronbach Alpha internal consistency was examined, the internal consistency coefficient of the attitude scale towards geometry was found to be 0.790 and the internal consistency coefficients of the sub-dimensions "positive attitude", "negative attitude" and "technology" were calculated as 0.832, 0.600 and 0.795, respectively. As a result, it was concluded that the " Scale of Attitude towards Geometry" was a valid and reliable scale for this study.

Perceived School Experiences Scale, a five-point Likert-type scale with 14 items, was developed by Anderson-Butcher et al. (2012) to determine students' perceived school experiences and was adapted to Turkish by Baytemir et al. (2015). Cronbach's alpha reliability coefficient for the whole scale was found to be 0.93. The scale consists of three sub-dimensions as "Academic Press" (1., 2., 3. and 4. items), "Academic Motivation" (5., 6., 7., 8., 9. and 10. items) and "School Connectedness" (11., 12., 13., and 14. items). Cronbach's alpha reliability coefficients for the sub-dimensions of the scale were 0.85 for Academic Press, 0.83 for Academic Motivation and 0.85 for School School Connectedness.

The validity and reliability of the Perceived School Experience Scale was retested for this study with Confirmatory Factor Analysis and via calculation of Cronbach's Alpha coefficient. As a result of the validity analysis, the *t* values were found to be significant (t> 2.56, p>0.01) while fit intervals and validity coefficients showed that the scale was valid (r>0.30). When the Cronbach Alpha internal consistency was examined, the internal consistency coefficient of the perceived school experience scale was found to be 0.84, and the internal consistency coefficients of the sub-dimensions "academic press", "academic motivation" and "school

connectedness" were 0.693, 0.653 and 0.75, respectively. As a result of the findings, it was concluded that the "Perceived School Experiences Scale" was a valid and reliable scale for this research.

Data Collection and Analysis

The data obtained from the scales applied to the required sample were coded and entered into the SPSS 22 package program. Negative items were coded in reverse. Descriptive statistics were used in the analysis of the data collected in the scales. Normality tests were carried out in the research to determine the suitable analysis method to be used in statistical analysis. Normality tests were analyzed and "parametric" or "non-parametric" tests were utilized as suitable analysis methods based on the normality of the distribution. Normality interpretation was done with the help of skewness and kurtosis values obtained from normality tests. Table 2 presents the statistical central tendency and distribution measures, skewness and kurtosis values of the scales and their sub-dimensions as used in the study.

Tablo 2: Descriptive statistics on scales

Variable	N	Min	Max	x̄	Ss	Variance	Skewness	Kurtosis
PSES	607	1,29	5,00	3,76	,76	,58	-,854	,250
Academic Press	607	1,00	5,00	3,94	,93	,87	-,969	,295
Academic Motivation	607	1,17	5,00	3,57	,82	,68	-,453	-,435
School Connectedness	607	1,00	5,00	3,87	1,0	1,04	-,777	-,316
ATG	607	1,21	4,79	3,35	,52	,28	-,168	,014
Positive Attitude	607	1,00	5,00	3,28	,80	,65	-,367	-,142
Negative Attitude	607	1,00	5,00	3,42	,82	,67	-,254	-,431
Technology	607	1,30	5,00	3,38	,76	,58	-,185	-,294

As Table 2 shows, the skewness values of the scales and their sub-dimensions took values between --0,168/-0,969 in the normality test while the kurtosis values were between --0,435/+0,295. According to Tabachnick and Fidell (2013), the skewness and kurtosis values of the data between -1.5 and +1.5 indicate that normality is provided and the scores of the data are normally distributed. In order to analyze whether there was a statistically significant difference between the variables in the research sub-problems, "*t*-test" was used for the variables with two subgroups and "One-Way Analysis of Variance" was used for the variables with three or more subgroups. Multiple comparison analyzes were used based on ANOVA results to identify the source of the difference between the groups when there was a significant difference. In the Post Hoc tests, the Sheffe test was used to determine the source of the significant difference between the groups. The Dunnett C test was used in the cases where the group variances regarding the distribution of scores were not equal. Correlation coefficients were calculated with the Pearson Correlation test in order to determine the relationship between the Attitudes towards Geometry and the Perceived School Experiences. In addition, "Multiple Regression Analysis" was carried out to determine how the specific independent variables affected the dependent variable.

The assumptions required for the multiple regression analysis were checked. A linear relationship was found between the variables with the help of graphics and since the correlation between the variables was less than 0.80, it was concluded that there was no problem of multicollinearity (Berry et al., 1985). In addition, while checking the multicollinearity assumption, VIF values were determined to be less than 2,5 (1,53; 1,76; 1,62) and Cook's Distance values were found to be less than 1,00 for the extreme value assumption (0,061), therefore the assumptions were met (Allison, 1999; Cook et al, 1982). The histogram graph was examined to control the normality assumption of the dependent variable, and the curve of the graph was determined to have a normal slope. In addition, the Durbin Watson value was calculated to control the assumption that the errors were independent from each other and this value was determined to be 1,80. Since the calculated value was between 1 and 3, it was concluded that the assumption was met (Field, 2009). Hence, necessary assumptions for analysis were found to be provided.

FINDINGS

The study presents the findings under the following headings: the findings regarding the examination of the relationship between middle school students' attitudes towards geometry and their perceived school experiences and the findings about whether this relationship differed according to demographic variables. In addition, findings are presented regarding the predictive power of perceived school experiences on attitudes towards geometry.

Findings Related to Middle School Students' Attitudes towards Geometry and Their Perceived School Experiences

Table 3 presents the mean scores for the Scale of Attitudes towards Geometry and the Perceived School Experiences Scale.

Tablo 3:Mean scores for the attitude scale towards geometry and the scale of perceived school experiences

Scale	N	x̄	Ss
Scale of Attitudes Towards Geometry	607	3,35	0,52

Sub Dimensions	Positive Attitude (ATG)	607	3,28	0,80
	Negative Attitude (ATG)	607	3,42	0,82
	Technology (ATG)	607	3,38	0,76
Perceived School Experiences Scale		607	3,76	0,76
Sub Dimensions	Academic Press (PSES)	607	3,94	0,93
	Academic Motivation (PSES)	607	3,57	0,82
	School Connectedness (PSES)	607	3,87	1,02

As Table 3 shows, the mean score for the whole Scale of Attitudes towards Geometry was calculated as x̄=3,35. Based on the findings, it was found that middle school students' attitudes towards geometry were at the "moderate" level. The mean score the whole Perceived School Experiences Scale was calculated as x̄=3,76 and it was concluded that the positive school experiences perceived by the secondary school students were at a “high” level.

Examining the Attitudes towards Geometry in Terms of Variables

Table 4 presents the results of the *t*-test, conducted to determine whether middle school students’ attitudes of towards geometry differed by gender.

Tablo 4: t-test results of students' Attitudes towards Geometry by gender

Variable	Gender	N	x̄	Ss	Sd	t	p
Scale of Attitudes Towards Geometry	**Female**	317	3,34	,54	605	-,402	,688
	Male	290	3,36	,51			
Positive Attitude	**Female**	317	3,31	,82	605	1,180	,238
	Male	290	3,24	,79			
Negative Attitude	**Female**	317	3,42	,83	605	,088	,930
	Male	290	3,42	,80			
Technology	**Female**	317	3,33	,79	605	-1,844	,065
	Male	290	3,44	,72			

According to Table 4, students' positive and negative attitudes towards geometry and their attitudes towards technology did not differ significantly by gender, ($t_{(Positive\ Attitude)}$= 1,180, p>.05; $t_{(Negative\ Attitude)}$=0,088,*p>.05*; t ($_{(Technology)}$= -1,844, *p>.05*). Students' attitudes towards geometry did not differ statistically according to gender ($t_{(Attitude\ Towards\ Geometry)}$=-0,402, *p>.05*). Based on these results, female and male students' attitudes towards geometry and sub-dimensions of attitudes such as positive attitudes, negative attitudes and views towards technology were similar to each other.

Table 5 displays the results of the *t*-test conducted to determine whether middle school students’ attitudes towards geometry differed by school type.

Table 5: *t*-test results of students' Attitudes towards Geometry by school type

Variable	School Type	N	x̄	Ss	Sd	t	p
ATG	**Middle School**	465	3,36	,51	212	,651	,516
	İmam Hatip Middle School	142	3,32	,58			
Positive Attitude	**Middle School**	465	3,29	,78	605	,839	,402
	İmam Hatip Middle School	142	3,23	,87			
Negative Attitude	**Middle School**	465	3,41	,82	605	-,364	,716
	İmam Hatip Middle School	142	3,44	,80			
Technology	**Middle School**	465	3,39	,74	605	,094	,578
	İmam Hatip Middle School	142	3,35	,82			

Examination of the analysis results in Table 4 shows that students’ ositive and negative attitudes towards geometry and their attitudes towards technology did not differ significantly by school type ($t_{(Positive\ Attitude)}$= 0,839, *p>.05*; $t_{(Negative\ Attitude)}$=-0,364, *p >.05,* $t_{(Technology)}$=0,094, *p>.05*). In addition, students' attitudes towards geometry did not differ statistically according to school type ($t_{(Attitude\ towards\ geometry)}$=-0,651, *p>.05*). Based on these results, students' attitudes towards geometry and sub-dimensions of attitudes such as positive attitudes, negative attitudes and views towards technology were similar to each other whether they attended Basic Education Middle Schools or Imam Hatip Middle Schools.

Table 6 provides the results of ANOVA which was conducted to determine whether middle school students’ attitudes towards geometry differed by their mathematics achievement score.

Table 6: ANOVA results regarding students' Attitudes towards Geometry by achievement score

	Achievement Level	N	x̄	Ss	Sd	F	p	Significant Difference
Attitudes towards Geometry	0-49,99	172	3,28	,54	4-602	3,239	,012*	80-100 >0-49,99
	50-59,99	163	3,31	,48				
	60-69,99	103	3,35	,48				
	70-84,99	79	3,43	,52				
	80-100	90	3,50	,58				
	Toplam	607	3,35	,52				
Positive Attitude	0-49,99	172	3,21	,86	4-602	,749	,559	
	50-59,99	163	3,26	,76				
	60-69,99	103	3,32	,78				
	70-84,99	79	3,28	,85				
	80-100	90	3,39	,77				
	Toplam	607	3,28	,80				
Negative Attitude	0-49,99	172	3,35	,78	4-602	4,803	,001*	80-100 >0-49,99 80-100 > 50-59,99
	50-59,99	163	3,28	,84				
	60-69,99	103	3,45	,81				
	70-84,99	79	3,47	,76				
	80-100	90	3,72	,84				
	Toplam	607	3,42	,82				
Technology	0-49,99	172	3,30	,72	4-602	1,920	,106	
	50-59,99	163	3,37	,76				
	60-69,99	103	3,33	,72				
	70-84,99	79	3,55	,76				
	80-100	90	3,48	,85				
	Toplam	607	3,38	,76				

**p<,05*

According to Table 6, there was a statistically significant difference in participating students' mean attitude scores towards geometry in regards to the achievement variable ($F_{(4\text{-}602)\text{Attitude towards Geomerty}}$= 3,239, p<.05). Then, the groups with a significant difference were examined. In comparing the attitudes towards geometry by achievement groups, significant differences were observed between 0-49,99 and 80-100 achievement groups based on the Sheffe test. The groups with higher or lower attitudes towards geometry were identified by examining the arithmetic means of these achievement groups. The arithmetic mean of the attitude towards geometry in the 0-49,99 achievement group was (x̄= 3,28); and the arithmetic mean of the attitude towards geometry in the 80-100 achievement group was (x̄= 3,50). The attitudes towards geometry for the students with 80-100 achievement scores were found to be higher than the attitudes of the students with 0-49.99 achievement scores.

When Table 6 was examined, a statistically significant difference was observed in the sub-dimension "negative attitude" based on the achievement variable ($F_{(4\text{-}602)\text{ Attitude towards Geomerty}}$ = 3,239, *p<,05*; $F_{(4\text{-}602)\text{Negative Attitude}}$=4,803; *p<,05*).Examination of "Positive Attitude" and "Technology" sub-dimensions showed no significant difference between students' meaan scores in the "positive attitude" and "technology" sub-dimensions based on the achievement variable ($F_{(4\text{-}602)\text{Positive Attitude}}$=0.749, p>.05; $F_{(4\text{-}602)\text{Technology}}$=1,920, *p>.05*).

The arithmetic mean of the attitude towards geometry was (x̄= 3,35) in the 0-49,99 achievement group; it was (x̄= 3,28) in the 50-59,99 achievement group and it was (x̄= 3.72) in the 80-100 achievement group. Examination of the obtained means showed that the attitudes of the groups with 80-100 achievement scores were more negative compared to the attitudes of the students with 0-49,99 and 50-59,99 achievement scores.

Examination of Perceived School Experiences in Terms of Variables

Table 7 presents the results of the *t*-test conducted to determine whether middle school students' perceived school experiences differed by gender.

Table 7: *t*-test results of students' Perceived School Experiences by gender

	Gender	N	x̄	Ss	Sd	t	p
PSES	Female	317	3,83	,77	605	2,51	,012*
	Male	290	3,68	,74			
Academic Press	Female	317	3,98	,94	605	1,30	,194
	Male	290	3,88	,92			
Academic Motivation	Female	317	3,63	,83	605	1,95	,051
	Male	290	3,50	,81			

School Connectedness	Female	317	3,98	1,00	605	3,00	,003*
	Male	290	3,74	1,03			

**p<,05*

According to Table 7, it was concluded that there was no statistically significant difference by gender in the scores of "academic press" and "academic motivation", the sub-dimensions of Perceived School Experience Scale ($t_{(Academic\ Press)}$; 1,30, *p>,05*; $t_{(Academic\ Motivation)}$=1,95, *p>,05*). A significant difference was found by gender in the sub-dimension of students' perceived school experiences and "school connectedness" ($t_{(Perceived\ School\ Experiences)}$; 2,51, *p<,05*; $t_{(school\ connectedness)}$=3,00, *p<,05*). It was concluded that female students' mean perceived school experiences and mean school connectedness (x̄=3,83), were higher than thhose of the male students' (x̄=3,68). Perceived school experiences and school connectedness dimensions were found to be more positive and higher in female students compared to male students.

Table 8 presents the results of the *t*-test conducted to determine whether middle school students' perceived school experiences differed by school type.

Table 8: *t*-test results of students' Perceived School Experiences by school type

		N	x̄	Ss	sd	t	p
PSES	**Middle School**	465	3,74	,77	605	-,957	,339
	İmam Hatip Middle School	142	3,81	,74			
Academic Press	**Middle School**	465	3,96	,95	605	1,029	,304
	İmam Hatip Middle School	142	3,86	,86			
Academic Motivation	**Middle School**	465	3,54	,81	605	-1,707	,088
	İmam Hatip Middle School	142	3,68	,87			
School Connectedness	**Middle School**	465	3,83	1,03	605	-1,376	,169
	İmam Hatip Middle School	142	3,97	,96			

Based on the analysis results presented in Table 8, it was concluded that there was no statistically significant difference between school types in Perceived School Experience Scale and sub-dimension scores ($t_{(Perceived\ School\ Experiences)}$=-0,957, *p>,05*; $t_{(Academic\ Press)}$= 1,029 , *p>,05*; $t_{(Academic\ Motivation)}$=-1,707, *p>,05*; $t_{(School\ Connectedness)}$=-1,376, *p>,05*). The perceived school experiences and the sub-dimensions of academic press, academic motivation and school connectedness of middle school students studying in Basic Education Middle Schools and Imam Hatip Middle Schools were found to be similar to each other.

When the analysis results shown in Table 7 were examined, it was concluded that there was no statistically significant difference between Perceived School Experience Scale scores by school type ($t^{(Perceived\ School\ Experiences)}$ = -0,957,*p>,05*). The school experiences perceived by the secondary school students studying in Basic Education Middle Schools and Imam Hatip Middle Schools were found to be similar to each other

Table 9 presents the results of ANOVA conducted to determine whether middle school students' perceived school experiences differed by mathematics achievement score.

Table 9: ANOVA results of students' Perceived School Experiences by achievement score

	Achievement Level	N	x̄	Ss	Sd	F	p	Significant Difference
PSES	0-49,99	172	3,66	,79	4-602	2,769	,027*	60-69>0-49,99
	50-59,99	163	3,72	,74				
	60-69,99	103	3,92	,72				
	70-84,99	79	3,72	,80				
	80-100	90	3,89	,72				
	Total	607	3,76	,76				
Academic Press	0-49,99	172	3,87	1,00	4-602	1,083	,364	
	50-59,99	163	3,92	,95				
	60-69,99	103	4,08	,80				
	70-84,99	79	3,85	,96				
	80-100	90	4,00	,85				
	Total	607	3,94	,93				
Academic Motivation	0-49,99	172	3,44	,88	4-602	3,600	,007*	60-69,99>0-49,99
	50-59,99	163	3,49	,77				60-69,99>50-59,99

	60-69,99	103	3,76	,77				
	70-84,99	79	3,60	,81				
	80-100	90	3,72	,83				
	Total	607	3,57	,82				
School Connectedness	0-49,99	172	3,76	1,03	4-602	1,659	,158	
	50-59,99	163	3,85	1,01				
	60-69,99	103	3,99	1,00				
	70-84,99	79	3,78	1,10				
	80-100	90	4,03	,95				
	Total	607	3,87	1,02				

**p<,05*

Based on Table 9, there was a statistically significant difference in participating students' mean perceived school experiences scale scores by the achievement variable ($F_{(4\text{-}602)\text{Perceived School Experiences}}$ = 2,769, *p<,05*). Then, the groups with a significant difference were examined. In comparing the perceived school experiences by achievement sub groups, significant differences were observed between 0-49,99 and 60-69,99 achievement sub groups based on the Dunnett C test. The groups with higher or lower perceived school experiences were identified by examining the arithmetic means of these achievement groups. The arithmetic mean of the perceived school experiences in the 0-49,99 achievement group was x̄= 3,66; and the arithmetic mean of the perceived school experiences in the 60-69,99 achievement group was x̄= 3,92.

The perceived school experiences in the 0-49,99 achievement group were found to be higher than the perceived school experiences of the students in the 60-69,99 achievement group.

Examination of Table 9 demonstrated a statistically significant difference by achievement in the "academic motivation" dimension, one of the sub-dimensions of Perceived School Experiences Scale ($F_{(4\text{-}602)\text{Perceived School Experiences}}$= 2,769, *p<05*; $F_{(4).\ \text{-}602)\ \text{Academic Motivation}}$= 3,600, *p<,05*). When the perceived school experiences mean scores were examined, the mean score of the 60-69,99 achievement group (x̄=3,76) was found to be higher than the mean score of the 40-49,99 achievement group (x̄=3,44) and 50-59,99 achievement group (x̄=3,49). Perceived academic motivation of students in the 60-69,99 achievement interval was more positive than the students in the 40-49,99 and 50-59,99 achievement groups.

Examination of the "Academic Press" and "School Connectedness" sub-dimensions of the Perceived School Experience Scale, showed no significant difference by student achievement ($F_{(4\text{-}602)\text{Academic Press}}$=1,083, *p>,05*; $F_{(4\text{-}602)\ \text{School Connectedness}}$ = 1,659, *p>,05*).

The Relationship between Perceived School Experiences and Attitudes towards Geometry

Pearson correlation analysis was performed to determine the relationship between perceived school experiences and attitudes towards geometry and the results are presented in Table 10.

Table 10: Analysis of pearson correlation coefficient values between Perceived School Experiences and Attitudes towards Geometry

	ATG	Positive Attitude (GYT)	Negative Attitude (GYT)	Technology (GYT)	**PSES**	Academic Press (PSES)	Academic Motivation (PSES)	School Connectedness (PSES)
ATG	1							
Positive Attitude (ATG)	,788**	1						
Negative Attitude (ATG)	,396**	,232**	1					
Technology (ATG)	,701**	,233**	-,100*	1				
PSES	,316**	,302**	,067	,203**	1			
Academic Press (PSES)	,264**	,254**	,054	,168**	,793**	1		
Academic Motivation (PSES)	,294**	,270**	,066	,196**	,879**	,550**	1	
School Connectedness (PSES)	,231**	,229**	,045	,142**	,826**	,495**	,585**	1

According to Table 10, there was a positive, significant and moderate relationship between perceived school experiences and attitudes towards geometry ($R_{(,316)}$; p<0,01). Perceived school experiences consist of only positive items, and as positively perceived school experiences increase, attitudes towards geometry increase as well. Based on the calculaiton of the coefficient of determination (r^2=0.09), it can be concluded that 9% of the total variability in attitudes towards geometry was based on positively perceived school experiences.

Multiple regression analysis was used to analyze whether the perceived school experiences sub-dimensions predicted the attitude towards geometry and the results are presented in Table 11.

Table 11: Multiple linear regression analysis results on predicting the attitudes towards geometry

	B	Standard Error	Beta	T	p	Binary r	Partial R
Fixed	2,519	,103	-	24,384	,000*	-	-
Academic Press	,075	,027	,133	2,775	,006*	,264	,112
Academic Motivation	,120	,033	,188	3,679	,000*	,294	,148
School Connectedness	,029	,025	,055	1,123	,262	,231	,046

R= 0,321 R^2= 0,103

$F_{(3,603)}$= 23,071 p= ,000*

Table 11 pointed to a significant and moderate relationship between perceived school experiences sub dimensions and students' attitudes towards geometry (R= 0,321; R^2= 0,103; p< ,05). 10% of students' attitudes towards geometry were explained by students' perceived school experiences sub-dimensions. According to the standardized regression coefficient (β), "Academic Press" (t= 2,775, *p<,05*) and "Academic Motivation" (t=3,679, *p<,05*) sub dimensions of Perceived School Experiences Scale were significant predictors of students' attitudes towards geometry.

There is a significant and moderate relationship between Perceived school experiencessub dimensions and students' attitudes towards geometry. 10% of the students' attitudes towards geometry are interpreted with the sub-dimensions of the school life perceived by the students. According to the standardized regression coefficient (β), the "Academic Press" and "Academic Motivation" sub-dimensions of Perceived School experiences are significant predictors of students' attitudes towards geometry. The relative order of importance of sub-dimensions was found to be as follows: academic motivation and academic press.

DISCUSSION

This research, which was conducted with a sample selected from the Southeastern Anatolia Region, was carried out with the aim of determining the relationship between perceived school experiences and attitudes towards geometry. In this regard, it is believed that identifying the relationships between the affective characteristics that guide behaviors can help in increasing achievement in education and acquiring the target behaviors. The fact that a significant, positive and moderate relationship was found in the study between students' attitudes towards geometry and their perceived school experiences showed that the attitude towards geometry will increase with the increase in positively perceived school experiences. 10% of the students' attitudes towards geometry was explained by the sub-dimensions of perceived school experiences. Hence, it was concluded that improving school life will be effective in improving attitudes towards geometry. The conclusion that the regulation of school experiences based on the factors that affect the attitudes towards geometry may improve the attitudes towards geometry will contribute to the literature.

According to the findings, middle school students' attitudes towards geometry were at "moderate" level. While this result of the research was similar to the findings obtaned by Bindak (2004) who conducted a study with middle school students; Özdişçi (2019) found that middle school students' attitudes towards geometry were at a "high" level, and Yücel and Koç (2011) concluded that students had a "good" attitude towards geometry.

When the attitudes towards geometry were examined by gender, no significant difference was observed in the attitude scores of female and male students towards geometry. While Sevgi and Gürtaş (2020) and Yücel and Koç (2011), who worked with of middle school students, also found no significant difference in attitudes according to the gender; İlhan, Gemcioğlu and Poçan (2021) and Kaba, Daymaz and Boğazlıyan (2016) found significant differences by gender. Kaba et al. (2016) found that female students' attitudes towards mathematics were more positive compared to male students' attitudes.

It was concluded that there was no statistically significant difference between the students' attitude scores towards geometryby school type and the geometry attitude scores of the students studying in Basic Education Middle Schools and Imam Hatip Middle Schools were similar. The fact that attitude towards geometry did not differ according to school type; can be explained with similar type of teaching in these school types.

It was concluded that attitudes towards geometry differed significantly in terms of achievement. The attitudes towards geometry were found to be higher for the students with 80-100 achievement scores compared to those of students with 0-49,99 achievement scores. This research result was similar to the finding obtained by Bulut, Ekici, İşeri and Helvacı (2020), Özdişçi (2019) and Yücel and Koç (2011). The finding that the group with the highest achievement score had higher attitude towards geometry compared to the group with the lowest score shows the relationship between achievement and attitude.

According to the research results, middle school students' perceived positive school experiences were found to be "high". Based on the analysis results, a significant difference was found in students' perceived school experience scores by gender. It was determined that female students perceived school experiences more positively and at higher levels compared to male students. Güler (2019), who worked with middle school students, reached a similar conclusion. The fact that female students are more emotionally attached can be interpreted as one of the reasons for the higher perceived school experience among female students.

It was concluded that there was no statistically significant difference in students' Perceived School Experience Scale scores by school type. There was a statistically significant difference in students' Perceived School Experience Scale scores by achievement and the school experiences perceived by the 0-49,99 achievement group was more negative compared to the school experiences perceived by 60-69i99 achievement group.

CONCLUSION AND RECOMMENDATIONS

Since positive school experiences increase the attitude towards geometry, it is recommended to create positive school experiences and to carry out studies on school experiences to increase the attitude towards the lesson.

School experiences include the education students receive, administrators and teachers, and their connectedness to the school and therefore, increasing student-teacher interaction, involving students in school decisions, guiding students, implementing plans that will make students feel committed and connected to the school increase students' perceived school experiences. With this approach, there will be an increase in student attitudes towards geometry.

Qualitative research is recommended to determine the reasons for the differences between the groups based on attitudes towards geometry scores and perceived school experiences scores as well as demographic variables.

It is recommended to determine the characteristics of the schools with the desired geometry attitudes by comparing the regional studies and the results of this research, to provide interaction between schools, to establish an information network in cooperation with schools and to carry out activities that increase the attitude, positive school experiences, and therefore achievement.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' Contribution Rate

The study was conducted and reported with equal collaboration of the researchers.

Details on Ethics Committee Approval

Prior to the collection of research data, ethics committee approval was obtained from Çankırı Karatekin University Ethics Committee with the decision dated 07/02/2022 and numbered 130d0a1491084933. After the decision that the research was ethically appropriate, the research process was started.

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ANNEXES

ANNEX -A: PERMISSION TO USE THE ATTITUDE TOWARDS GEOMETRY SCALE

Re: Geometri Tutum Ölçeği Kullanım İzni

SS selda sevim <sevim.selda@gmail.com>
7.12.2021 20:59

Kime: Feyza Uysal

Merhabalar, yüksek lisans tezimde geliştirmiş olduğum "Geometriye Yönelik Tutum Ölçeği" ni araştırmanızda kullanabilirsiniz..
Kolay gelsin..

Selda ÖZDİŞCİ
MEB' da Uzm. Mat. Eğitimcisi
Dokuz Eylül Üniversitesi Doktora Öğrencisi
7 Ara 2021 Sal, saat 20:25 tarihinde Feyza Uysal <feyzauysall@outlook.com> şunu yazdı:

> Merhaba,
>
> Ben Feyza Uysal. Çankırı Karatekin Üniversitesi Eğitim Programları ve Öğretim Yüksek Lisans Tez çalışması aşamasındayım. Geliştirmiş olduğunuz "Ortaokul Düzeyinde Geometriye Yönelik Tutum Ölçeği"ni araştırmamda kullanabilir miyim?
>
> Windows için Posta ile gönderildi

ANNEX -B: PERMISSION TO USE THE PERCEIVED SCHOOL EXPERIENCES SC

Re: Algılanan Okul Yaşantıları Ölçeği Kullanım İzni

KEMAL BAYTEMİR <kemalbaytemir@hotmail.com>
19:07

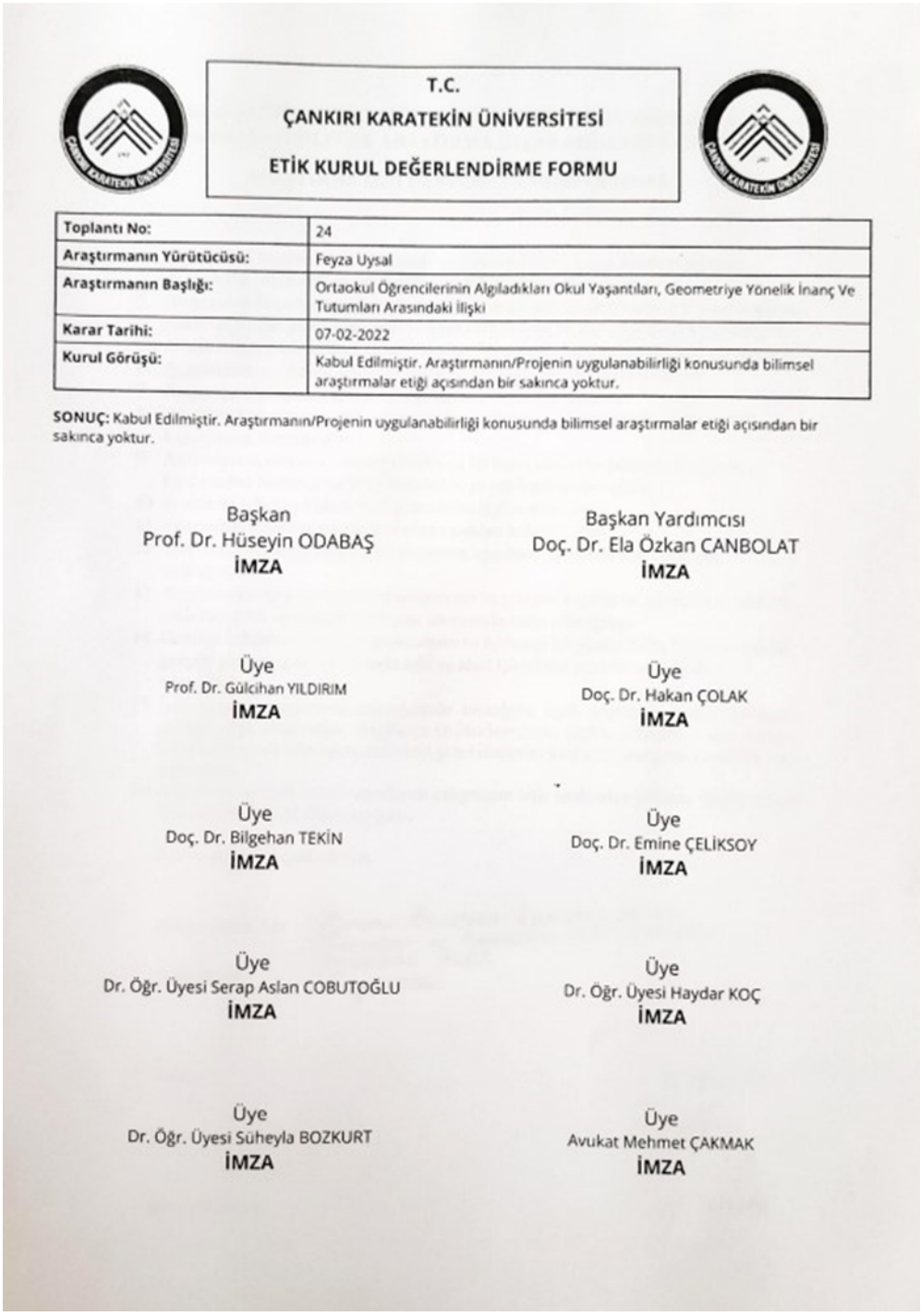
Kime: Feyza Uysal

Merhaba Feyza kullanabilirsin, çalışmalarında kolaylıklar dilerim.

iPhone'umdan gönderildi

> Feyza Uysal <feyzauysall@outlook.com> şunları yazdı (14 Ara 2021 18:15):
>
> Merhaba,
>
> Ben Çankırı Karatekin Üniversitesi Eğitim Programları ve Öğretim Yüksek Lisans tez dönemi öğrencisi Feyza Uysal.
> Türkçe'ye çevirmiş olduğunuz "Algılanan Okul Deneyimleri Ölçeği" ni yüksek lisans tez araştırmamda kullanabilir miyim?
>
> Teşekkürler.
>
> Windows için Posta ile gönderildi

ANNEX-C: ETHICS COMMITTEE ASSESSMENT FORM



T.C.
ÇANKIRI KARATEKİN ÜNİVERSİTESİ
ETİK KURUL DEĞERLENDİRME FORMU

Toplantı No:	24
Araştırmanın Yürütücüsü:	Feyza Uysal
Araştırmanın Başlığı:	Ortaokul Öğrencilerinin Algıladıkları Okul Yaşantıları, Geometriye Yönelik İnanç Ve Tutumları Arasındaki İlişki
Karar Tarihi:	07-02-2022
Kurul Görüşü:	Kabul Edilmiştir. Araştırmanın/Projenin uygulanabilirliği konusunda bilimsel araştırmalar etiği açısından bir sakınca yoktur.

SONUÇ: Kabul Edilmiştir. Araştırmanın/Projenin uygulanabilirliği konusunda bilimsel araştırmalar etiği açısından bir sakınca yoktur.

Başkan
Prof. Dr. Hüseyin ODABAŞ
İMZA

Başkan Yardımcısı
Doç. Dr. Ela Özkan CANBOLAT
İMZA

Üye
Prof. Dr. Gülcihan YILDIRIM
İMZA

Üye
Doç. Dr. Hakan ÇOLAK
İMZA

Üye
Doç. Dr. Bilgehan TEKİN
İMZA

Üye
Doç. Dr. Emine ÇELİKSOY
İMZA

Üye
Dr. Öğr. Üyesi Serap Aslan COBUTOĞLU
İMZA

Üye
Dr. Öğr. Üyesi Haydar KOÇ
İMZA

Üye
Dr. Öğr. Üyesi Süheyla BOZKURT
İMZA

Üye
Avukat Mehmet ÇAKMAK
İMZA