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Research Article

The Relationship Between High School Students' Perceived Self-Regulation Skills and Mobile Technology Acceptance Levels in Mathematics Learning*

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Abstract – With the widespread use of mobile technology in education, individual learning came to the fore, which required the student to organize his/her work in the best way, that is, to develop self-regulation skills. This study examined the relationship between high school students' perceived self-regulation skills and mobile technology acceptance levels in mathematics learning. In addition, the study also examined students' self-regulation skills and mobile technology acceptance levels in mathematics learning in terms of gender, grade level and academic achievement averages. The research included students studying at a high school determined by the appropriate sampling method and evaluated the data of 752 students. The study used Student Information Form, Perceived Self-Regulation Scale and Mobile Technology Acceptance Scale in Mathematics Learning as data collection tools. The study also employed descriptive and relational screening methods. According to the research, a low positive correlation existed between high school students' perceived self-regulation skills and their mobile technology acceptance levels for learning mathematics. In addition, the perceived self-regulation skills of the students were above the average; and their mobile technology acceptance levels in learning mathematics were close to the average.

Keywords: High school students, mathematics, mobile learning, mobile technology acceptance, self-regulation.

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Introduction

While some students are more willing to learn and grasp, subjects easily in educational environments, others have difficulty understanding and studying. These students usually have low motivation for the lesson. At the beginning of the twentieth century, individual educational differences began to gain importance, and metacognition and social cognition perspectives emerged (Aydın & Atalay, 2015). While metacognition is the awareness of the individual's thoughts, in social cognition, students focus on social factors that affect their self-regulation (Zimmerman, 2002). Self-regulated learning is the process in which the individual is cognitively motivating and behaviorally effective in line with his/her learning objectives (Zimmerman, 1986). Self-regulated learners are motivated to learn, trust their ability, know their strengths and weaknesses, and can use resources to help their learning process (Smith, 2001).

The literature includes different models of self-regulated learning developed by Boekaerts (1999) and Zimmerman (2000). For example, Boekaerts (1999) treats self-regulation as a process of different layers. Zimmerman (2000), on the other hand, explains the functional aspect and different stages of self-regulation. Self-regulated learning strategies created by Zimmerman and Pintrich are based on Bandura's social cognitive theory (Pustinen & Pulkkinen, 2001). Depending on this theory, personal, environmental, and behavioural factors influence self-regulated learning. The personal regulation model developed by Zimmerman (2000), which indicates the process that allows the regulation of personal feelings and thoughts, is one of the most commonly used models.

Self-regulation can be improved through some educational activities. According to Aydın and Atalay (2015), self-regulation increases with some factors, such as enabling questioning, increasing problem-solving and critical thinking skills, cooperative learning, supporting the use of technology, creating strategies for students to create mental models, and student and teacher beliefs. The use of technology, one of these factors, use of internet-based technology in particular. Thanks to the mobile devices that emerge with the developing technology, information is accessed at the desired place and time. The fact that mobile technologies are smaller, portable, accessible and personal has made such access possible. Mobile technologies' portability and wireless connectivity support students' access to and interaction with information at any time (Demir & Akpınar, 2016).

Mobile devices included mobile phones, smartphones, laptops, tablets, mobile (handheld) computers, personal digital assistants (PDA), portable media players (mp3, mp4,

CD, DVD player, audio recorder, camera, etc.), e-book readers, wearable technologies (Su, 2015). The use of mobile devices in all areas of life, such as communication, learning and entertainment, is gradually increasing. However, besides the fact that students find mobile learning interesting, it has many shortcomings, such as small screen size, limited memory capacity and battery life. Also, the weaknesses of mobile learning include high cost, motivation and control difficulties of the student in the learning process, and perhaps most importantly, the acceptance of mobile technology by the student (Diri, 2021; Şener, 2016). Individuals must adopt and accept technology to use it effectively in the learning and teaching process and to develop themselves (Ursavaş et al., 2014). If an individual has a negative attitude toward accepting and using new technological systems, the expected efficiency of that system decreases. In addition, examining personal self-regulated learning skills related to the acceptance of mobile learning technology is very important for preparing educational content suitable for mobile technologies.

While mobile technology in education has become widespread in many disciplines, it also comes to the fore in learning mathematics, which is generally difficult for students to understand. In mathematics learning, the student is expected to understand abstract mathematical concepts and their relationships and use them when solving problems. The use of technology in mathematics education has positive effects on student achievement compared to traditional methods (Cheung & Slavin, 2013). Mobile technologies and applications provide new opportunities to increase students' participation in mathematics and improve their mathematical thinking. Thanks to technology in mathematics education, learning mathematics has exceeded classroom limits with the opportunity to access the internet (Borba et al., 2016). Mobile technologies contribute to students' modelling of concepts and problem-solving processes in mathematics and geometry course achievements. Thanks to the motion sensors that mobile devices have depending on their hardware and software features, users can be drawn into their use, and students can participate effectively in the lesson (Karaarslan et al., 2013). Besides, mobile technology has other benefits such as being easily transferred to different learning conditions and suitable for student cooperation (Larken & Calder, 2016). Although mobile technologies offer the opportunity to learn anytime and anywhere through wireless internet, it is possible to successfully use mobile technology systems in mathematics with students' mobile technology acceptance in mathematics learning. This study examined high school students' mobile technology acceptance level in mathematics education since there are few studies about this issue in the literature.

The study has developed many models to determine the factors affecting the acceptance and use of technology. The Technology Acceptance Model (TAC) developed by Davis (1989) is the most effective and widely used model to explain individuals' acceptance of information technology systems. Nevertheless, explaining the acceptance of information systems is also weak and complex (Šumak & Sorgo, 2016). Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT) by considering the conceptual and experimental similarities between eight theories in this field to examine the information technology acceptance behaviours of individuals and to explain technology acceptance completely. Models reviewed by Venkatesh et al. (2003) are as follows: Theory of Reasoned Action, Theory of Planned Behavior, Combined Theory of Planned Behaviours (TPB) and Technology Acceptance Model (TAM), The Model of PC Utilization, The Motivational Model, The Social Cognitive Theory, The Innovation Diffusion Theory, Technology Acceptance Model. Among these models, the principles on which Bandura's social cognitive theory is based include self-regulation capacity (Baysal, 2010). Self-regulation is one of the basic principles in social cognitive theory, one of the theories on which UTAUT is based. Therefore, self-regulation and UTAUT are theoretically related.

In their study, Venkatesh et al. (2003) explained the technology acceptance behaviours of individuals between 17% and 53% in the examination of each model, and UTAUT was solely 70%. In this respect, when investigating the technology acceptance levels of individuals, the use of UTAUT provides an advantage in explaining the behaviours ofindividuals. Behavioural intention determines the technology use behaviours of individuals in UTAUT (Thomas et al., 2013). While four of the eight variables in the UTAUT directly or indirectly affect behavioural intention and behaviour, the other four direct the relationships between the variables. Performance expectation, effort expectation, social impact, and facilitating conditions directly or indirectly affect behavioural intention and behaviour. Additionally, gender, age, experience, and use of voluntariness direct the relationships between variables (Yıldız, 2020).

In UTAUT, the expectation of performance is the degree of the expectation of the increase in the individual's work performance with the use of technology. On the other hand, effort expectation is the degree of convenience perceived by the individual related to the use of technology. Social impact is the perception that important people believe individuals should use this technology. Facilitating conditions are facilitating elements, such as the

technical infrastructure the individual requires when using technology (Venkatesh et al., 2003). Figure 1 shows UTAUT.

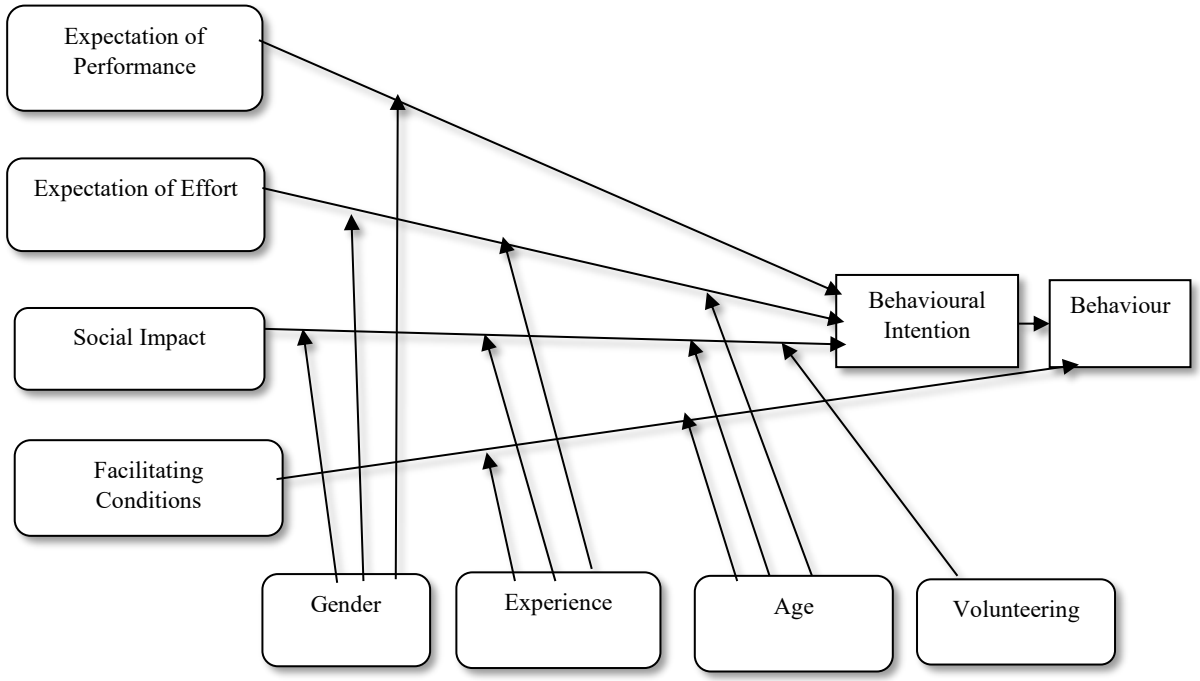

Figure 1 UTAUT (Venkatesh et al., 2003)

Then, Venkatesh et al. (2012) created UTAUT-2 by removing the volunteering variable in the UTAUT and adding hedonic motivation, habit, and price value variables to the model. Hedonic motivation refers to the entertainment and pleasure obtained from using technology. While habit refers to the tendency to change behaviour with the use of technology, and price value is the cognitive exchange between the perceived benefit and the monetary cost of using technology (Açıkgül & Şad, 2021). UTAUT-2, a different synthesis of eight technology acceptance models, is an expanded version of UTAUT for consumers. In addition, the UTAUT-2 model has a better predictive validity than other technology acceptance models with higher percentages of variance by explaining 74% of behavioural intention and 52% of technology use behaviour (Venkatesh et al., 2012). Figure 2 shows UTAUT-2.

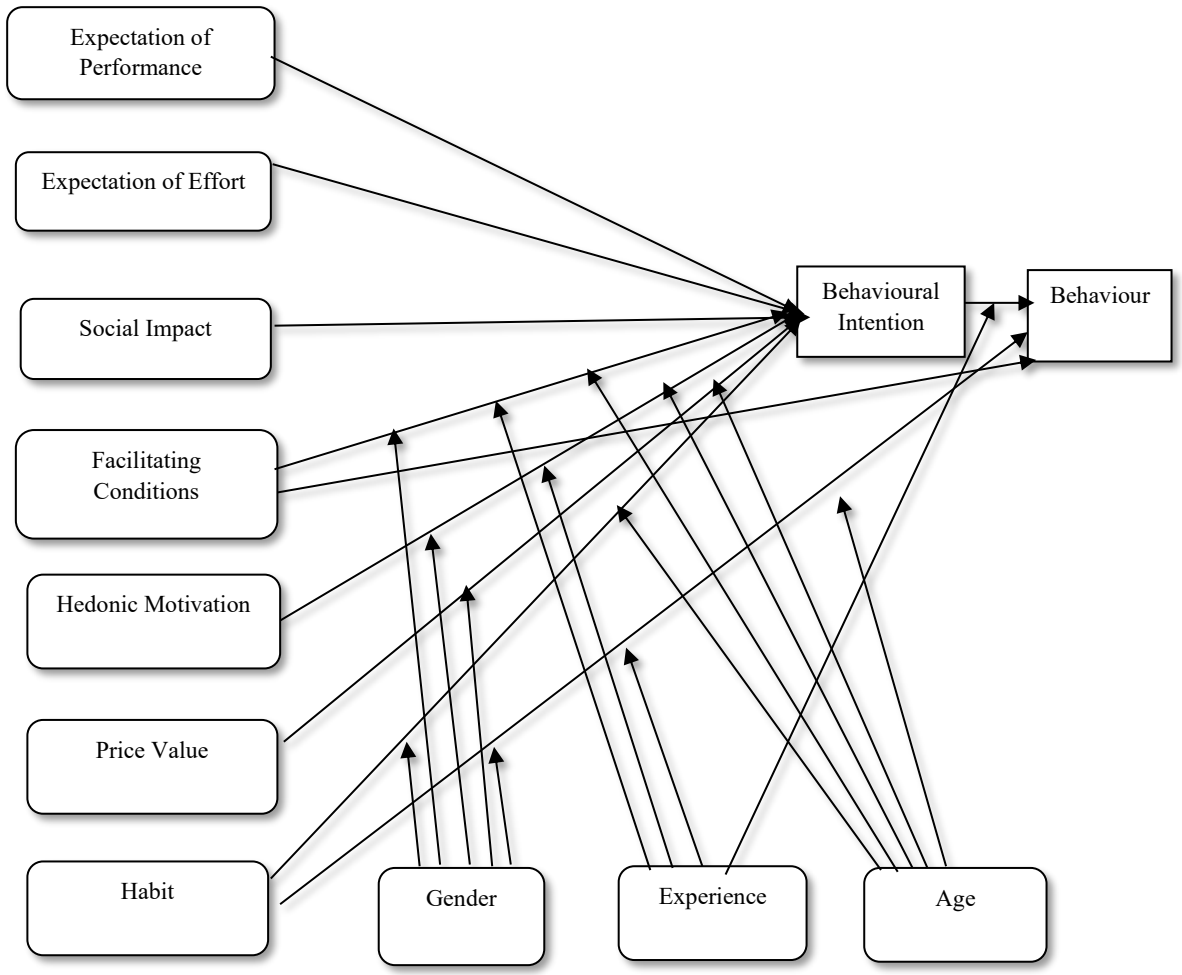

Figure 2 UTAUT-2 (Venkatesh et al., 2012)

In the literature, studies (Bradley et al., 2017; Zare Bidaki et al., 2013) investigate the self-regulation skill levels of preschool and higher education students more. It is inevitable that self-regulation skills, which are important for achievement, will be researched more for students at all educational levels. There are also a small number of studies (Cacciamani et al., 2018; Açıkgül & Şad 2020; Diri, 2021) examining the technology acceptance levels of high school students using UTAUT models. Additionally, a few studies (Chen & Hwang, 2019) examining the relationship between students' self-regulation skills and the UTAUT model in the literature include university students. Considering that the self-regulation skills of the students are very important, especially in the high school period when academic achievement is effective and the foundations are laid for higher education where the student's life will be shaped, such a study with a participant group consisting of high school students will contribute to the literature.

In the literature, there are studies examining the variables of gender (Aksoy & Yaralı, 2017), school type and grade level (Baysal & Özgenel, 2019). Different factors may affect students' behaviours towards accepting and using mobile technology. Nikolopoulou et al. (2020) found that behavioural intention was the most important determinant in the use of mobile phones by university students in mobile learning according to the UTAUT-2 model. Still, gender, age and experience did not have any regulatory effect. In addition, some variables affecting technology acceptance in the literature are gender (Venkatesh et al., 2003), age (Wang et al., 2009), and school type (Demir, 2013). In their research, Rezaei Rad and Naseri (2020) found the positive effect of mobile learning, hence the use of mobile technology, on self-regulation and academic achievement. This study investigated high school students' self-regulated learning skills and mobile technology acceptance level in mathematics learning in terms of gender, grade level (age), and academic achievement score variables. The study also examined the mobile technology acceptance level of high school students in mathematics learning according to the UTAUT-2 model.

The research problem is "What is the relationship between high school students' perceived self-regulation skills and their mobile technology acceptance levels in learning mathematics?".

Sub-problems of the research are;

1. What are high school students' perceived self-regulation skills?

2. Is there a difference in high school students' perceived self-regulation skills according to gender, grade and academic achievement?

3. What are high school students' mobile technology acceptance levels in learning mathematics?

4. Is there a difference in high school students' mobile technology acceptance levels in learning mathematics according to gender, grade and academic achievement?

5. Is there a significant relationship between high school students' perceived self-regulation skills and their mobile technology acceptance levels in learning mathematics?

6. Is there a significant relationship between high school students' perceived self-regulation skills and their mobile technology acceptance levels in learning mathematics learning according to gender, grade and academic achievement?

Hypotheses are;

H1: High school students' perceived self-regulation skills are above average.

H2a: There is a significant difference in students' perceived self-regulation skills according to gender.

H2b: There is a significant difference in students' perceived self-regulation skills according to grade level.

H2c: There is a significant difference in students' perceived self-regulation skills according to academic achievement.

H3: High school students' mobile technology acceptance levels in learning mathematics are above average.

H4a: There is a significant difference in students' mobile technology acceptance levels in learning mathematics according to gender.

H4b: There is a significant difference in students' mobile technology acceptance levels in learning mathematics according to grade level.

H4c: There is a significant difference in students' mobile technology acceptance levels in learning mathematics according to academic achievement.

H5: There is a significant relationship between students' perceived self-regulation skills and their mobile technology acceptance levels in learning mathematics.

H6a: The relationship between self-regulation skills and mobile technology acceptance in learning mathematics significantly differs according to gender.

H6b: The relationship between self-regulation skills and mobile technology acceptance in learning mathematics significantly differs according to grade level.

H6c: The relationship between self-regulation skills and mobile technology acceptance in learning mathematics significantly differs according to academic achievement.

Method

The study used the screening model, one of the quantitative methods. The study determined high school students' self-regulation skills and mobile technology acceptance levels in learning mathematics learning with the descriptive screening model. In addition, the study used correlation analysis and relational screening method to examine the relationship

between high school students' perceived self-regulation skills and mobile technology acceptance levels in learning mathematics.

Participants

The study's participant group consisted of 9th, 10th, 11th and 12th-grade students studying at an Anatolian High School in the northern district of Izmir in the 2021-2022 academic year. The study determined the high school by appropriate sampling method. The school within the scope of the study consisted of 846 students. Before collecting student data, the study explained the purpose and stated that participation was voluntary. After eliminating the erroneous data, the study analyzed 752 (486 women, 266 men) data.

Table 1 Findings Regarding the Personal Information of the Research Participants

Variable		f	%
Gender	Female	486	64.6
	Male	266	35.4
	Total	752	100
Grade	9	183	24.3
	10	231	30.7
	11	161	21.4
	12	177	23.5
	Total	752	100
Academic achievement average	50 - 59.9	32	4.3
	60-69.9	354	47.1
	70-84.9	327	43.5
	85-100	39	5.2
	Total	752	100

Data collection

The study used three data collection tools: The student Information Form, the Perceived Self-Regulation Scale and Mobile Technology Acceptance Scale for Learning Mathematics.

Student Information Form

The Student Information Form enabled to collect information about the variables such as the gender of the students (female, male), grades (9, 10, 11, 12th grade), achievement averages (0-100 points), the status of having their rooms for studying, planning and complying with this plan while studying, mobile technologies used, having efficient internet access in the place where they live, the experience of using mobile technologies, frequency of using mobile technologies while studying.

Perceived Self-Regulation Scale

To determine the students' self-regulated learning skills, the study used the "Perceived Self-Regulation Scale" developed by Arslan and Gelişli (2015). KMO (Kaiser-Meyer-Olkin) scale value consisting of 16 items and 2 dimensions explaining 54.3% of the total variance was 95, and Bartlett's test was 2388.664. The first sub-dimension of the scale is "Being Open", consisting of 8 items, and the other sub-dimension is "Search", consisting of 8 items. The scale is of 5-point Likert type and is scored as (5) "always", (4) "frequently", (3) "occasionally", (2) "rarely", and (1) "never". In the scale development studies, the Cronbach Alpha reliability coefficient was 84, 82 for the Search sub-dimension and 90 for the whole scale. In this study, the Cronbach Alpha reliability coefficient for the whole scale was 82. The Perceived Self-Regulation Scale is a valid and reliable data collection tool to measure individuals' "Self-Regulation" skills.

Mobile Technology Acceptance Scale for Learning Mathematics

To determine high school students' mobile technology acceptance levels in learning mathematics, the researchers used the "Mobile Technology Acceptance Scale in Learning Mathematics" developed by Açıkgül and Şad (2020). The scale consisted of 36-item and 8-dimensional structure explaining 66.068% of the total variance. There were 6 items in the Expectation of Performance, 3 in the Expectation of Effort, 4 in the Habit, 3 in the Price Value, and 5 in the Social Impact dimension. Additionally, there were 4 items in the Hedonic Motivation, 5 in the Facilitating Conditions and 6 in the Behavioral Intention dimension. In addition, the scale was in 5-point Likert type as "Strongly Agree (5), Agree (4), Partially Agree (3), Disagree (2) and Strongly Disagree (1)". Within the scope of the reliability analysis of the measurement tool, the Cronbach Alpha internal consistency coefficient was 94 for the Expectation of Performance, 88 for the Expectation of Effort, 91 for the Social Impact, 93 for the Facilitating Conditions, 94 for Hedonic Motivation, 87 for the Price Value, 86 for the Habit, and 92 for the Behavioral Intention dimension. In this study, the Cronbach Alpha reliability coefficient for the whole scale was 89. The analyses showed that the scale was valid and reliable in determining the mobile technology acceptance level in mathematics learning.

Data Analysis

The research utilized frequency and percentage distributions, independent groups T-test, one-way analysis of variance ANOVA, and simple correlation analysis (Pearson Product-Moment Correlation) in the analysis of the data to find answers to the research questions.

Findings and Discussions

1. Findings Regarding High School Students' Perceived Self-Regulation Skills

The study investigated high school students' perceived self-regulation skills for the first sub-problem of the study. Table 2 gives the findings related to the students' perceived self-regulation skills.

Table 2 Descriptive Values Related to Students' Perceived Self-Regulation Skills (SPSS)

Dimension	Mean (*SD*)	SS
Being open	29.54 (3.69)	4.15
Search	26.09 (3.26)	5.81
SPSS	55.64 (3.48)	8.81

According to the results of the descriptive analysis in Table 2, both the mean scores of SPSS and the mean scores in the Being Open and Search sub-dimensions were above average.

2. Findings Regarding the Differentiation of Students' Perceived Self-Regulation Skills According to Gender, Grade and Academic Achievement

This sub-problem of the study investigated whether there was a significant difference in SPSS according to gender. For this purpose independent samples t-tests were conducted on the data. According to the analysis results, the intergroup variances were homogeneous regarding two sub-dimensions and the whole scale ($p>.05$).

According to the examination of the sub-dimensions of the scale, there was a statistically significant difference between the mean score of the Being Open sub-dimension of female students (M =29.77) and that of male students (M = 29.13) ($t(750) = 2.01$; $p < .05$). Accordingly, the Being Open sub-dimension scores of female students were higher than that of male students.

The study performed a one-way analysis of variance regarding the significance of the scores of SPSS and sub-dimensions according to the grade variable. There was a significant difference regarding students' scores according to grade in the two sub-dimensions of the scale and the whole scale ($p<.05$). The study also performed a post hoc test to determine the

source of this difference. Accordingly, 12th-grade students scored higher in Being Open and Search sub-dimensions and perceived self-regulation skills.

The study performed a one-way analysis of variance regarding the significance of the scores of SPSS and its sub-dimensions according to the academic achievement variable. The study collected the overall achievement means of the students as data. To provide convenience in the analysis, the mean achievement scores of the students were expressed as 1 in the range of 0-49.99, 2 in the range of 50-59.99, 3 in the range of 60-69.99, 4 in the range of 70-84.99, and 5 in the range of 85-100. As a result, the achievement means of the participants were above 50 points. There was a significant difference regarding students' achievement scores in the two sub-dimensions of the scale and the whole scale ($p<.05$). According to the results of the multiple comparison post hoc test, students with achievement scores of 4 and 5 had higher perceived self-regulation skills scores according to the Being Open and Search sub-dimensions and the whole scale.

3. Findings Regarding High School Students' Mobile Technology Acceptance Levels in Mathematics Education

For the second sub-problem of the research, the study investigated mobile technology acceptance levels of high school students in learning mathematics learning. Table 3 gives the findings regarding the students' mobile technology acceptance in learning mathematics (MTALM).

Table 3 Descriptive Values Regarding Students' Mobile Technology Acceptance Levels (n=752)

Dimension	Mean (*SD*)	SS
The Expectation of Performance	21.16 (3.53)	4.57
The Expectation of Effort	11.16 (3.72)	2.68
Social Impact	15.37 (3.07)	4.46
Facilitating Conditions	20.66 (4.13)	3.99
Hedonic Motivation	13.66 (3.42)	4.07
Habit	11.30 (2.83)	3.79
Price Value	7.88 (2.63)	3.45
Behavioral Intention	20.48 (3.41)	5.26
MTALM	121.68 (3.38)	19.18

According to the results of the descriptive analysis in Table 3, both the mean scores of MTALM and the scores in the sub-dimensions of Expectation of Performance, Expectation of Effort, Social Impact, Facilitating Conditions, Hedonic Motivation and Behavioral Intention

were above the average. Also, the Habit and Price Value sub-dimensions scores were slightly below average.

4. Findings Regarding the Differentiation of High School Students' Mobile Technology Acceptance Levels in Mathematics Education According to Gender, Grade and Academic Achievement

This sub-problem of the study investigated whether there was a significant difference between the students' mobile technology acceptance levels in learning mathematics according to gender. For this purpose, the study conducted an independent T-test on the data. According to the results of the analysis, the intergroup variances were not homogeneous in terms of Expectation of Performance, Expectation of Effort, Hedonic Motivation and Price Value sub-dimensions ($p<.05$), Social Impact, Facilitating Conditions, Habit, Behavioral Intention, and the intergroup variances were homogeneous in terms of the whole scale ($p>.05$). There was no statistically significant difference between the mean score of female students' mobile technology acceptance levels in mathematics education (M= 122.06) and the mean score of male students' mobile technology acceptance levels in mathematics education (M= 120.98) ($t(750) = 0.74$; $p > .05$).

There was a significant difference in the sub-dimensions of Expectation of Performance, Expectation of Effort, Social Impact and Price Value of the scale in terms of students' scores according to their grades ($p<.05$). Additionally, the expectation of performance of 12th-grade students was higher than that of 9th-grade students in mobile technology acceptance in learning mathematics. In the Expectation of Effort sub-dimension, there was a significant difference in favour of 12th-grade students between the students in the 12th grade and the 10th-grade students in mobile technology acceptance in learning mathematics. In the Social Impact sub-dimension, there was a significant difference in favour of 10th-grade students between 9th-grade students and 10th-grade students in mobile technology acceptance in mathematics learning. In the Price Value sub-dimension, there was a statistically significant difference between 9th-grade students and 10th, 11th and 12th-grade students in mobile technology acceptance in learning mathematics. Also, 9th-grade students had higher scores than other grades. The study performed that students with an achievement score of 4 and 5, that is, students who were considered to be more successful academically, had higher scores in the Hedonic Motivation dimension than students with an achievement score of 2. In other words, more successful students had more fun and enjoyed studying while using mobile technology to learn mathematics.

5. Findings Regarding the Relationship Between High School Students' Perceived Self-Regulation Skills and Mobile Technology Acceptance Levels in Learning Mathematics

Table 4 gives the results of the Pearson correlation analysis conducted to examine the relationship between students' perceived self-regulation skills and mobile technology acceptance levels in learning mathematics learning. According to the table, the correlation value was p<.and significant. There was a low level of positive correlation between SPSS and MTALM.

Table 4 The Relationship between SPSS and MTALM (n=752)

Variables		SPSS	MTALM
SPSS	r	1	.28
	p		.00
MTALM	r	.28	1
	p	.00	

6. Findings Regarding the Relationship Between High School Students' Perceived Self-Regulation Skills and Mobile Technology Acceptance Levels in Learning Mathematics According to Gender, Grade and Academic Achievement

Results of the partial correlation analysis conducted to examine whether there was a significant relationship between SPSS and MTALM according to gender, there was a low level of positive correlation (.10 <r<.29). Which includes the results of the partial correlation analysis conducted to examine whether there was a significant relationship between SPSS and MTALM according to grade, there was a low level of positive correlation (.10 <r<.29). And which includes the results of the partial correlation analysis conducted to examine whether there was a significant relationship between SPSS and MTALM according to grade, there was a lower level of positive correlation compared to gender and grade variables (.10 <r<.29).

The sample of this study consists of 752 students enrolled in an Anadolu High School located in a northern district of İzmir during the 2021-2022 academic year. Since the sample was drawn from a single school and a specific geographic area, the generalizability of the findings to student groups with different socio-economic backgrounds, cultural settings, or school types (e.g., science high schools, vocational high schools, private schools) is limited. This represents a significant constraint on the external validity (generalizability) of the results.

In this study, the relationship between students' self-regulation skills and their mobile technology acceptance levels in mathematics learning was examined based on variables such as gender, grade level, and academic achievement. Other potential variables, such as socio-

economic status, digital literacy, teacher attitudes, or the quality of the learning environment, were not included in the scope of the research. This limitation restricts the breadth of the findings and their applicability to a broader context.

Conclusions and Suggestions

According to the findings, high school students' perceived self-regulation skills were above average, consistent with prior research indicating that students tend to acquire effective study habits and learning regulation abilities by this educational stage (Ekşi et al., 2018). No significant gender differences were found in self-regulation skills, although some studies have reported females to possess higher skills due to cognitive and behavioral differences (Fawaıt et al., 2020; Özen & Gencel, 2016). A significant difference was found by grade level, with 12th-grade students demonstrating higher self-regulation skills than 9th graders, supporting the notion that self-regulation improves with age and maturity (Fawaıt et al., 2020). Furthermore, students with higher academic achievement showed significantly better self-regulation abilities, aligning with prior studies that established a positive relationship between academic success and self-regulated learning (Aktan, 2012; Duru et al., 2004; Üredi & Üredi, 2005). In terms of mobile technology acceptance in mathematics learning, students scored above average in "Performance Expectancy," "Effort Expectancy," "Social Influence," "Facilitating Conditions," "Hedonic Motivation," and "Behavioral Intention," but slightly below average in "Habit" and "Price Value." These results may be attributed to students' negative attitudes towards mathematics or a preference for traditional learning tools (Poçan et al., 2021), as supported by studies reporting moderate (Diri, 2021) or high (Horzum et al., 2014) acceptance levels. Gender was not a significant factor in mobile technology acceptance (Nikolopoulou, 2018; Nikolopoulou et al., 2020), while 12th-grade students showed higher "Performance Expectancy" and "Effort Expectancy" than lower grades. Interestingly, 10th-grade students were more socially influenced, and 9th-grade students perceived mobile technologies as more cost-effective. Regarding academic achievement, a significant difference was found only in "Hedonic Motivation," with higher-achieving students reporting greater enjoyment while using mobile technologies for mathematics (Han & Shin, 2016). A low but positive correlation was found between students' perceived self-regulation skills and mobile technology acceptance in mathematics. This correlation remained consistently low across gender, grade level, and academic achievement. It suggests that students who are capable of managing their learning are more inclined to accept and utilize mobile technology effectively (Liou & Kuo, 2014; Ngampornchai & Adams, 2016; Zare Bidaki et al., 2013).

However, the relatively moderate levels of both self-regulation and mobile technology acceptance may explain the weakness of this relationship. Moreover, students' attitudes toward mathematics could have also influenced this interaction. Therefore, fostering both self-regulation skills and positive attitudes toward educational technologies is essential for enhancing academic performance (Schunk & Ertmer, 2000).

Based on the results, hypotheses H1, H2b, H2c, H3, H4b, H4c, and H5 are supported, while hypotheses H2a, H4a, H6a, H6b, and H6c are not supported. Specifically, no significant differences were found based on gender, age, or academic achievement, while a low but positive relationship between self-regulation skills and mobile technology acceptance was observed.

This study offers significant contributions to both the theoretical literature and practical applications by examining the relationship between high school students' perceived self-regulation skills and their acceptance levels of mobile technology in mathematics learning. While existing studies in this field predominantly focus on university students, this research stands out as one of the few that investigates this relationship in the context of secondary education. By addressing this gap, the study provides a more comprehensive understanding of how individual learning skills interact with technology acceptance among adolescents. Moreover, the integration of the Unified Theory of Acceptance and Use of Technology (UTAUT-2) and self-regulation theory within the framework of this study offers a novel perspective to the literature, highlighting how self-regulatory capacities can influence technology adoption processes in educational settings.

In addition to its theoretical contributions, the study also provides several practical implications for educators, policymakers, and instructional designers. To ensure students can effectively benefit from mobile technologies in mathematics learning, it is essential to enhance their self-regulation skills. Therefore, teachers are encouraged to incorporate self-regulation-oriented instructional strategies into their lessons, especially when utilizing mobile technologies. Furthermore, the development of instructional materials and mobile learning applications that explicitly support students' self-regulation processes is recommended. From a policy perspective, there is a need for in-service training programs aimed at equipping teachers with the competencies required to integrate mobile technologies into their teaching practices effectively. By doing so, both students' academic performance and their positive attitudes towards technology can be fostered in a more holistic manner. Research can also be carried out for different variables theoretically supported in the future. The study participants

consisted of only the students of one school through appropriate sampling. In the following studies, a larger group of participants with high representation power of the universe can be studied, including different types of schools (Science High School, Social Sciences High School, Vocational High School, Imam Hatip High School, etc.) and even different levels of education (primary school, secondary school, university, etc.). This study included only the screening method, but experimental and qualitative methods can also be used to obtain in-depth research results.

Compliance with Ethical Standards

Disclosure of potential conflicts of interest

No conflict of interest.

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CRediT author statement

The article was collaboratively written by three authors, with each contributing equally to its content.

Research involving Human Participants and/or Animals

The ethics committee permissions were obtained with the letter dated 23.02.2022 and numbered 02/23 of the "Social and Human Sciences Scientific Research and Publication Ethics Committee of University Institute of Educational Sciences."

Lise Öğrencilerinin Algılanan Öz Düzenleme Becerilerinin Matematik Öğreniminde Mobil Teknoloji Kabul Düzeyleri ile İlişkisi

Özet:

Eğitimde mobil teknolojinin yaygınlaşmasıyla birlikte bireysel öğrenme ön plana çıkmış, bu da öğrencinin işini en iyi şekilde organize etmesini, yani öz düzenleme becerilerini geliştirmesini gerektirmiştir. Bu araştırmada lise öğrencilerinin algılanan öz düzenleme becerileri ile matematik öğrenmede mobil teknoloji kabul düzeyleri arasındaki ilişki incelenmiştir. Ayrıca araştırmada öğrencilerin matematik öğrenmede öz düzenleme becerileri ve mobil teknoloji kabul düzeyleri cinsiyet, sınıf düzeyi ve akademik başarı ortalamaları açısından incelenmiştir. Araştırmaya uygun örnekleme yöntemi ile belirlenen bir lisede öğrenim gören öğrenciler dahil edilmiş ve 752 öğrencinin verileri değerlendirilmiştir. Araştırmada veri toplama araçları olarak Öğrenci Bilgi Formu, Algılanan Öz Düzenleme Ölçeği ve Matematik Öğrenmede Mobil Teknoloji Kabul Ölçeği kullanılmıştır. Araştırmada ayrıca betimsel ve ilişkisel tarama yöntemleri kullanılmıştır. Araştırmaya göre lise öğrencilerinin algılanan öz düzenleme becerileri ile matematik öğrenmeye yönelik mobil teknoloji kabul düzeyleri arasında düşük düzeyde pozitif bir korelasyon vardır. Ayrıca öğrencilerin algılanan öz düzenleme becerileri ortalamanın üzerindedir ve mobil teknoloji kabul düzeyleri matematik öğreniminde ortalamaya yakındı.

Anahtar kelimeler: Lise öğrencileri, matematik, mobil öğrenme, mobil teknoloji kabulü, öz düzenleme.

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