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| Research Article / Araştırma Makalesi |

Investigation of Primary School Students' Attitudes towards Mathematics in terms of Various Variables

İlkokul Öğrencilerinin Matematik Dersine Yönelik Tutumlarının Çeşitli Değişkenler Açısından İncelenmesi[1]

Osman Aktan[2], **Yusuf Budak**[3]

Keywords

1.Primary school
2.Mathematics class
3.Attitude of mathematics class
4.Fourth grade primary school student

Anahtar Kelimeler

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Abstract

Purpose: The current study aims to examine primary school students' attitudes towards mathematics lessons in terms of gender, having an individual room, having internet connection at home, having a social media account, family income and parents' education level.

Design/Methodology/Approach: This is a descriptive study that aims to investigate primary school students' attitudes towards mathematics lessons in terms of various variables, and it employs survey design. Data of the study were collected from 229 students attending fourth grade in primary schools in the central district of Düzce, Turkey in the 2017-2018 academic year. In order to identify primary school students' attitudes towards mathematics lessons, Scale of Attitudes towards Mathematics, which was developed by Nazlıçiçek and Erktin (2002) and the reliability and validity of which was tested by Aktan (2018) with regard to scale structure, was used in the current study. The data in this study were analyzed with a statistical package program.

Findings: The findings of the study reveal that students' attitude means scores towards mathematics do not differ significantly in terms of gender, having an individual room, having internet connection at home, having a social media account, family income, parents' education level. With regard to factors of the scale of attitude towards mathematics, there are significant differences in the factors of the scale in terms of having an individual room, having internet connection at home and family income while there are not any significant differences in terms of having a social media account and parents' education level.

Conclusion : Based on the results of the current study, to help students develop positive attitudes towards mathematics lessons, it is recommended that social media should be used to support learning, primary school teachers should offer mathematics lessons in an interesting and fun way, and activities should include games considering the developmental characteristics of primary school students. Besides, families should arrange environments for their children to study efficiently, offer better studying opportunities and they should be guided about efficient studying to raise their awareness.

Öz

Çalışmanın amacı: Bu araştırmanın amacı ilkokul öğrencilerinin cinsiyet, bireysel odaya sahip olup olmama, evde internet bağlantısı olup olmama, öğrencinin sosyal medya hesaplarına sahip olup olmama, aile gelir durumu, anne ve baba eğitim durumu değişkenleri açısından Matematik dersine karşı tutumlarının belirlenmesidir.

Materyal ve Yöntem: İlkokul öğrencilerinin matematik dersine ilişkin tutumlarının çeşitli değişkenler açısından incelendiği bu araştırma betimsel bir araştırma olup, tarama modelinde desenlenmiştir. Araştırmanın verileri 2017-2018 eğitim-öğretim yılından Düzce ili Merkez ilçede ilkokul kademesinde öğrenim gören toplam 229 ilkokul 4.sınıf öğrencisinden elde edilmiştir. Araştırmada ilkokul öğrencilerinin matematik dersine ilişkin tutumlarını belirlemek amacıyla, Nazlıçiçek ve Erktin (2002) tarafından geliştirilen, Aktan (2018) tarafından geçerlik ve güvenirlik çalışmaları ölçek yapısı test edilen Matematik Tutum Ölçeği kullanılmıştır. Veriler istatistik paket programı ile analiz edilmiştir.

Bulgular: Araştırma bulguları incelendiğinde, öğrencilerin matematik dersine yönelik tutum puanları ortalamalarının cinsiyet, bireysel odaya sahip olma, evde internet bağlantısına sahip olma, sosyal medya hesabına sahip olma, ailenin sahip olduğu gelir ve anne-baba eğitim durumlarına göre anlamlı farklılık göstermediği belirlenmiştir. Matematik tutum ölçeği alt boyutları incelendiğinde, bireysel odaya sahip olma, evde internet bağlantısı olma, ailenin sahip olduğu gelir durumlarına göre alt boyutlarda anlamlı farklılık olduğu; sosyal medya hesabına sahip olma, anne-baba eğitim durumlarına göre ise anlamlı farklılık olmadığı belirlenmiştir.

Sonuçlar: Araştırmada elde edilen bulgulara dayalı olarak öğrencilerin matematik dersine yönelik olumlu tutum geliştirmelerini sağlamak için, sosyal medyanın öğrenmede destek sağlayıcı olarak kullanılması, öğretmenlerin özellikle ilkokul dönemi öğrencilerinin gelişim özellikleri dikkate alınarak matematik dersini öğrencilerin ilgisini çekecek şekilde ve oyun ve eğlenceli etkinliklere dayalı olarak yapılandırmaları önerilmektedir. Ayrıca ailelerin, verimli ders çalışma ortamlarının oluşturulması, ders çalışma imkânlarının artırılması konusunda bilgilendirilmeleri, aile ve öğrencilere verimli ders çalışma konusunda rehberlik yapılarak farkındalık düzeylerinin artırılması sağlanabilir.

[1] Summary of this study; It was presented as an oral presentation at the X. International Educational Research Congress, April 27-30, 2018, Nevsehir, Turkey.

[2] **Corresponded Author,** Ministry of National Education, Düzce, TURKEY; https://orcid.org/ 0000-0001-6583-3765

[3] Gazi Üniversitesi, Eğitim Fakültesi, Ankara, TÜRKİYE; https://orcid.org/ 0000-0001-9625-204X

INTRODUCTION

There are several factors affecting learning. These factors can be addressed as intrinsic and extrinsic factors with respect to their effect on learning. Intrinsic factors can be explored within the learning environment due to their close relationship. A positive attitude towards learning is one of the significant intrinsic factors (Ertürk, 1993). It can offer the energy needed for interaction with the environment which forms the basic condition for learning. As a result of these interactions with the environment, individuals gain values through cognitive, affective and psycho-motor behaviors that form the basis of learning (Özden, 2008, p. 68). Within the existence of positive attitudes towards learning, students may be motivated and attain achievement. Lin and Lin (2011) argue that students get negative outputs in learning if they have negative attitudes towards learning. Therefore attitude is a critical variable affecting learning (Dörnyei, 2001). The concept of attitude can be defined as a latent affective characteristic guiding behavior (Arkonaç, 2001). It is the state of having a positive perspective on learning and being predisposed and willing to learn. In other words, a positive attitude towards learning is an effective stand fueling students for learning.

The concept of attitude which was first scientifically studied in the nineteenth century is of Latin origin and means "ready for action" (Arkonaç, 2001, p.158). Scholars have offered a number of definitions for the concept of attitude. According to Allaport (1935), who made the first definition in the literature, attitude is a state of mental approval, built as a result of life experiences shaping individuals' reactions to facts, entities or situations. According to İnceoğlu (2010) and Senemoğlu (2013), it is an acquired internal state that affects an individual's choice in individual activities based on experience, knowledge, feelings and motives for any individual, community, event and many different situations. With a simpler and shorter statement, it is a positive or negative reaction people develop for an object, event or situation (Baykul, 2015; Eagly & Chaiken, 2007; Hogg & Vaughan, 2005; Franzoi, 2003; Myers, 2001; Türker & Turanlı, 2008). From another point of view, attitude is an emotional reaction state where people give approval or disapproval of each thought, person, institution or group (Özgüven, 2017). Some scholars think that attitude includes psychological variables that are acquired later in life and that guide one's behaviors (Şengül & Dereli, 2013; Taşdemir, 2009; Tavşancıl, 2014, p.65). In this regard, attitude consists of evaluative judgments that integrate and summarize cognitive and affective behaviors (Crano & Prislin, 2006).

A holistic view towards these definitions suggests that attitude is a state of mental and affective readiness that is acquired through experiences rather than learning. It includes one's preferences of positive or negative manner or acceptance or rejection to individuals, events and situations. It depends on knowledge, emotion and motives that guide individuals' behaviors.

An individual constructs the needed information in one's mind in a faster and understandable way to meet learning needs. The interest that arises out of willingness helps to arouse the affective aspect of learning (Kagan, Schauble, Resnikoff, Danish & Krathwohl, 1969). Research evidence that attitude and motivation in learning are significant affective elements affecting success (Boyd, 2002; Dellal & Günak, 2009; Dörnyei, 2001; Frey & Fisher, 2010; Yıldız, 2006). Bloom (2012, p.146) states that affective principles in learning should always be considered in education and it is hard to teach a student who does not have positive attitudes towards a lesson. The changes in students' attitudes also reflect their performance and behaviors (Oyman, 2010, p. 19). Development of positive attitudes towards lessons occurs with the effects of factors such as caring about learning outcomes, having an interest in lessons and being successful (Çengeloğlu, 2005, p.57). In cases when students have positive attitudes towards lessons, higher levels of academic achievement and active participation are gained while in cases when students have negative attitudes, levels of achievement decline, and students alienate from the learning process (Alkan, 2010; Tuncer, Berkant & Doğan, 2015). Positive attitudes towards lessons ease learning and increase interest in lessons, duration of participation to lessons and satisfaction gained out of lessons (Akbaba Altun & Çakan, 2008; Killian & Bastas, 2015; Maure & Marimon, 2014; Özçelik, 2010; Turgut & Baykul, 2012; Weimer, 2002).

Mathematics is a discipline that improves analytical thinking with estimation, calculation, counting, drawing and measuring (Altun, 2013), which the human mind uses to solve problems in daily life based on environmental influences (Minisker, 2006). Mathematics lessons are generally perceived as a lesson that is difficult to learn and not fun. This perception causes students' opinions and emotions related to learning processes in mathematics lessons to be negative (Yavuz Mumcu, 2020), and leads students to develop negative attitudes based on bias towards lessons and in turn, causes them to fail in mathematics lessons as a result of negative attitudes (Baykul, 2016; Kurbanoğlu & Takunyacı, 2012; Rashid & Brooks, 2010; Sertöz, 2002). Attitude towards mathematics is a significant factor that shapes students' behaviors towards this lesson as well as their emotions such as being motivated, liking or disliking the lessons (Bayturan, 2004; Nazlıçiçek & Erktin, 2002). Among the most eminent factors that lead students to develop positive attitudes towards mathematics lessons are belief in the benefit of mathematics, way of perceiving mathematics, the effect of learning, self-confidence and belief in achievement, sympathy towards mathematics, and experiences confronted in the process of learning mathematics (Yücel & Koç, 2011; Tobias, 1991).

Attitude towards lessons may be positive or negative. Positive attitudes towards lessons affect academic achievement while negative attitudes have an effect in academic failure (Çanakçı & Özdemir, 2011; Ekizoğlu & Tezer, 2007; Abalı Öztürk & Şahin, 2014; Tapia & Marsh, 2000; Yücel & Koç, 2011). It is evidenced that there is a reciprocal relationship between achievement in mathematics and attitude towards mathematics. This suggests that students' positive attitudes towards mathematics have significant effects on achievement in mathematics lessons (Abalı Öztürk & Şahin, 2015; Çanakçı & Özdemir, 2011; Ekizoğlu & Tezer,

2007; Tapia & Marsh, 2000; Yücel & Koç, 2011). According to Chinn (2012) and Eshun (2004), students who have positive attitudes towards mathematics may love mathematics and invest their effort to achieve more. The possibility of achieving success as a result of this effort may increase. This feeling of success makes positive attitudes more permanent. Students who have negative attitudes, on the other hand, make less effort in lessons, do not study as needed, and feel failure, which in turn leads to an increase in negative attitudes.

In the related literature, there are a lot of research studies regarding the investigation of attitudes towards mathematics lessons of students at different grades in terms of various variables. In most of these studies, students' attitudes towards mathematics lessons were examined in terms of gender (Abalı Öztürk & Şahin, 2014; Akdemir, 2006; Alkan, Güzel & Elçi, 2004; Birgin & Demirkan, 2017; Çelik & Bindak, 2005; Çelik & Ceylan, 2009; Kaplan & Kaplan, 2006; Kurbanoğlu & Takunyacı, 2012; Sezgin, 2013; Yaşar, 2016; Yağmur, 2012; Yaşar, Çermik & Güner, 2014; Yenilmez, 2007; Yenilmez & Özabacı, 2003), parents' level of education (Akdemir, 2006; Pehlivan, 2010; Tuncer & Yılmaz, 2016; Yağmur, 2012; Yenilmez & Özabacı, 2003) and socio-economic status of the family (Akdemir, 2006; Pehlivan, 2010). A review of these studies suggests that these studies mostly focus on students attending to lower secondary school or higher levels of education, there are not studies investigating primary school students' attitudes towards mathematics, and they do not explore attitudes with respect to variables such as having an internet connection at home or having a social media account.

It is well accepted that information and communication technologies today have more place in children's lives. The use of computers and the internet has an effect in children's learning, games, studying and having fun (Oblinger & Oblinger, 2005). In studies on lower secondary and high school students' use of the internet, it is revealed that students mostly use the internet to listen to music, play games, surf the internet, send emails, and access information (Kvavik, 2005; Madell & Muncer, 2004). Regarding their aims in using the internet, it can be asserted that investigation of the effect of students' use of the internet and social media on their attitudes towards mathematics lessons is significant for the related literature.

This study holds significance in that it is carried out with primary school students and addresses new and significant variables. It is expected with this study to contribute to the literature and fill a gap in the literature particularly due to revealing the effects of variables such as having an individual room and using the internet or social media on attitudes towards mathematics. The current study aims to examine primary school students' attitudes towards mathematics lessons in terms of gender, having an individual room, having internet connection at home, having a social media account, family income, parents' education level. To this end, answers to the following research questions are sought:

1. What is the score of the sample with regard to attitudes towards mathematics lessons?
2. Do students' scores of attitudes towards mathematics lessons differ significantly in terms of gender?
3. Do students' scores of attitudes towards mathematics lessons differ significantly in terms of having an individual room?
4. Do students' scores of attitudes towards mathematics lessons differ significantly in terms of having internet connection at home?
5. Do students' scores of attitudes towards mathematics lessons differ significantly in terms of having a social media account?
6. Do students' scores of attitudes towards mathematics lessons differ significantly in terms of parents' level of education?
7. Do students' scores of attitudes towards mathematics lessons differ significantly in terms of family income?

METHOD

Aiming to investigate primary school students' attitudes towards mathematics lessons in terms of various variables, this is a descriptive study and it employs survey design. Descriptive studies are studies that aim to put forth the investigated subject or phenomena thoroughly (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2012). Studies in survey design represent a past or current case as it is. The phenomenon, person, case or object that is the subject of research is explained as it is considering its unique context (Karasar, 2016).

Participants

Data of the study were collected from 229 students attending fourth grade in primary schools in the central district of Düzce, Turkey in the 2017-2018 academic year. The participants were attending three primary schools in the central district of Düzce. The sample was formed through a convenience sampling method. In this method, a sample that is close or accessible to the researcher is selected (Yıldırım & Şimşek, 2013). The sample consisted of easily accessible and volunteering primary school students. The sample included 240 students but 11 scale forms were excluded from the analysis as they were filled either in a wrong or missing way. 229 scale forms were included in the analysis. Some characteristics of the sample are presented in Table 1.

Table 1. Characteristics of the sample

Variable		Frequency (f)	Percentage (%)
Gender	Male	98	42.8
	Female	131	57.2
An individual room	Yes	184	80.3
	No	45	19.7
Internet connection at home	Yes	169	73.8
	No	60	26.2
Social media account	Yes	149	65.1
	No	80	34.9
Mother's education level	Primary school	40	17.5
	Lower secondary school	33	14.4
	High school	80	34.9
	University	76	32.2
Father's education level	Primary school	48	21.0
	Lower secondary school	43	18.8
	High school	68	29.7
	University	70	30.5
Family income	0-1000 TL	32	14.0
	1001-2000 TL	68	29.7
	2001 -3000 TL	62	27.0
	3001 TL an over	67	29.3
	Total	229	100

Instrument

In order to identify primary school students' attitudes towards mathematics lessons, Scale of Attitudes towards Mathematics, which was developed by Nazlıçiçek and Erktin (2002) and the reliability and validity of which was tested by Aktan (2018) with regard to scale structure, was used in the current study. This scale measures attitudes towards mathematics in general and includes three factors to measure perceived achievement in mathematics, benefits of mathematics and interest in mathematics lessons. This is a five-point Likert type scale including twenty items (eight are negative) gathered under three factors. The options are from 1 to 5 ranging from "Never" to "Always". The reliability Alpha coefficient of the study was calculated as 0.8413 (Nazlıçiçek & Erktin, 2002, p.3). The scale was also used in different studies investigating students' attitudes towards mathematics (Demirgören, 2010; Göç, 2010; Işıtan, 2013; Uysal Koğ, 2012; Yıldırım, 2016). Aktan (2018) used the scale with a different sample and collected data from 208 fourth grade primary school students to carry out reliability and validity analyses. Following item analyses, four items which had item-total correlations below .30, contributed very little to the scale, had negative values, overlapped between different factors, and had factor load difference less than .10 were removed from the scale form (Büyüköztürk, 2017). Confirmatory factor analysis (CFA) resulted in a 16 item scale form with three factors. 5 items in the scale are reverse-coded (1,3,4,11,15). The reliability value of the scale is .85 (De Vellis, 2014; Özdamar, 2016; Büyüköztürk, 2017). Fit indices of CFA were calculated as follows: X2/sd=1.399, RMSEA=0.044, SRMR=0.054, CFI=0.96, NFI= .90, GFI=.92, AGFI=.87. It was put forth that the model showed a statistically acceptable fit and it was a reliable instrument (Carvalho & Chima, 2014; Chan, Lee, Lee, Kubota & Allen, 2007; Kline, 2011; Schumacker & Lomax, 2010; Tabachnick & Fidell, 2013; Ullman, 2006). In the current study, the reliability of the scale was tested with 229 students. Cronbach Alpha coefficients regarding the total of the scale and its factors are provided in Table 2.

Table 2. Cronbach Alpha coefficients

Factor	Items	Cronbach Alpha
Interest in mathematics lessons	1, 2, 4, 8, 12, 17, 18	.87
Perceived achievement in mathematics	3, 6, 7, 13, 14, 16	.91
Perceived benefit of mathematics	10, 11, 19	.84
Scale of attitude towards mathematics		.89

The reliability values of the scale factors are .87, .91 and .84 respectively and the value for the overall scale is .89. Reliability values of .80 and over mean the scale has a high reliability (De Vellis, 2014; Özdamar, 2016; Büyüköztürk, 2017). CFA fit indices for

the scale were calculated as following for the current implementation: X2/sd=2,326, RMSEA=0.051, SRMR=0.068, CFI=0.92, NFI= .90, GFI=.89, AGFI=.90. The literature suggests that these values are acceptable and therefore the results are valid and reliable (Carvalho & Chima, 2014; Chan, Lee, Lee, Kubota & Allen, 2007; Kline, 2011; Schumacker & Lomax, 2010; Tabachnick & Fidell, 2013; Ullman, 2006).

Data Analysis

The data in this study were analyzed with a statistical package program. First descriptive statistics were carried out and it was checked whether data had a normal distribution. Kolmogorow-Smirnov and Shapiro Wilk tests were also performed to check the normal distribution (Hair, Anderson, Tatham & Black, 1998). Shapiro Wilks is used with samples less than 29 and Kolmogorow-Smirnov is used with samples more than 29 (Kalaycı, 2016; McKillup, 2012; Shapiro & Wilk, 1965). Since the sample was larger than 29, normal distribution was checked with the Kolmogorow-Smirnov test and the results are provided in Table 3.

Table 3. Kolmogorov–Smirnov (KS) normal distribution test results

	N	df	p
Scale of attitude towards mathematics	229	229	,000

The Kolmogorow-Smirnov test is significant as seen in Table 3 (p<.05), which means that the data do not show a normal distribution. Therefore, the Mann Whitney U and Kruskal Wallis tests, which are non-parametric tests, were used in data analysis.

FINDINGS

Findings and interpretation regarding the first research question

The first research question is "What is the score of the sample with regard to attitudes towards mathematics lessons?". Descriptive statistics regarding scores the participants obtained from the scale are presented in Table 4.

Table 4. Descriptive statistics regarding the scale

Scale	N	x̄	SS	Minimum	Maximum
Interest in mathematics lessons	229	27,67	4,9	11	35
Perceived achievement in mathematics	229	25,13	4,1	13	30
Perceived benefit of mathematics	229	14,49	1,9	3	15
Scale of attitude towards mathematics	229	68,65	10,73	40	80

As is given in Table 4, students' attitude scores in 'interest in mathematics' and 'perceived achievement in mathematics' factors are close to high (interest x̄=27,67; achievement x̄= 25,13) and their score in 'perceived benefit of mathematics' factor is at medium level (benefit x̄=14,49). Attitude scores regarding the overall scale are close to high level (Overall scale x̄=68,65).

Findings and interpretation regarding the second research question

The second research question of the study is "Do students' scores of attitudes towards mathematics lessons differ significantly in terms of gender?". Whether the participants' attitudes differed significantly in terms of gender was tested with the Mann Whitney U test. Table 5 presents the test results regarding the change in terms of gender.

Table 5. Mann Whitney U test results regarding gender

Scale and factors	Gender	N	Mean Rank	Total Rank	U Value	P
Interest in mathematics lessons	Male	98	119,46	11707,00	5982,500	,377
	Female	131	111,66	14628,00		
Perceived achievement in mathematics	Male	98	124,19	12170,00	5518,000	,068
	Female	131	108,13	14164,00		
Perceived benefit of mathematics	Male	98	119,46	11720,50	5969,000	,263
	Female	131	111,66	14615,00		
Overall Scale	Male	98	123,16	12070,00	5619,000	,106
	Female	131	108,89	14265,00		

*P<0,05

As provided in Table 5, there is not a significant difference in students' attitudes towards mathematics lessons in terms of gender both in overall scale and factors of the scale (p>.05). This suggests that male and female students have similar attitudes towards mathematics lessons. This result is plausible because regardless of gender, all students are affected by similar stimuli in mathematics lessons and it is evident that they undergo similar experiences. As in other lessons, curricula of mathematics lessons are developed by the Ministry of National Education and learning experiences are arranged in every school for the same learning outputs. This lack of significant difference in students' attitudes towards mathematics lessons in terms of gender can be

considered as a coherent result for curricula. However, it is also noticed that male students had higher mean ranks for all three factors.

Findings and interpretation regarding the third research question

The third research question is "Do students' scores of attitudes towards mathematics lessons differ significantly in terms of having an individual room?". Whether the participants' attitudes differed significantly in terms of having an individual room or not was tested with the Mann Whitney U test. Table 6 presents the test results regarding the change in terms of having an individual room.

Table 6. Mann Whitney U test results regarding having an individual room

Scale and factors	Individual room	N	Mean Rank	Total Rank	U Value	P
Interest in mathematics lessons	Yes	184	115,92	52118,50	4098,000	0,917
	No	45	114,77	5216,50		
Perceived achievement in mathematics	Yes	184	119,42	21972,50	3327,500	0,04*
	No	45	96,94	4362,50		
Perceived benefit of mathematics	Yes	184	120,03	22085,00	3215,000	0,004*
	No	45	94,44	4250,00		
Overall Scale	Yes	184	119,12	21793,50	3381,500	0,111
	No	45	98,14	4541,50		

*P<0,05

There is a significant difference in students' attitudes towards mathematics lessons in terms of having an individual room in the factors of 'perceived achievement in mathematics' (U=3327,500, p<.05) and 'perceived benefits of mathematics' (U=3215,000, p<.05). These differences are in favor of students who have individual rooms. On the other hand, no significant differences were found in the overall scale and factor of 'interest in mathematics' in terms of having an individual room. This means that students who have individual rooms at home have higher levels of perception of achievement in mathematics lessons and they perceive mathematics as a useful lesson at a greater level when compared to those who do not have individual rooms. It can be argued that this is valid although there is not a statistically significant difference in the other factor of the scale. In the general sense, students who have individual rooms in their homes have higher scores of attitude towards mathematics. It can be argued that students who have a private room for studying can focus on studying more efficiently, spare more time for studying, think soundly as to their learning losses and what they need to learn, develop efficient strategies for these issues, cope with challenges efficiently and thereby have a greater level of achievement in mathematics, which in turn increases their scores regarding attitudes towards mathematics (Şeker, 2013).

Findings and interpretation regarding the fourth research question

The fourth research question is "Do students' scores of attitudes towards mathematics lessons differ significantly in terms of having internet connection at home?". Whether the participants' attitudes differed significantly in terms of having internet connection at home or not was tested with Mann Whitney U test. Table 7 presents the test results regarding the change in terms of having internet connection at home.

Table 7. Mann Whitney U test results regarding having internet connection at home

Scale and factors	Internet connection at home	N	Mean Rank	Total Rank	U Value	P
Interest in mathematics lessons	Yes	169	118,22	19979,00	4526,000	0,216
	No	60	105,93	6356,00		
Perceived achievement in mathematics	Yes	169	120,36	20341,50	4163,500	0,039*
	No	60	99,89	5993,50		
Perceived benefit of mathematics	Yes	169	116,79	19737,50	4767,000	0,397
	No	60	109,96	6597,50		
Overall Scale	Yes	169	119,75	20238,50	4266,500	0,070
	No	60	101,61	6096,50		

*P<0,05

There is a significant difference in students' attitudes towards mathematics in terms of having an internet connection at home only in the factor of 'perceived achievement in mathematics' (U=4163,500, p<.05), and this difference is in favor of students who have internet connection at home. No significant differences were found in other factors or in the overall scale; however, the values in Table 7 reveal that the scores of students who have internet connection at home are also higher in other factors than

students who do not. The reason for this case may be that the internet offers various stimuli for students and increases students' interest in mathematics through different narrators (Lin, 2009) and their expectations of achievement are supported. Various stimuli attract students' achievement (Shunk, 2009). Besides, the internet provides students with the chance of repetition and time as much as needed by them.

Findings and interpretation regarding the fifth research question

The fifth research question is "Do students' scores of attitudes towards mathematics lessons differ significantly in terms of having a social media account?". Whether the participants' attitudes differed significantly in terms of having a social media account or not was tested with the Mann Whitney U test. Table 8 presents the test results regarding the change in terms of having a social media account.

Table 8. Mann Whitney U test results regarding having a social media account

Scale and factors	Social Media Account	N	Mean Rank	Total Rank	U Value	P
Interest in mathematics lessons	Yes	149	115,86	17262,50	5682,500	0,789
	No	80	113,41	9072,50		
Perceived achievement in mathematics	Yes	149	116,79	17401,00	5749,500	0,576
	No	80	111,68	8934,00		
Perceived benefit of mathematics	Yes	149	120,82	18002,00	5093,000	0,724
	No	80	104,16	8333,00		
Overall Scale	Yes	149	116,13	17304,00	5648,000	0,723
	No	80	112,89	9031,00		

As given in Table 8, students' attitudes towards mathematics lessons do not differ significantly in terms of having a social media account in the overall scale (U=5648,000, p>.05) and the factors of the scale. Yet scores of students who use social media accounts are higher than those who do not in all three factors. Students who use social media may be getting peer or knower specialist support through social media. It is evidenced that use of social media in a supporting way in learning eases students' learning experiences (Al-rahmi, Othman & Musa, 2014; Ekici & Kıyıcı, 2012; Tanrıverdi & Sağır, 2014; Toğay, Akdur, Yetişken & Bilici, 2013).

Findings and interpretation regarding the sixth research question

The sixth research question is "Do students' scores of attitudes towards mathematics lessons differ significantly in terms of parents' level of education?". Whether the participants' attitudes differed significantly in terms of mothers' education level or not was tested. It was carried out with the Kruskal Wallis test. Table 9 gives the test results regarding the change in terms of mothers' level of education.

Table 9. Kruskal Wallis test results regarding mothers' education level

Scale and factors	Mothers' Education Level	N	Mean Rank	X^2	df	p
Interest in mathematics lessons	Primary School	29	133,98	1,622	3	0,655
	Lower Secondary School	31	109,65			
	High School	73	118,57			
	University	96	108,28			
Perceived achievement in mathematics	Primary School	29	118,17	2,185	3	0,535
	Lower Secondary School	31	90,55			
	High School	73	124,28			
	University	96	114,88			
Perceived benefit of mathematics	Primary School	29	122,84	8,595	3	0,350
	Lower Secondary School	31	91,21			
	High School	73	128,18			
	University	96	110,29			
Overall Scale	Primary School	29	128,41	1,756	3	0,860
	Lower Secondary School	31	97,84			
	High School	73	122,75			
	University	96	110,59			

Students' attitudes towards mathematics lessons do not differ significantly in terms of mothers' education levels in the overall scale and the factors of the scale (p>.05). However, regarding the mean rank values for mothers' education level, there are differences in the overall scale as well as factors. Although high levels of parents' education status may contribute to achievement in mathematics lessons or positive attitudes towards lessons, there are cases where the vice versa is valid (McMullen, 2005). Mothers with a high education level may have high expectations from their children with regard to mathematics lessons which is

important for quantitative-based jobs and their increased care for children with this respect may have contributed to children's positive attitudes towards lessons.

Whether the participants' attitudes differed significantly in terms of fathers' education level or not was tested. It was carried out with the Kruskal Wallis test. Table 10 presents the test results regarding the change in terms of fathers' level of education.

Table 10. Kruskal Wallis Test results regarding fathers' education level

Scale and factors	Fathers' Education Level	N	Mean Rank	X^2	df	p
Interest in mathematics lessons	Primary School	48	124,45	1,622	3	0,283
	Lower Secondary School	43	112,27			
	High School	68	116,07			
	University	70	109,16			
Perceived achievement in mathematics	Primary School	48	111,59	2,185	3	0,123
	Lower Secondary School	43	104,23			
	High School	68	116,66			
	University	70	122,34			
Perceived benefit of mathematics	Primary School	48	101,83	8,595	3	0,085
	Lower Secondary School	43	111,02			
	High School	68	129,93			
	University	70	111,96			
Overall Scale	Primary School	48	115,08	1,756	3	0,195
	Lower Secondary School	43	108,03			
	High School	68	119,24			
	University	70	115,10			

Table 10 reveals that students' attitudes towards mathematics lessons do not differ significantly in terms of fathers' education levels in the overall scale and the factors of the scale (p>.05). Yet, regarding the mean rank values for fathers' education level, there are differences in the overall scale as well as factors. This result can be interpreted with the fact that parents' cannot spare adequate time for their children since they work even if they have high levels of education. Though high levels of parents' education status may contribute to achievement in mathematics lessons or positive attitudes towards lessons, there are cases where the vice versa is valid (McMullen, 2005).

Findings and interpretation regarding the seventh research question

The seventh research question is "Do students' scores of attitudes towards mathematics lessons differ significantly in terms of family income?". Whether the participants' attitudes differed significantly in terms of family income or not was tested. It was carried out with the Kruskal Wallis test. Table 10 provides the test results regarding the change in terms of family income.

Table 11. Kruskal Wallis Test results regarding family income

Scale and factors	**Family income**	**N**	**Mean Rank**	X^2	**df**	**p**
Interest in mathematics lessons	0-1000 TL	32	126,67	1,583	3	0,663
	1001-2000 TL	68	113,07			
	2001 -3000 TL	62	109,21			
	3001 TL and over	67	116,75			
Perceived achievement in mathematics	0-1000 TL	32	110,44	20,820	3	0,000*
	1001-2000 TL	68	93,65			
	2001 -3000 TL	62	109,29			
	3001 TL and over	67	144,13			
Perceived benefit of mathematics	0-1000 TL	32	110,72	5,192	3	0,024*
	1001-2000 TL	68	117,15			
	2001 -3000 TL	62	104,06			
	3001 TL and over	67	124,98			
Overall Scale	0-1000 TL	32	121,98	8,682	3	0,034*
	1001-2000 TL	68	101,87			
	2001 -3000 TL	62	106,84			
	3001 TL and over	67	132,54			

*p<.05

Significant differences were found in students' attitudes towards mathematics in terms of family income in 'perceived achievement in mathematics' factor (X^2 = 20,820, p<.05), 'perceived benefit of mathematics' (X^2 = 8,075, p<.05) factor and the overall scale (X^2 = 8,682, p<.05) while no significant differences were found in 'interest in mathematics lessons' factor (X^2 = 1,183,

p>.05). To reveal among which income groups these differences were, the non-parametric Dunn multiple comparison test was performed. Significant differences were found in 'perceived achievement in mathematics', 'perceived benefit of mathematics' factors and the overall scale between the group of students whose family income is 3000 TL and over and groups of students whose family incomes are 0-1000TL, 1001-2000 TL and 2001-3000 TL. The differences were in favor of the group of family income with 3000 TL. This means that as the income of families increases, so do positive attitudes towards mathematics.

CONCLUSION AND DISCUSSION

The current study reveals that the participating students' attitude scores in 'interest in mathematics' and 'perceived achievement in mathematics' factors are close to high but their scores in 'perceived benefit of mathematics' factor are relatively lower. The reason for higher perceived achievement in mathematics may be due to the fact that the coefficients of mathematics questions in examinations are higher and thereby students spare more time for mathematics. The relatively lower level of perceived benefit of mathematics can be accounted for by the fact that mathematics lessons are performed in an unconnected way to life (Daley & Valdès, 2006; Northcote & Marshall, 2016). However, due to its high impact in examinations, students invest more interest in it (Baki, 2006) and this affects their expectation of achievement positively.

The study revealed that there were not any significant differences in students' attitudes towards mathematics in terms of gender. It can be argued that the primary school students have similar attitudes towards mathematics lessons, which is plausible because, regardless of gender, all students are affected by similar stimuli and undergo similar experiences. As in other lessons, curricula of mathematics lessons are developed by the Ministry of National Education and learning experiences are arranged in every school for the same learning outputs. This lack of significant difference in students' attitudes towards mathematics lessons in terms of gender can be considered as a coherent result for curricula. This finding of lack of difference in terms of gender is in parallel with the literature (Abalı Öztürk & Şahin, 2014; Akdemir, 2006; Birgin & Demirkan, 2017; Çelik & Bindak, 2005; Çelik & Ceylan, 2009; Işık & Çağdaşer, 2009; Kaplan & Kaplan, 2006; Sezgin, 2013; Tuncer & Yılmaz, 2016; Yaşar, 2016; Yaşar, Çermik & Güner, 2014; Yağmur, 2012; Yenilmez & Özabacı, 2003; Yücel & Koç, 2011). There are also studies reporting significant differences in students' attitudes towards mathematics lessons in favor of male students (Pehlivan, 2010) or female students (Yenilmez, 2007; Kurbanoğlu & Takunyacı, 2012) in the literature.

The study revealed significant differences in students' attitudes towards mathematics lessons in terms of having an individual room. These differences are in the factors of 'perceived achievement in mathematics' and 'perceived benefits of mathematics', and they are in favor of students who have individual rooms. On the other hand, no significant differences were found in the overall scale and factor of 'interest in mathematics' in terms of having an individual room. There are not any studies in the literature investigating the effect of having an individual room on students' attitudes towards mathematics lessons yet there are some studies reporting that having an individual room has an effect on students' academic achievement (Şeker, 2013) and there are studies reporting vice versa (Aydoğdu & Dilekmen, 2016; Sadi, Uyar & Yalçın, 2014). Having better study opportunities at home has an effect on the increase in students' academic achievement (Dursun, 2004; Hill & Craft, 2003; Rani & Siddiqui, 2015). It can be argued that students who have a private room for studying can focus on studying more efficiently, spare more time for studying, thereby increasing their scores regarding attitudes towards mathematics and particularly scores in 'perceived benefit of mathematics' factor.

The study also revealed a significant difference in students' attitudes towards mathematics in terms of having an internet connection at home only in the factor of perceived achievement in mathematics and this difference is in favor of students who have internet connection at home. No significant differences were found in other factors or the overall scale. This may be due to the fact that the internet offers various stimuli for students and increases students' interest in mathematics through different contents. Besides, the internet provides students with the chance of repetition and time as much as needed by them. Although there are not any studies in the literature investigating the effect of having internet connection at home on students' attitudes towards mathematics lessons, Kuzu et al. (2008) reported that those who accessed the internet from home or work used it for any purposes, those who accessed to the internet from internet cafes used it generally for access to information and research, and as their academic achievement increased, their use of the internet from the café decreased. Yılmaz, Şahin, Haseski and Erol (2014) also revealed that students used the internet for chatting or playing games rather than doing homework or research. Hence, arranging subjects related to mathematics lessons in a format including chatting and game may be an appropriate approach for developing positive attitudes.

Regarding having a social media account variable, there are not any significant differences in students' attitudes towards mathematics lessons either in the overall scale or in the factors of the scale. On the other hand, the mean ranks of students who use social media accounts are higher than those who do not in all three factors. There are not any studies investigating the effects of primary school students' using social media on their attitudes towards mathematics. Yet, Aksoy (2015) found out that having social media accounts did not have an effect on academic achievement, and Tanrıverdi and Sağır (2014) and Koç and Karabatak

(2011) reported that students who used social media intensively had lower achievement. The reason for this difference in those studies may be due to the fact that the students in the sample groups were from various types of high schools.

Parents' education level is another variable investigated in the current study. The results of the study suggest that students' attitudes towards mathematics lessons do not differ significantly in terms of mothers' education level in the overall scale and the factors of the scale. However, regarding the mean rank values for mothers' education level, there are differences in the overall scale as well as factors. Although high levels of parents' education status may contribute to achievement in mathematics lessons or positive attitudes towards lessons, there are cases where the vice versa is valid (McMullen, 2005). In parallel with the findings in the current study, Pehlivan (2010), Yağmur (2012) and Yenilmez and Özabacı (2003) also did not identify a significant difference in students' attitudes towards mathematics in terms of mothers' education level. On the contrary, Akdemir (2006) reported a significant difference in students' attitudes towards mathematics in terms of mothers' education level.

With respect to fathers' education level, students' attitudes towards mathematics lessons do not differ significantly in the overall scale and in the factors of the scale in the current study. There are studies in the literature that lend their support to this finding (Pehlivan, 2010; Tuncer & Yılmaz, 2016; Yağmur, 2012; Yenilmez & Özabacı, 2003). This finding, on the other hand, is contrary to that of Akdemir (2006), who found a significant difference in students' attitudes towards mathematics in terms of fathers' education level. Family and social environments have a critical effect on the formation and development of attitudes. Therefore, the education level of family members is among the significant variables affecting students' attitudes towards lessons (Özkan, 2005). In the current study, it can be argued that fathers' education level does not have an effect on students' attitudes towards mathematics and the education level of family members is not a sole indicator to affect students' attitudes towards lessons in the overall scale.

The last variable is family income. Significant differences were found in students' attitudes towards mathematics in terms of family income in 'perceived achievement in mathematics' factor, 'perceived benefit of mathematics' factor, and the overall scale while no significant differences were found in 'interest in mathematics lessons' factor. The group of students whose family income is 3000 TL and over has significantly higher scores in 'perceived achievement in mathematics', 'perceived benefit of mathematics' factors and the overall scale than the groups of students whose family incomes are 0-1000TL, 1001-2000 TL and 2001-3000 TL. This means that as the income of families increases, so do positive attitudes towards mathematics. Akdemir (2006) and Yıldız (2006) also identified significant differences in students' attitudes towards lessons in students with higher family incomes, which is in parallel with the current study. A reason for this difference may be the support families with higher income levels provide to their students for mathematics lessons thanks to their economic advantages. Pehlivan (2010), on the other hand, reported this relationship was insignificant.

RECOMMENDATIONS

Based on the results of the current study, to help students develop positive attitudes towards mathematics lessons, it is recommended that social media should be used to support learning, primary school teachers should offer mathematics lessons in an interesting and fun way, and activities should include games considering the developmental characteristics of primary school students. Besides, families should arrange environments for their children to study efficiently, offer better studying opportunities and they should be guided about efficient studying to raise their awareness. The study revealed that male students' had higher levels of attitudes towards mathematics lessons. Therefore it can be recommended to carry out a qualitative study on the reasons for this issue.

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