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CONTENTS

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Investigation of Pre-Service Teachers' Opinions on Advantages and Disadvantages of Online Formative Assessment: An Example of Online Multiple-Choice Exam

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ABSTRACT

The interest in using online formative assessment activities has gradually increased in both traditional teaching and distance education processes. Research emphasizes the importance of using online formative assessment in learning processes. Due to this fact, it is essential to uncover pre-service teachers' thoughts about online formative assessment activities in a critical manner. Because they will decide whether to employ these activities in the educational field in a few years. Therefore, the aim of this study is to explore pre-service teachers' opinions about the advantages and disadvantages of online formative assessment. The research was conducted on 35 pre-service teachers enrolled in Computer I course during an academic term. They participated in online formative assessment activities every week within the scope of the research. An online formative assessment system based on multiple-choice exams and providing immediate feedback was developed. Data were collected through using a semi-structured interview method and content analysis was conducted to analyze the data. The advantages and disadvantages of using online formative assessment activities that provide immediate feedback in the form of a multiple-choice exam were revealed according to pre-service teachers' opinions as a result of this study. Various practical and constructive suggestions were offered for the design, development and implementation of online formative assessment in accordance with the results obtained from the research.

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INTRODUCTION

The advancements of information and communication technologies have brought about digital transformation in the field of education as in all areas of our lives. The limitations of space and time in the teaching and learning processes have been overcome with the digital transformation in the field of education. Learners can access the information sources they need from the inside and outside of the classroom via the internet. Massive Online Open Courses (MOOCs), video sharing platforms, social networking communities are commonly preferred online learning resources today. Although these online learning resources, specifically MOOCs, are informal learning platforms, several institutions including universities have begun to utilize these platforms as a formal learning platform if meeting their accreditation requirements (Annabi & Wilkins, 2016; Tsai et al., 2018). Many universities offer accredited degree courses for a variety of undergraduate programs through MOOCs. Learners can even find opportunities to complete undergraduate and graduate degree programs through MOOCs. MOOCs have also become learners' preferred learning environments of all ages for certificate programs (Wong et al., 2019). Besides, although online education is an optional instructional delivery system for those who live far from campus, prefer to study at your their pace or work full-time, it might be an inevitable way of delivering educational instruction when traditional learning cannot be applicable due to any undesired conditions affecting human beings such as wars or pandemics like coronavirus. According to these developments, online learning can be considered as a lifelong learning program encompassing learners of all ages. In fact, research reveals that online education can be as beneficial and effective as traditional education if the online learning environment is well-designed (Sezer, Karaoglan Yilmaz, & Yilmaz, 2017).

One of the most important components of the learning process is assessment. Assessment is an essential component of the learning process for the evidence and accreditation of learning (Lubinescu, Ratcliff, & Gaffney, 2001). Assessments that ask probing questions also help students to deepen their understanding (Ustun & Tracey, 2019). Summative assessment encompasses decisions that are mostly related to certification of achievement and performance, giving a final grade, making a pass-fail decision (Harlen & James, 1997). However, formative evaluation is being recognized as being at the forefront of the online learning process (Yilmaz, 2017). Since learners are responsible for their own learning process in online learning. Because of this fact, they need to possess skills such as self-regulated learning, self-directed learning, and intrinsic motivation to be successful in the online learning process (Lynch & Dembo, 2004; Saks & Leijen, 2014). Learners who do not have these skills may need external support (Karaoğlan Yılmaz, Olpak, & Yılmaz, 2018). However, it might not be possible to provide external support to each learner when it is considered that masses are taught in online learning. Formative assessment becomes important at this point (Gikandi, Morrow, & Davis, 2011).

Online formative assessment is an assessment approach in which each learner can test themselves using online tools and environments, where feedback is provided to them about the learning process, in which it is aimed for them to make self-assessment based on this feedback and consequently, they make decisions about their own learning process to improve this process. The main advantages of online formative assessment are to allow learners to take the exam without the restriction of place and time, to repeat it as needed, to obtain ongoing and immediate feedback as soon as completing it, to get an opportunity for self-regulation and self-directed learning and to receive continuous external support (Gikandi et al., 2011). Ongoing feedback helps learners identify their strengths and weaknesses and determine gaps in their understanding of topics they have learned.

The related literature shows that a wide variety of learning activities is used to carry out online formative assessment (Baleni, 2015; Crossouard, 2008; Olson & McDonald, 2004). Peer assessment, computer-assisted cooperative learning, online discussions, online project-based learning are some examples of activities used to make online formative assessment. Besides, one of the widely preferred strategies to do online formative assessment is an online multiple-choice exam based on self-assessment.

However, when the literature is examined, it is determined that there is a need to conduct studies investigating the effects of doing online multiple-choice exams based on self-assessment on learning-teaching processes. The aim of this study is to examine the pre-service teachers' opinions about online formative assessment based on multiple-choice exams.

METHOD

The information about the research model, study group, data collection tools and data analysis is provided in this section.

Research Model

The preservice teachers' opinions towards online formative assessment were tried to be determined within the scope of the research. In accordance with this purpose, their opinions about the advantages, disadvantages and limitations of online formative assessment were revealed. In this sense, the research strategy was the case study that is one of the qualitative research designs. Both quantitative and qualitative research methods were employed in this research. Quantitative data were obtained using a questionnaire developed by the researchers and qualitative data were obtained using a semi-structured interview form developed by the researchers.

Study Group

The participants of the study were 35 students studying the Faculty of Education at a state university in Turkey. The age ranges of students vary between 17 and 23. Preservice teachers studied at the department of elementary mathematics education, 17 students of them are male (48.6%) and 18 students of them are female (51.4%). When looking at the technological devices they had, it was ascertained that all of them had smartphones with the internet connection, 91% of them had laptops and 57% of them had tablet computers. It was observed that students mostly preferred to use their smartphones to connect the internet.

Data Collection Tools and Analysis

The data were collected through a questionnaire and an interview form consisting of semi-structured questions. Both data collection instruments were developed by the researchers. A series of questions were asked to the preservice teachers in the questionnaire in order to obtain information about their age, department, technological tools, internet accessibility and so on. The semi-structured questions in the interview form were also asked to them in order to determine the advantages and disadvantages of online formative assessment. After the questionnaire and interview form was judged by experts in the field of instructional technology, both instruments were reshaped according to their feedback and used in the research.

Online Formative Assessment and Procedure

Moodle was used as a learning management system in the research. The assessment tool Moodle provided was utilized to develop the online formative assessment activities. Students participated in the online formative assessment activity implemented in Moodle to assess themselves after studying each topic every week within the scope of the course. Each online formative assessment activity was available to students at the end of each week. Online formative assessment activities were prepared in a way that allowed the students to take the assessment activity whenever and wherever they want. The questions included in the online formative assessment were prepared as a multiple-choice exam with five choices for each question. A multiple-choice exam consisting of approximately 10 questions was applied to students every week. While preparing a multiple-choice exam, an immediate feedback system that provided the reason why the selected choice of answer is correct or wrong for each question was designed. Feedback was also given to students at the end of the exam. Thus, it was aimed that the student could make self-assessment according to feedback. Students were able to take an exam as many times as they wanted. The research continued every week through an academic semester in the same manner.

Data Analysis

The content analysis technique was used to analyze the data obtained from the student opinion form consisted of semi-structured questions. After the collected data was coded by a coder in the qualitative data analysis process, the data was re-coded by a second coder to ensure the reliability of the study. The number of codes that both coders agreed on divided by the total number of codes to calculate the reliability of the coding. The coding reliability percentage was found as 91%. For the remaining 9% difference, the coders came together and reached a consensus. When the pre-service teachers' written explanations were examined, this difference of coders was because of the fact that some of the answers given by a pre-service teacher were gathered under several sub-themes.

FINDINGS

Technological Tools Pre-Service Teachers Prefer to Participate in Online Formative Assessment

Pre-service teachers were asked which tool they would prefer to participate in online formative assessment. Technological tools that they preferred to participate in online formative assessment are shown in Table 1.

Table 1. *Technological Tools Pre-Service Teachers Prefer to Participate in Online Formative Assessment*

TECHNOLOGICAL TOOL	PREFERENCE STATUS (%)
Smart Phone	92%
Laptop	8%
Tablet	0%

Pre-service teachers mostly preferred to use their smartphones to take the online formative assessment. Some of them preferred to use their laptop in participating in the online formative assessment. There are no students who used their tablets.

Pre-service Teachers' Opinions towards and Intention to Use for Online Formative Assessment

The pre-service teachers were asked if they found the online formative assessment activities beneficial. Their thoughts about finding online formative assessment beneficial are shown in Figure 1.

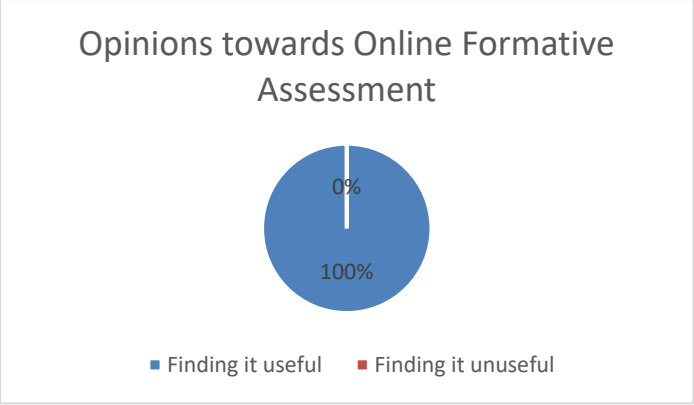

Figure 1. *Pre-service Teachers' Opinions Towards Finding Online Formative Assessment Useful*

When Figure 1 is examined, all of the pre-service teachers who participated in the study found online formative assessment useful.

The pre-service teachers were asked if they would like to utilize online formative assessment activities in the future. The behavioral intention of pre-service teachers to utilize online formative assessment in the future is shown in Figure 2.

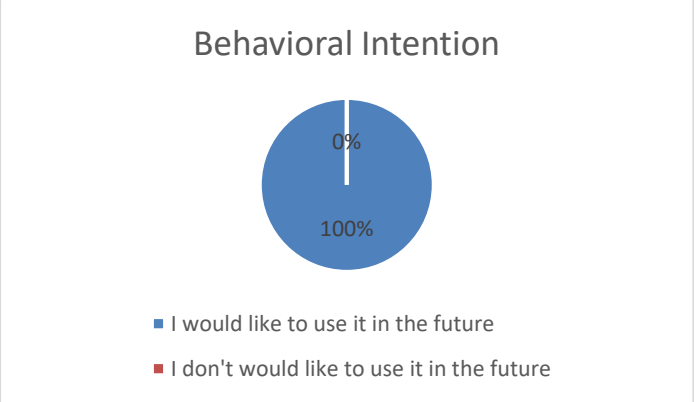

Figure 2. *Pre-service Teachers' Opinions on Finding Online Formative Assessment Useful*

When Figure 2 is examined, all of the pre-service teachers who participated in the study were willing to use the online formative assessment in their future courses and their behavioral intentions were positive.

Pre-service Teachers' Opinions about Advantages of Online Formative Assessment

What the advantages of online formative evaluation pre-service teachers gained were asked. Pre-service teachers' opinions about the advantages of online formative assessment they gained are shown in Table 2.

Table 2. *Pre-service Teachers' Opinions About the Advantages of Online Formative Assessment*

SUB-THEMES	FREQUENCY (f)
Allowing me to check whether I have succeeded or not	35
Giving an opportunity for me to take the exam at any desired place and time	34
Providing an opportunity for me to take the exam as much as I want	32
Promoting learning	31
Providing immediate feedback about my correct and wrong answers at the end of the exam	29
Enabling me to make self-assessment	28
Reinforcing what I have learned	27
Allowing me to understand/learn the topic better	26
Facilitating learning	26
Helping me become more successful at the course	25
Being a practical activity	23
Making the learning process more efficient	22
Being less stressful and more comfortable than the traditional in-class (paper-based) exam	21
Increasing my motivation	19
Making me active in the learning process	19
Providing feedback that helps me learn by myself	17
Being enjoyable	15
Encouraging me to study in a regular manner	14
Asking questions related to the course topics	12

Some pre-service teachers' opinions are given below.

PsT1: "It not only helps us understand the course topics better but also gives us the opportunity to test ourselves after studying the topics. Therefore, we can realize how much we have learned. We understand our deficits better."

PsT2: "Because of having the exam in a more comfortable environment, I can do it easier. As a result of the exam, I can be aware of my learning needs. I get stressed less."

PsT3: Mobile exam activities are economic because there is no transportation problem, there is no fear of being late for the exam, there is no limitation of time and place, it provides an educational opportunity for students with physical disabilities.

Pre-service Teachers' Opinions about the Disadvantages / Limitations of Online Formative Assessment

What the advantages/limitations of online formative evaluation pre-service teachers experienced were asked. Pre-service teachers' opinions about the advantages of online formative assessment they experienced are shown in Table 3.

Table 3. *Pre-service Teachers' Opinions About the Disadvantages/Limitations of Online Formative Assessment*

SUB-THEMES	FREQUENCY (F)
Experiencing internet connection problems during the exam	22
Easily cheating in the exam	19
Feeling anxious during the exam	12
Getting not enough time to finish the exam sometimes	11
Obtaining low scores as a result of the exam may lead to demoralization or may decrease motivation	10
Having smartphones with insufficient features	4

ÖA1: We are sometimes demoralized when we receive low scores. There is a decrease in our motivation toward the course."

ÖA2: "The disadvantage is that the person feels anxious so being unable to answer questions."

ÖA3: "I don't think there is any disadvantage."

DISCUSSION AND CONCLUSION

Pre-service teachers' opinions about online formative assessment activities were investigated in this study. A multiple-choice online formative assessment system providing immediate feedback was developed and the positive and negative opinions of pre-service teachers who used this system through a semester within the scope of the course were revealed. As a result of the study, all pre-service teachers stated that they found the online formative assessment beneficial. All of them also indicated that they would like to utilize online formative assessment in their future courses. In other words, it was concluded that their behavioral intentions towards online formative assessment were positive. This aligns with a study conducted by Santamaría Lancho et al. (2018) who found that students were satisfied and encouraged with automated formative assessment. They also revealed that students' writing skills and levels of conceptual understanding were improved by means of the feedback given after the automated assessments.

According to pre-service teachers' opinions about online formative assessment, there were many advantages of carrying out online formative assessment activities such as allowing students to receive feedback to improve their performance. Productive formative assessment activities increasing students' motivation depend on providing opportunities for students in obtaining feedback instead of points (Shepard, Penuel & Pellegrino, 2018). Duckor (2014) indicated that carefully designed formative assessment can be influential on student outcomes in a positive way. However, it was observed that a small number of pre-service teachers encountered some problems during the online formative assessment activities. When the advantages of online formative assessment are considered, employing online formative assessment in traditional and distance education can be a beneficial part of the effective teaching and learning process despite its disadvantages.

Gibbs and Simpson (2005) pointed out that making formative assessment and providing individualized feedback are effective factors in order to enhance students' performance, promote their motivation and maintain their engagement. According to pre-service teachers' opinions and suggestions about developing online formative assessment activities, availing the following design elements to develop effective online formative assessment activities is essential in the instructional design process. Therefore, while developing and implementing multiple-choice online formative assessment activities, the following design points should be considered;

- Feedback should be prepared for the choices of each question in a multiple-choice exam. Explanations should explicitly be provided to the student why his answer is correct or wrong.

- The student should be able to see summary reports on the total score he achieved, the topics he learned well, and the topics he needs to study more at the end of the exam.
- All the questions are displayed in random order. In other words, if a student takes the exam again, questions will appear in a random order.
- The exam duration is essential to attract the student's attention to the exam. However, the length of time for the per question should not be too short.
- It should be noted that online formative assessment is considered a part of the learning process. Therefore, students should be allowed to take an exam as many times as they want.
- Students indicated that their anxiety surface during online formative assessment. Online formative assessment should be used in students' early ages (primary school, middle school, etc.) in order to cope with this exam anxiety,
- Students should be able to take the exam at any time and place.
- Multimedia elements such as video, sound recording, graphic or table should be included in questions in order to make the questions more attractive.
- The vast majority of students participated in online formative assessment activities using their smartphones. Considering this fact that it is important that the format of online formative assessment should be compatible with mobile devices.

In conclusion, online formative assessment can be employed to shift teaching and learning approaches from teacher-centered learning to student-centered learning by giving chance to students to identify their learning needs and focus on learning processes and their own progress. The design of online formative assessment activities developed as a multiple-choice exam can be effective to positively influence students' learning experience when specific and immediate feedback is provided and multiple-choice exams are easily accessible and iterative. The principles of universal design for learning can also be followed to develop effective online formative assessment activities. Therefore, using online formative assessment can positively influence students' learning experience.

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The Effect of Robotic Coding Training Given In Private Schools On The Self-Efficacy Perceptions of Students' Computational Thinking Skills

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ABSTRACT

This research aimed to determine the self-efficacy perceptions of computational thinking skills of the students studying in private school. In the study, a quantitative research method was adopted and the descriptive survey model was used. The study group consists of 223 students from two different private schools that continue their education in Konya in the fall semester of the 2019-2020 academic year. "The Perception Scale of Self-Efficacy for Computational Thinking Skill" adapted to Turkish by Gülbahar, Kert, and Kalelioğlu (2019) was used to gather personal information as a data collection tool, to demonstrate the demographic information form developed by the researchers and the computational thinking skills of the study group in the research." Descriptive statistics were used to analyze the data and t-test was used for unrelated samples. In line with the data obtained from the research, it was found that there was no significant difference in the self-efficacy perception of computational thinking skill in terms of gender, having a computer at home, and having internet access, while there was a significant difference between the self-efficacy perception of computational thinking and robotic coding lesson. Besides, it was concluded that there was a significant difference among the opinions regarding robotic coding education increasing the success level in other courses.

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INTRODUCTION

In the development of individual talents, which is also called the 21st century talents that the digital world expects from individuals along with the developing technology, the biggest task that falls in the education and training field is the acceleration of compliance to the integration process of developing technologies and the development of knowledge, skill and attitude levels of technological literacy, information processing thinking skills and technology usage in the individuals' integration process (Ananiadou & Claro, 2009). It is aimed for individuals to learn to use other technological tools effectively together with computers in computer lessons starting from primary school age (Çelik, 2019).

In the 21st century, students must be individuals with problem solving, analytical and critical thinking, production, and high communication skills (Akpınar & Altun, 2014). However, the fact that traditional education methods are book-based, teacher-centered, and students are reluctant to learn abstract subjects cause less participation and less motivation in class (Çelik, 2019).Therefore, education should be carried out in environments where students can participate actively and learn by living by doing. It is thought that robotic coding trainings given in schools provide students with many 21st century features such as problem solving, reflective and creative thinking, collaborative work (Grout & Houlden, 2014; Konyaoğlu, 2019).

The concept of coding is educationally based on 50-60 years ago (Tağci, 2019). Countries that want to keep up with rapidly developing technology are also increasing their studies on developing computer science curriculum so that the growing generation can progress with this awareness (Angeli, Voogt, Fluck, Webb, Cox, Malyn-Smith & Zagami, 2016). Countries such as the UK, Canada, Ireland allocate high budgets to teach computer science, Japan, Argentina, Malaysia, Ireland, South Korea and Sweden offer programming training for the entire K12 level. Many countries, especially Australia, Estonia, Finland, Greece, Ireland, Israel, Lithuania, New Zealand, Romania, South Korea, England and Vietnam, provide coding education for all students at primary level within the scope of computer education (Code.org, 2017). In our country, curriculum arrangements are made and developed for primary and secondary schools (Code.org, 2017). In our country, 5th and 6th graders take Information Technologies and Software lessons twice a week (Talim ve Terbiye Board, 2018). In total, there is a Problem Solving and Programming unit that will last 18 weeks in a 37-week education and training period. This situation shows that students are aimed to develop their problem solving skills by taking coding training along with basic computer knowledge, to approach problems from different perspectives, and to gain creative and critical thinking skills (Yükseltürk & Altıok, 2015).

In our country, tools such as "Alice", "Scratch", "Code.org" are used in robotic coding education. In these tools, the code line can be created with drag and drop methods and the coding logic is shown to the student with simple steps (Konyaoğlu, 2019). Visual coding programs such as Scratch also help to think in computers (Brennan & Resnick, 2012). These block-based tools enable even individuals who do not have programming knowledge to develop programming and increase the interest in programming (Al-Jarrah, 2016).

Robotic coding education in schools basically allows students to code themselves and develop their own games and animations without the need to learn complex program language structures in detail (Resnick et al., 2009). Robotic coding sets; With its features such as improving visual programming, being inexpensive and having a clear technology (distance, sound, light, contact sensors etc.), is important among educational tools that can be used in the classroom environment (Çelik, 2019). By using robotic sets, coding ability can be provided to students from preschool age (Tekinarslan & Çetin, 2018). While robotic kits reached high costs in the first years of use, they have become more convenient and accessible tools today (Çelik, 2019). Developed by Lego Wedo, Lego Mindstorms, Makeblock, mBot is among the widely used robotic kits (Çelik, 2019). In the literature review, it was seen that in the trainings given with robotic kits, students actively participate in the learning process by seeing the kits as toys and this situation increases the scientific creativity and scientific process skills of the students, improves their problem

solving skills, and positively develops their thoughts about the robot-human and society (Alimisis, 2012; Cavas et al, 2012; Mauch, 2001).

Robotic coding education and robotic kits are not only limited to computers and informatics, but are also related to different disciplines. Robot parts (engine, sensor, coding) are also related to different disciplines such as engineering and electronics (Ebelt, 2012). The 21st century, in which young people also have information processing thinking skills to use informatics and information and communication technologies with such professions. skills should also be available (Tutulmaz, 2019). Computational thinking skills are also among the 21st century skills.

Computational thinking skill is defined as the ability to understand how computers are used to solve problems, organize and analyze data, and use computers to produce effective solutions (Computer Science Teachers Association, 2011). Computational thinking skills are generally accepted as problem solving skills or higher level thinking skills that are accepted as its lower step (Üzümcü, 2019). In addition, computing thinking skills can be used to solve problems in social and physical sciences, mathematics and all other fields besides computer applications (Education, 2019).

When the studies on computational thinking skill and robotic coding are examined in the literature, many studies are encountered. In his doctoral thesis study, Yolcu (2018) investigated the effect of robotics use on computing thinking in programming. He conducted his research with a mixed method and 47 students studying in 6th grade in a 14-week period. At the end of the process, it has been reached that programming education increases students' computing thinking skills. In addition, data were obtained that robotic coding had no effect on computational thinking skills. In another master's thesis, the effects of trainings given by scratch application and robotics application on computational thinking and academic success were compared (Şimşek, 2018). According to the data obtained as a result of the research, no significant difference was found between the effects of the two forms of education. Konyaoğlu (2019), in his master's thesis, investigated the effect of robotics education on problem solving skills of middle school students and their opinions on robotic activities. 26 students participated in the study, which was carried out using a mixed method. As a result of the research, it was seen that robotics education had a positive effect on students' problem solving skills. In addition, it was concluded that students developed positive thoughts about robotics as a result of the activities. Most of the research involves secondary school students studying at public schools and qualitative measurement research tools are used along with quantitative measurement tools. In this research, the current situation in private schools will be investigated by using descriptive screening model, which is one of the quantitative research methods.

Therefore, the purpose of this study is to investigate the effect of robotic coding education given in private schools on students' computational thinking skills. In this context, the sub-research questions that direct this research are:

1. Are the students' computational thinking skills self-efficacy perceptions meaningful by gender?
2. Are the students' computing thinking skills self-efficacy perceptions meaningful according to the availability of computers at home?
3. Do the students' computational thinking skills self-efficacy perceptions make sense according to their internet access status?
4. Do the students' computational thinking skills self-efficacy perceptions make sense according to their robotic coding education?
5. Is there a significant relationship between the thoughts of robotic coding education to increase students' success levels in other courses?

METHOD

In this research, descriptive scanning method, one of the quantitative research methods, was used. The studies carried out to describe the characteristics of the phenomenon studied are descriptive studies (Fraenkel, Wallen & Hyun, 2012). In screening models, researchers are interested in how thoughts and features are distributed to individuals rather than why they occur (Fraenkel et al, 2012).

Study Group

The study group of the study consisted of 176 students in the 5th and 6th grades studying in a private school that provides robotic coding training and 47 students in the 5th and 6th grades in a private school that does not teach robotic coding. In the study in which 223 students participated in total, data on students' gender, computer availability at home, internet availability, robotic coding education status, and their interest in robotic coding outside school are given in Table 1.

Table 1. *Students' Demographic Information (n = 223)*

VARIABLE	GROUP	FREQUENCY	%
Gender	Female	108	48,4
	Male	115	51,6
	Total	223	100
Computer availability at home	Yes	177	79,4
	No	46	20,6
	Total	223	100
Internet availability	Yes	213	95,5
	No	10	4,5
	Total	223	100
Robotic coding training status	Yes	176	78,9
	No	47	21,1
	Total	223	100

When Table 1 is analyzed, it is seen that 22.4 students in total participated in the study, 48.4% (n = 108) were female students, 51.6% (n = 115) were male students. It is seen that 79.4% (n = 177) of the students have a computer at home and 20.6% (n = 46) do not have a computer. It is seen that 95.5% (n = 213) of the students have internet access and 4.5% (n = 10) do not have internet access. While 78.9% (n = 176) of the students receive robotic coding training, 21.1% (n = 47) do not receive robotic coding training.

Data Collection Tools and Analysis

In accordance with the objectives of the research, the "Self-Efficacy Perception for Computing Thinking" scale, which was adapted according to the Turkish education system by Gülbahar, Kert and Kalelioğlu (2019), was used for secondary school students. The scale consists of 36 questions developed as 3-point Likert (1-Yes, 2-Partially, 3-No) type in order to be suitable for the students' level of development. It consists of 5 sub-sections as algorithm design competence (9 items), problem solving ability (10 items), data processing competency (7 items), basic programming competence (5 items), self-confidence (5 items). The total reliability coefficient of the scale was .943. Kaiser Meyer Olkin coefficient was .966 and Bartlett test significance level was found as <.05.Correlation matrix values above .30 were reached.

In addition, personal information form was used to reach demographic information of the students in the study group. In the personal information form, questions were asked and demographic information was obtained to determine what students think about gender, whether they have computers at home, internet access, and whether robotic coding improves success in other courses.

Data Analysis

In the research, an investigation was made on the collected forms. As a result of the examinations,

no missing or inaccurate scale was found and transferred to the computer before analysis. The data transferred to the computer was analyzed with the statistical program. In the analysis of the data, the level of significance was accepted as .05. Demographic data obtained from students were explained using frequencies in descriptive statistics methods. T-test was used for unrelated samples to determine whether students' gender, computer ownership, internet possession, and robotic coding activities showed a significant difference.

FINDINGS

The results of the participants' computing thinking skills self-efficacy perceptions by gender variable are given in Table 2.

Table 3. *Students' Computational Thinking Skills Self-Efficacy Perceptions t-Test Results by Gender*

GENDER	N	$\bar{X}$	s	sd	t	p
Female	108	61,6389	15,70312	221	,442	,562
Male	115	60,6696	16,95387			

When Table 2 is examined, there is no significant difference between the students' self-efficacy perceptions and gender in computing thinking (t (221) =, 442, p> .05). The average of perceptions of female students' computing thinking skills self-efficacy is $\bar{X}$ = 61.63, and the average of perceptions of male students' computing thinking skills self-efficacy is $\bar{X}$ = 60.66. Considering this, it can be said that the perceptions of female students' and male students' computing thinking skills self-efficacy are close to each other.

The results of the participants' perceptions of computing thinking self-efficacy according to their ownership of computers at home are given in Table 3.

Table 3. *Students' Computational Thinking Skills Self-Efficacy Perceptions t-Test Results According to Having A Computer at Home*

HAVING A COMPUTER	N	$\bar{X}$	s	sd	t	p
Yes	177	60,0000	16,66924	221	-2,058	,368
No	46	65,5217	14,28867			

When Table 3 is examined, there is no significant difference between students' computing thinking skills self-efficacy perceptions and having a computer at home (t (221) = -2.058, p> .05). The average of computing thinking self-efficacy perceptions of students who have a computer at home is $\bar{X}$ = 60.00, and the average of computing thinking self-efficacy perceptions of students who do not have a computer at home is $\bar{X}$ = 65.52. Considering this, it can be said that the computing thinking skills self-efficacy perceptions of students who have a computer and those who do not have a computer are close to each other.

The results of the participants' computing thinking skills self-efficacy perceptions according to their internet access status are given in Table 4.

Table 4. *Students' Computational Thinking Skills Self-Efficacy Perceptions t-Test Results According to Their Internet Access Status*

HAVING İNTERNET ACCESS	N	$\bar{X}$	s	sd	t	p
Yes	213	60,9390	16,38370	221	-,844	,974
No	10	65,4000	15,30577			

When Table 4 is examined, there is no significant difference between students' perceptions of computing thinking self-efficacy and having internet access (t (221) = -, 844, p> .05). The average of computing thinking self-efficacy perceptions of students with internet access is $\bar{X}$ = 60.93, the average of computing thinking self-efficacy perceptions of students without internet access is $\bar{X}$ = 65.40. Considering this, it can be said that the computing thinking skills self-efficacy perceptions of students who have a computer and those who do not have a computer are close to each other.

The results of the participants' perceptions of information processing thinking skills self-efficacy according to their robotic coding training are given in Table 5.

Table 5. *T Test Results According to The Students' Robotic Coding Education Perceptions of Their Self-Efficacy Perceptions of Information Processing Thinking Skills*

GETTING ROBOTIC CODING TRAINING	N	$\bar{X}$	s	sd	t	p
Yes	176	73,9574	17,57092	221	-6,615	,034
No	47	57,7159	14,18607			

When Table 5 is examined, it can be said that there is a significant difference between students' perceptions of computational thinking skills self-efficacy and robotic coding education. (t (221) = -6.615, p> .05). The average of computing thinking skills self-efficacy perceptions of students who have received robotic coding training is $\bar{X}$ = 73.95, and the average of computing thinking self-efficacy perceptions of students who do not have robotic coding training is $\bar{X}$ = 57.71. Considering this, it can be said that the computational thinking skills self-efficacy perceptions of students who have received robotic coding training are higher than the computing thinking skills self-efficacy perceptions of students who do not have robotic coding training.

The results of the participants according to their thinking status towards increasing the level of success of robotic coding training in other courses are given in Table 6.

Table 6. *T Test Results of Student Views on Increasing The Level of Success of Robotic Coding Education in Other Courses*

ROBOTIC CODING TRAINING INCREASES SUCCESS IN OTHER COURSES	N	$\bar{X}$	s	sd	t	p
Yes	109	67,0439	16,66398	221	-5,932	,026
No	104	54,9633	13,50372			

When Table 6 is analyzed, it can be said that there is a significant difference between students' thoughts towards increasing the level of success of robotic coding education in other courses. (t (221) = -5.932, p <.05). The average of the students who think that the robotic coding education increases the success level in other courses is **X** =67,04, and the average of the students who do not think that the robotic coding education increases the level of success in other courses is **X** = 54,96.Considering this, it can be said that students who think that robotic coding education increases their success in other courses are higher than students who do not think that robotic coding education increases their success level in other courses.

DISCUSSION AND CONCLUSION

The aim of the research is to measure the self-efficacy perceptions of the students who are educated in private school about their computational thinking skills by gender, having a computer at home, having internet access, getting robotic coding education and determining the effect of the robotic coding education on the level of success in other courses. This study was attended by 223 students studying at a private school. The findings obtained as a result of the research were discussed and interpreted.

According to the results obtained in the research, it is stated that students' computing thinking skills self-efficacy perceptions do not show a significant difference according to gender. According to this information, it can be said that self-efficacy perceptions of female students towards computational thinking skills and self-efficacy perceptions of male students' computational thinking skills are close to each other. In parallel with this result, there was no significant relationship between the levels of computational thinking skills and gender (Werner, Denner, Campe & Kawamoto, 2012). In a study conducted with 8th grade students of secondary school, it was found that their perceptions of computing thinking skills self-efficacy differed by gender (Kuleli, 2019). In the study, the average of self-efficacy scores of female students for computational thinking skills was found 80,39, and male students were found to be 79,61 and it was stated that they differed in favor of female students with a low difference (Kuleli, 2019). In another study, it was concluded that women are more skilled in acquiring computational thinking skills (Prottsman, 2011). In addition, a study with students studying between 5th and 12th grades found that computing thinking skills favored male students by gender (Román-González, Pérez-González & Jiménez-Fernández, 2017).

According to the results of this research, it is seen that there is no significant difference between the students' computing thinking skills self-efficacy perceptions and having a computer at home. According to

this information, it can be said that the students who have a computer at home and those who do not have a computer have close computing skills and self-efficacy perceptions. According to a study, students' tablet ownership and computing thinking skills self-efficacy perceptions were examined and no significant difference was found (Kuleli, 2019).

According to this research, it was found that there was no significant difference between the students' computing thinking skills self-efficacy perceptions and their internet access status. According to this information, the computing thinking skills self-efficacy perceptions of students who have internet access and the computing thinking skills self-efficacy perceptions of students who do not have internet access can be said to be close to each other.

According to the results of the research, it is seen that there is a significant difference between the students' computing thinking skills self-efficacy perceptions and robotic coding education. According to this result, it can be said that the computational thinking skills self-efficacy perceptions of students who have received robotic coding education are higher than the computational thinking skills self-efficacy perceptions of students who do not have robotic coding education. It is stated that block-based robotic coding education positively contributes to problem solving, self-efficacy perception and computational thinking skills (Yukselturk & Altıok, 2016).

According to the results of the research, it is seen that the opinions of the students about the robotic coding education to increase their success levels in other courses differ significantly. It is seen that students who think that robotic coding education increases the success in other courses are more than students who do not think that robotic coding education increases the success in other courses. In a master's thesis research, it has been stated that robotic coding education also benefits other courses (Kök, 2019). Uslu (2018) stated in his research that programming did not improve computational thinking skills, but the students stated that it was beneficial for science courses (cited in: Kök, 2019). A relationship is determined between self-efficacy perceptions of computing thinking skills and mathematics, science and technology, English and T.C. Revolution History and Kemalism course scores (Kuleli, 2019). The fact that the computational thinking skill, which is accepted as the lower step of the robotic coding education, increases the level of success in other courses, can indirectly give the result that robotic coding education has a positive effect on the level of success in other courses.

SUGGESTIONS

According to the results of this research, where the effect of robotic coding education on students' computational thinking skills self-efficacy perceptions is examined, some suggestions can be offered to practitioners and researchers interested in the subject. It is concluded that robotic coding has a positive effect on computational thinking skill self-efficacy perception. In line with this information, parents and teachers can be made conscious of students' basic robotic education. Students can be directed to participate in robotic coding activities outside of school. Robotic coding competitions between schools can be increased, and efforts to increase students' desire to participate in these competitions can be organized and motivation enhancing gifts can be given as a result of the competition. Conducting descriptive, experimental or mixed studies in which the relationship between computing thinking skill and different disciplines is investigated will contribute to the field. Conducting mixed studies investigating the effects of robotic coding education on students' creative thinking, critical thinking and reflective thinking skills will contribute to the literature.

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The Role of Learning Analytics in Distance Learning: A SWOT Analysis

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ABSTRACT

The aim of this study was to analyze the role of learning analytics in education by discussing the phenomenon of learning analytics in detail. Thus, SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was conducted in the study. Initially, a literature review was conducted and the role of learning analytics in the distance learning system was detailed with the analysis of available studies in the literature. Gathered studies were analyzed by the contexts of strengths, weaknesses, opputunities and threats of learning analytics on distance learning. The strengths are "flexible and innovative design", "rising effectiveness", "induvidualisation of learning or system" and "understanding user expectations", and weaknesses are "determining parameters" and "lack of experts". On the behalf of external factors, oppurtunities are "development in artifical intelligence", "rom globalisation to localisation change trend" and "gathering big data easily", and threats of learning analytics on distance learning are "ethical issues (security of data, accessing data, private information etc.)" and "information consumption". Based on the SWOT matrix, it could be suggested that strengths and opportunities of learning analytics were more dominant when compared to its weaknesses and threats in distance learning.

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INTRODUCTION

Distance learning has become popular especially in the current situation since its introduction. In general, distance learning, which is described as time and space-independent learning activities, became an umbrella concept that covers learning approaches such as e-learning, mobile learning, and ubiquitous learning (Orhan Göksün, 2019: 17). It became one of the most adequate educational approaches in 21st century learning. Distance learning was introduced through mail and reduced to simple QR codes and made available for almost every individual. During these developments, distance learning and face to face education have been compared several times. These comparisons demonstrated that although it varief over time, the most important disadvantage of distance learning was the lack of interaction, inability to recognize the student since it is instructed to a larger audience; and thus, the lack of individualized education (Hurt, 2008).

One of the most crucial factors behind the prevalence of distance learning was the rapid diversification of knowledge and data. Especially after the development and popularization of computers and internet technologies, the data storage volume has increased significantly. About 300 exabytes (300 billion gigabytes) of new data are entered every day through computers. This led to the introduction of the "big data" concept. Big data refers to unstructured data pools without a significant pattern (Berman, 2013; Dean, 2014). These data pools could be defined based on three properties: volume, diversity, and velocity (Dean, 2014). The volume reflects the data saturation of the pool for the pattern of research, diversity reflects the width of the data range for the pattern of research in the data pool, and the velocity refers to cumulative changes in the data pool. Each data pool that could be described by one of these three parameters could be described as big data.

Due to the increase in online and offline data, the stored data became increasingly complex and standard data analysis techniques failed to cope with the big data, leading to the problem of how to utilize complex data mass (Berman, 2013). Thus, estimation and segmentation techniques came to the fore. Estimation techniques include logistic regression, neural networks, and decision trees, while segmentation techniques include clustering and classification analysis. While different techniques and analyzes could yield different results, the above-mentioned segmentation and estimation techniques provide interpretable findings (Pena-Ayala, 2014). These techniques were classified as descriptive and predictive techniques by Şimşek Gürsoy (2009; 2012).

Segmentation techniques are used to group the population or sample based on similar demographic, psychological or behavioral variables. Estimation techniques, on the other hand, are used in planning decisions and partially actions based on similarities of the groups. The findings obtained with these techniques and analyses have been used in the field of education in recent years along with data mining, educational data mining, learning analytics or academic analytics, as well as wide and effective use in the fields of finance, medicine, and advertising.

Data Mining

There are various definitions of data mining in the literature. Piateski and Frawley (1991) described data mining as the discovery of previously unknown and potentially useful data. Berry and Linoff (1997) described the concept as an exploratory and analytical process conducted on large data stacks to discover significant rules and patterns. In a study by Sever and Oğuz (2002), data mining was defined as a step in the process of the discovery of knowledge in databases, which allows to acquire previously unknown, hidden, significant and useful patterns in large database data. Based on these definitions, data mining could be described as the process of information, finding and pattern acquisition using big data.

Data mining is conducted in six main steps: goal definition, data understanding, data preparation, modeling, analysis and utilization (Bernstein, Provost & Hill, 2005; Pena-Ayala, 2014). A clearly defined data mining objective includes processes such as obtaining the required data from the databases, cleaning or analyzing the missing data, excluding noisy data, and comprehension and preparation of the data.

Patterns are developed using the acquired data using data mining models (descriptive/segmentation or estimator/prediction). These models are tested for the data set during the analysis phase for accuracy. In the final stage, the model is run with real data that was not included in the data set. Şimşek Gürsoy (2012) summarized the steps that should be employed in the data mining process and presented in Figure 1.

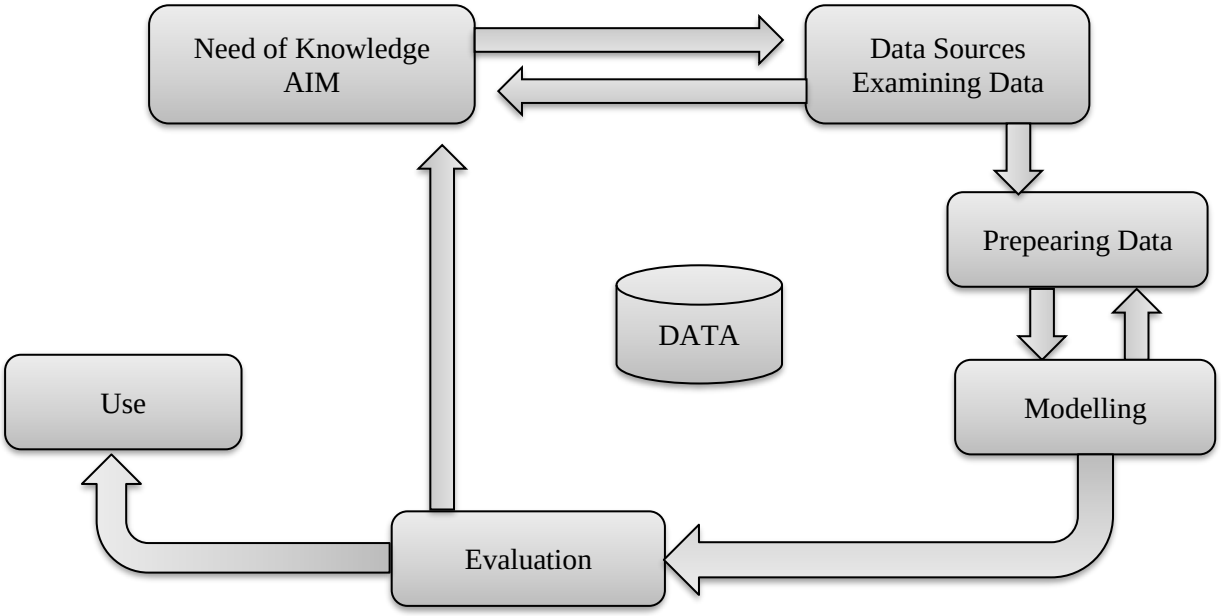

Figure 1. *Data Mining Analysis Process*

The review of Figure 1 demonstrated that data mining proposes a progress within the framework of the data by focusing on the data. Furthermore, although the discovery of information in databases was defined as a separate process from data mining in the literature (Karabatak, 2008; Şimşek Gürsoy, 2009), certain definitions suggested that these two concepts could be used interchangeably (Agrawal & Srikant, 1994; Şengür, 2013). Karabatak (2008) described the process of information discovery in databases as presented in Figure 2.

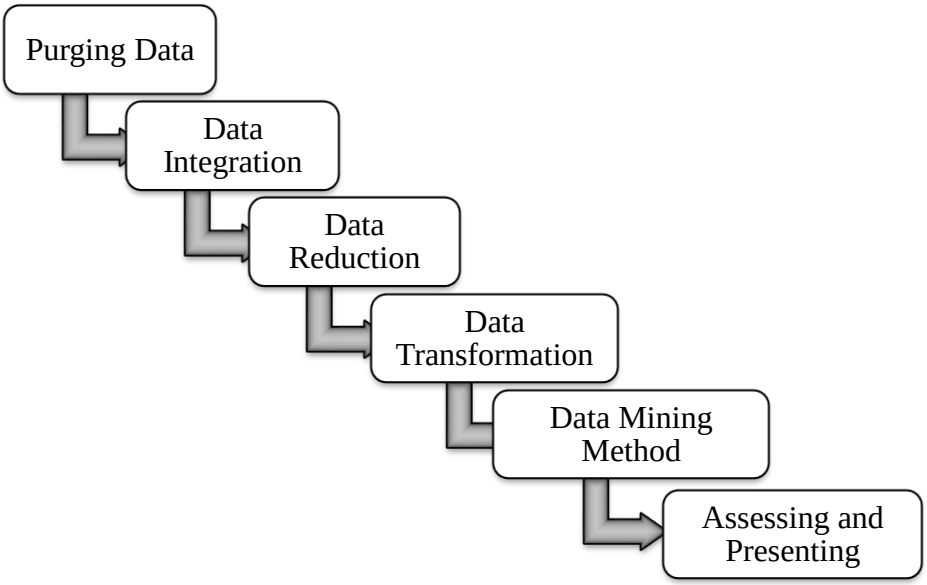

Figure 2. *Database Information Discovery Process*

As seen in Figure 2, the process of information discovery begins with data cleaning and ends with the analysis and presentation after the selection and implementation of the data mining method to transform the data into information. The comparison of the Figures 1 and 2 revealed that the data mining

process includes the information discovery process, but it provides a more comprehensive roadmap that includes the stages of the determination of the objective and utilization of the information. Either way, the determination of the modeling/data mining method is a common step. Descriptive and predictive models are employed in data mining methods that tackle big data. In descriptive models, the aim is to define the patterns in available data to assist the decision-making process. The predictive models aim to develop a model based on the data with known outcomes and to calculate the results for the data sets with unknown outcomes (Şimşek Gürsoy, 2009). The above-mentioned models are divided into main and sub branches. The main and sub-branches and analysis methods employed in these models are presented in Figure 3.

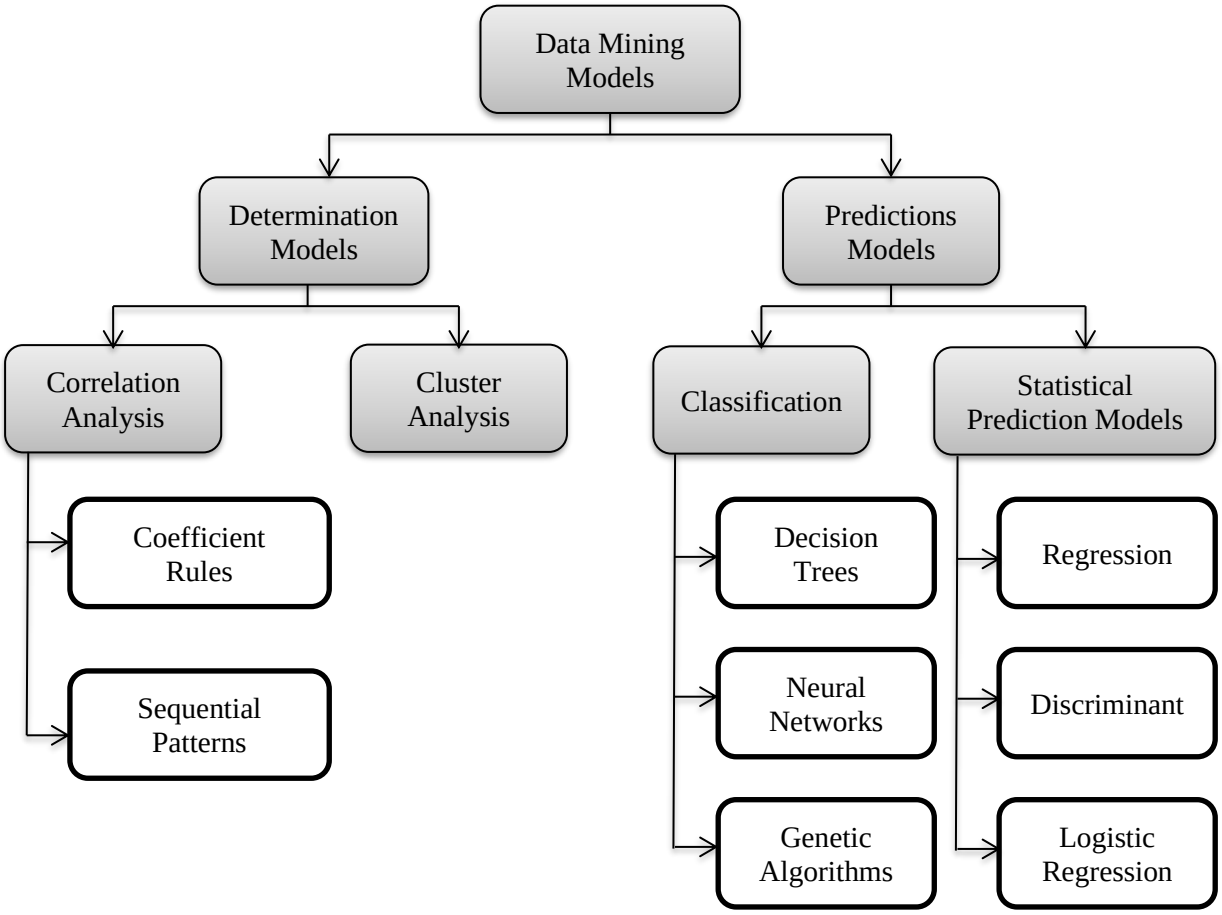

Figure 3. *Data Mining Models And Analyses*

As seen in Figure 3, descriptive models are categorized as correlation analysis and cluster analysis (Şimşek Gürsoy; 2009). Correlation analysis employs association rules and sequential patterns. Association rules define concurrent event series, while sequential patterns define successive event series. For example, "people who buy tourism and travel books would also buy a pocket dictionary with an 80% probability" is an association rule, while "people who buy a washing machine also buy a dryer within six months with a 90% probability" is a sequential pattern. Cluster analysis allows the acquisition of homogeneous groups through classification of the data based on a specific variable group (Han, Kamber & Pei, 2012).

Predictive models are scrutinized in the two groups of classification and statistical prediction models. Classification models employ decision trees, artificial neural networks and genetic algorithms. The decision trees analyze all actions that may be included in the dataset based on all aspects, and determine a classification of these actions, while artificial neural networks also generate and employ unknown data (Romero, Ventura, Pechenizkiy, & Baker, 2010). Genetic algorithms are described as a search method (Şimşek Gürsoy, 2009) employed to determine the most specific data in a data block,

inspired by "survival of the fittest" in Darwin's theory of evolution. Statistical estimation techniques, another predictive model, employ regression, discriminant and logistic regression analyses, which have been coomonly used in the literature.

Data mining is frequently used in finance and marketing. Its functions such as revealing hidden patterns, classification, and prediction paved the way for employment in the field of education. The utilization of data mining in education led to the introduction of the concept of "educational data mining."

Educational Data Mining

Educational data mining developed with the adoption of data mining processes in education. Baker (2010) described educational data mining as a discipline that employs data in educational field to improve educational conditions and to better understand the student and the was students learn. However, it was observed that this description neglected data mining processes and analytical techniques. According to Calders and Pechenizkiy (2011), educational data mining is a learning science that employs the broad application field of data mining and an application that both develops and improves educational practices and learning material based on the findings obtained with educational data. Romero and Ventura (2010; 2013), on the other hand, defined educational data mining as an application where data mining techniques are employed on educational data to identify or solve significant educational problems. Based on these definitions, it could be suggested that educational data mining aims to contribute to the educational environment by employing educational data and data mining processes in educational data mining operations. Furthermore, Bousbia and Belamri (2014) argued that educational data mining does not only employ data mining but also the computer science, educational and statistical processes. It could be argued that these fields are not separate, but their interaction could serve several purposes in educational data mining. The above-mentioned case is presented in Figure 4.

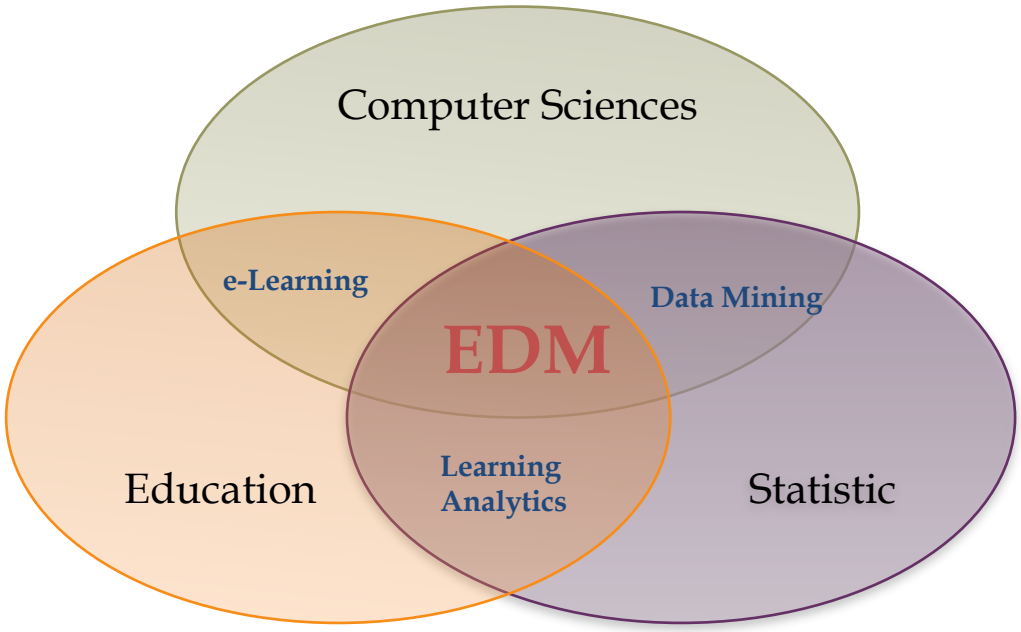

Figure 4. *The Fields in Educational Data Mining (EDM) (Bousbia and Belamri, 2014)*

As seen in Figure 4, educational data mining benefits from the interaction between several fields. Although the main fields include computer science, education and statistics, data mining is one of the main fields that educational data mining employs. Another field is lthe earning analytics.

Learning Analytics

Learning analytics was described as the measurement, collection, analysis and reporting of learner and context data to understand learning and the environment where learning occurs in hhe first Learning

Analytics and Knowledge (LAK) conference website (LAK'11, 2014). On the other hand, Elias (2011) desceribed learning analytics as a novel field where advanced analytical tools are employed to improve learning and education. According to Siemens and Gasevic (2012), learning analytics is the discovery of knowledge using data and various analysis models produced by students to predict learning and develop various recommendations. Johnson, Smith, Willis, Levine and Haywood (2011) suggested that learning analytics is the interpretation of big data collected by students with various methods to analyze the academic process, predict future performances, and determine potential problems. Apart from the differences in these descriptions, it was observed that the emphasis on the transformation of educational data into findings that could be useful in the advancement of learning by learning analytics was common (Chatti, Dyckhoff, Schroeder, & Thüs, 2012). Based on the fact that educational data mining provides information, findings or solutions for important problems in education and contributes to learning material, its confusion with learning analytics or inseparability of the concepts should be considered natural. The literature review revealed that the main difference was that although data mining processes are employed in educational data mining, the learning analytics processes are different from those of the data mining and educational data mining. This is a cyclical process that includes three steps: data collection and preprocessing, analytics and action, and post processing. This process is presented in Figure 5.

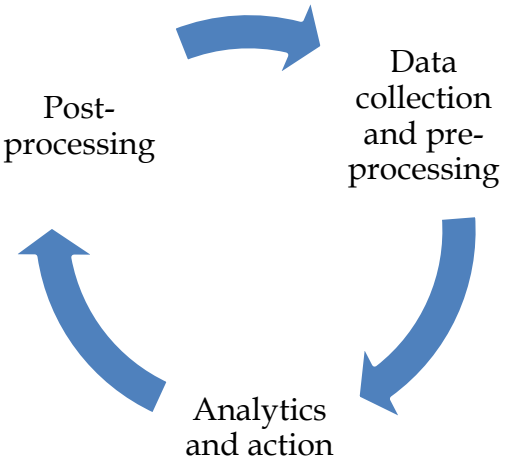

Figure 5. *Learning Analytics Process (Chatti et al., 2012)*

The cyclical process presented in Figure 5 includes three main stages. The first stage is the data collection and preprocessing phase. This stage includes preprocessing the data collected from various educational sources or systems, in other words, rendering the data suitable for the learning analytics method (Liu, 2006). In the analytics and actions stage, the patterns are explored, modeled and utilized. This process also includes processes such as observation, analysis, evaluation, compatibility testing, interpretation and model customization. These processes constitute the “actions” dimension of the stage (Han et al., 2012; Liu, 2006; Romero and Ventura, 2007). The final stage involves testing the adequacy of the model developed based on the acquired patterns using the data obtained from a new database. Considering the complexity and difficulty of the process, there is a need for a reference model that would facilitate the clarification of the actions in the steps described in the literature and for the researcher to develop a roadmap. The reference model, which serves as a road map in the learning analytics processes and developed by Chatti et al. (2012), is presented in Figure 6.

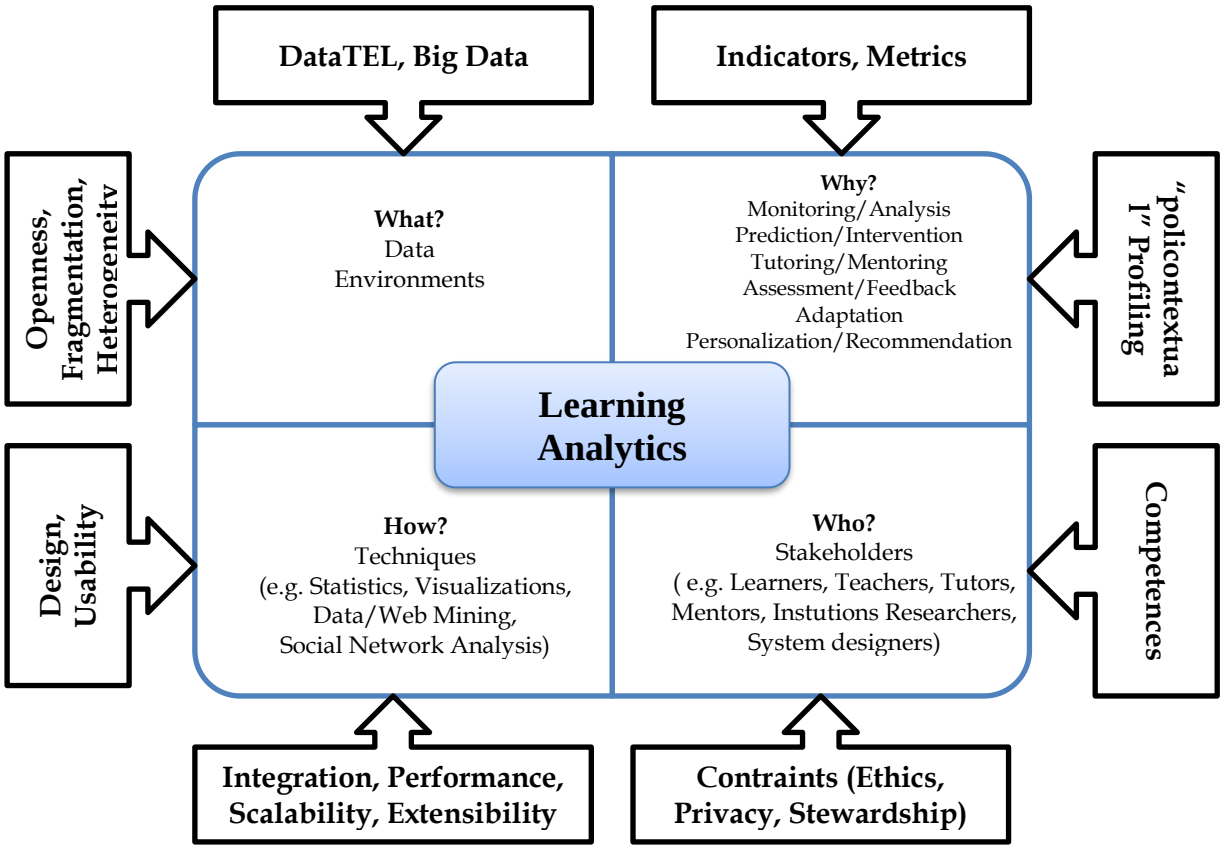

Figure 6. *Learning Analytics Reference Model* (Chatti et al., 2012)

The model presented in Figure 6 was based on four main questions: what, why, who and how. The process could progress by answering these four questions in learning analytics development. The boxes around the figure represent various difficulties and research opportunities that emerge when the questions are answered. The big data patterns are obtained based on these questions and the model. In distance learning, several records such as logs of students' interactions with the system, their personal and demographic information, instructor interaction and products, system-specific data could be kept and these records constitute the big data. Patterns that could be obtained from the distance learning big data could contribute to the system in many ways. However, they also lead to certain limitations.

The aim of the present study was to analyze the role of learning analytics in education by discussing the phenomenon of learning analytics in detail. Especially, these pandemic days, distance learning have a big importance than ever before. Instructional designers, administrators, faculty mambers, tezchers etc. stakeholders of learning are making a big effort to increase effectiveness of distance learning. At this point, it can be said that this study can support their design process and give them a guideline. Thus, SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was cınducted in the study. SWOT analysis aims to determine the current status of an act, a situation or a product, and tu guide R&D studies (Dyson, 2004; Pickton and Wright, 1998). In this analysis, the existing data are analyzed by asking questions about the internal factors that would reveal the strengths and weaknesses of the data, and about the external factors that would lead to opportunities and threats, and a table of four dimensions is developed (Kurtilla, Pesonen, Kangas and Kajanus, 2000). During this analysis, various data such as historical statistics, documents, purposive data, and analytics could be employed as a resource (Chang and Huang, 2006; Kumar, Dabas and Hooda, 2018).

CONCLUSION AND RESULTS

The data source for the SWOT analysis conducted in the present study included documents. For this analysis, initially, a literature review was conducted and the role of learning analytics in the distance learning system was detailed with the analysis of available studies in the literature. In the study, accessed electronic data were analyzed. Since the topic was current and most relevant studies were conducted in the last decade, the period of review was not limited. Web of Science, ERIC, Google Scholar and Turkish National Dissertation data bases were reviewed. Reached 37 studies, which were searched learning analytics in distance learning, were examined in the perspective of SWOT. However, there is a SWOT analysis study on learning analytics, conducted by Papamitsiou ve Economides at 2014. But they did not limit their issue with distance learning context or any area. Thus, studies that utilized learning analytics in distance learning, and those that included learning analytics recommendations for problems encountered in distance learning were included in the analysis. The analysis results are presented in Table 1.

Table 1. *SWOT Matrix*

Internal factors	**STRENGHTS**	**WEAKNESSES**
	- Flexible and innovative design - Rising effectiveness - Induvidualisation of learning or system - Understanding user expectations	- Determining parameters - Lack of experts
External factors	**Oppurtunities**	**Threats**
	- Development in artifical intelligence - From globalisation to localisation change trend - Gathering big data easily	- Ethical issues (security of data, accessing data, private information etc.) - Information consumption

As seen in Table 1, the strengths of the employment of learning analytics in distance learning were significantly higher. However, while learning analytics is employed in distance learning, certain action should be planned without ignoring the remaining concerns. Thus, the matrix determined in the study should be addressed based on the internal and external factors. Internal factors are those inherent in learning analytics and distance learning. More specifically, they are directly associated with the design. Thus, they are easy to employ and control. The products of learning analytics applications in distance learning significantly affect the design of learning environments (Bahçeci, 2015; Clow, 2012, Siemens, 2012). Previous studies revealed that flexible and innovative learning environments could be designed (Ferguson and Shum, 2012; Khalil and Ebner, 2017; Şahin and Yurdugül, 2020) in distance learning with learning analytics. Learning analytics is one of the most modern approaches that could be employed in 21st century learning. The non-innovative elements that are not interesting for the learners could be identified and eliminated in the design. There are studies which suggested that the employment of learning analytics improves the productivity in distance learning (Olmos and Corrin, 2012; Smith, Lange and Huston, 2012; Şahin and Yurdugül, 2020). Similarly, learning analytics that could provide a detailed analysis of learner and faculty member preferences and designs leads to a more efficient content design, timing and planning. Another strength was the ability to customize the learning or the system with learning analytics in distant education (Bozkurt, 2016; Ezen-Can, Boyer, Kellogg and Booth, 2015; Greller and Drachsler, 2012; Kilis and Gulbahar, 2016; Wilson, Watson, Thompson, Drew and Doyle, 2017).This was due to the that most analyzed big data were obtained from the learners, which easily provide information about the learner preferences., facilitating the customization of the designs. Similar to all educational processes, distance learning systems should meet 21st century learning expectations (Clow, 2012; Fulantelli, Taibi and Arrigo, 2013). However, it is necessary to determine expectations. Learning expectations vary based on content, quality, and innovation (Gazulla and Leinonen, 2016; Hickey, Kelley and Shen, 2014). Learning analytics provides convenience in this process. To be more specific, learning analytics in distance learning has certain strengths (Clow, 2012; Herodotou et all., 2017) in determining the expectations of system users and stakeholders such as learners, faculty members, and administrators.

When learning analytics is employed, the parameters that could obtain the patterns are determined. Big distance learning systems data could be quite complex. It is not always possible to determine the parameters that could produce a purposive pattern based on the data (Agudo-Peregrina, Iglesias-Pradas, Conde-González, and Hernández-García, 2014; Macfadyen and Dawson, 2012). Furthermore, not all determined parameters could produce purposive patterns. For example, in big data analysis, one of the important parameters in the "interaction and learning" pattern could be "the learner preferences." Failure to identify these cases well may result in a failure to produce efficient information with the collected data. However, one of the important weaknesses in conducting learning analytics in distance learning based on the collected literature data could be the lack of experts in the field of learning analytics (Fırat, 2015; Macfadyen and Dawson, 2012; Wilson, et all. 2017). However, it could be suggested that important developments could be observed towards the solution of this problem as learning analytics becomes more popular. The comparison of the internal factors based on strengths and weaknesses revealed a significant finding that the number of strengths were higher in the literature. Thus, it could be suggested that the aspects of learning analytics that could be used in distance learning were high.

External factors are associated with external stakeholders that affect the design of learning analytics in distance learning. Utilizing or controlling these factors require a more planned approach and efforts. External factors are analyzed in two groups: opportunities and threats. The literature review revealed that the reflections of the advances in artificial intelligence on education led to positive conditions for the use of learning analytics in distance learning (Alonso and Casalino, 2019; Bajracharya, 2019). Learning analytics patterns and artificial intelligence algorithms are basically similar. Thus, learning analytics applications in distance learning could support artificial intelligence applications in distance learning. It is inevitable that the artificial intelligence trend would increase the significance of learning analytics. Especially due to the pandemic, a trend from globalization to localization has already started. Digital globalization continues, but individuals prefer a change towards localization in their daily lives, economic order, education systems etc. Thus, it would be important to reveal various traits of individuals and develop designs that are suited for the individual rather than the general. For this purpose, learning analytics promise significant benefits for distance learning systems (Fulantelli, et all., 2013; Kalz, 2014; Siemens, 2012). As mentioned above, the big data required for learning analytics could easily be obtained from distance learning systems (Tabaa and Medouri, 2013).

The most important risk in the application of learning analytics in distance learning is ethical problems (Bozkurt, 2016; Prinsloo and Slade, 2013, 2015). There are significant ethical issues such as which information is private, which pattern violates confidentiality, and the protection of big data. These risks pose major threats. Necessary measures should be taken to provide data security, protection and storage of personal data (Bozkurt, 2016; Prinsloo and Slade, 2013, 2015). Furthermore, the rapid consumption of information, the short-term validity of the produced information, in other words, the short life span of the information are the other risks mentioned in the literature (Macfadyen and Dawson, 2012). Today, the information is produced, structured and consumed very quickly, and there is also a risk of rapid consumption of these analytics, which were acquired with great effort and attention to detail. The effectiveness of the distance learning design developed with the pattern produced with this scenario could be discussed as well.

Instructional design process begins with needs analysis. It continues with formative analysis during the process and summative analysis after the process (Merrill, 1991; Reigeluth, 2013; Sweller, 1999). Most instructional design models prioritize formative evaluations (Reigeluth, 2013; Reiser, 2001). As is known, since each evaluation is based on a measurement or observation, data are collected and analyzed during the evaluation process. The most important benefit of learning analytics in distance learning is the analysis of instructional design processes (Bayrak and Yurdugül, 2016; Chatti, et all., 2012; Mattingly, Rice and Berge, 2012). This is the most important reason behind the SWOT analysis conducted in the study. Strengths of learning analytics could be considered as an indicator of its significant role especially in formative assessment. Thus, the benefits of analyzing learning analytics in the context of distance learning are indisputable. It could be suggested that the present study provided a framework that could guide the decisions of distance learning

designers on stakeholders. Thus, it was considered that the study provides a roadmap for distance learning practitioners and researchers that could be beneficial in decision making and system improvement.

Based on the SWOT matrix, it could be suggested that strengths and opportunities of learning analytics were more dominant when compared to its weaknesses and threats in distance learning. It is highly functional when threats are kept under control in the process of instruction design and design improvement (Dyckhoff, Lukarov, Muslim, Chatti and Schroeder, 2013). Thus, it could be suggested that a learner-centered education system could benefit from learning analytics outcomes in developing a learner-oriented design. The contributions of the learning analytics to both content design and the requirements of faculty members are obvious. However, internal and external adverse factors mentioned in the literature should also be checked by administrators and decision makers and these parties should take necessary precautions.

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Facebook Security Awareness of Secondary School Students*

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ABSTRACT

Nowadays, social networks and usage are spreading rapidly. Social networks have become an indispensable part of communication. They are platforms that people use to communicate with each other online and share their beautiful moments. The number of social network users is increasing day by day. The most common social network known is Facebook. This study was conducted to investigate the awareness of secondary school students about Facebook security based on the age limit of 13 years of age using Facebook. In the survey, 266 users answered the subject matter about Facebook usage. The research was conducted in two different state schools in Istanbul. In the research, the quantitative survey method was used. According to the safety awareness of Facebook for secondary school students is found at a high level. There was no statistically significant difference between male and female students' Facebook security awareness. Children's level of awareness of Facebook does not vary according to the income levels of their families..

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INTRODUCTION

Technology covers the tools and equipment that people use to facilitate their daily activities and to increase the efficiency they receive (Günay & Arıduru, 2001). Technology affects individuals and society by providing products that affect quality of life (Bacanak, Karamustafaoğlu & Köse, 2003). Avoiding the use of social media in the digital age can lead to psychological problems (Sternberg et al., 2020). The concept of social media, especially referred to with web 2.0 technology, is defined as a whole of internet-based services where individuals can connect with other people, create their own list of links and follow the posts made by their connections, to be placed in a system that is open to the public or semi-open, with certain rules (Ellison, Steinfield, & Lampe 2007). "In today's internet age, the number of online communities has grown rapidly and people prefer online communication for communication and socialization. Thus, social networking sites have become the most widespread web-based sector in the world (Çelebi, 2014: 550).

Internet is undoubtedly the most important communication tool that has become the basic step of mass media, forming the backbone of communication and providing instant communication. Internet usage has increased with the development of Web 2.0 technologies. Thanks to the computer network, which we call the Internet, we have been able to reach a lot of information in the world in a short time.

The rapid spread of the information brought the following effect; the most important transformation point of the internet has been with the development of web 2.0 technologies. (Karagöz, 2013: 132). However, the information and reality shares reached are not correct in every information on the internet; it has made it compulsory for its users that the information should be investigated. Nevertheless, security has come to the forefront and the necessity of providing security in internet use has been demonstrated in many studies. Users were more passive in web 1.0 periods of the internet. They were in the form of ready-made receivers of the information revealed. The information transmission aspect, or rather the communication aspect, was unilateral. However, with the development of the technology we call web 2.0, users have also become more active. These internet environments, which have become a communication network with mutual interaction, have started to be called social networks. The contents of social networks have been created entirely interactively by users. According to Karadoğan Doruk et al. (2014: 213), social media is a social sharing-beyond-social sharing and discussion environment where people share their experiences through texts, videos, images and various other technological elements. "Internet technology forms the basis of Social Media" (Kırık, 2014: 274). When we say social media; Youtube, Facebook, Twitter, Instagram etc. sites like. In recent years, the age of using social media has also decreased considerably, and today it has become platforms for children to enjoy. Although the age of social media use has a certain limit, children have ignored this limit and have opened an account for them on each platform. In fact that social media has become a market even in sales and marketing. Large companies look for new colleagues who can introduce themselves in this field. The best platforms for simultaneous communication are managed through social networks.

Facebook

Facebook is a widely accepted social network all over the world (Manickam, Selvam & Ahrumugam, 2020). People use Facebook, which is the most widely used social network, to maintain existing relationships, meet new people, spend time, express themselves and for teaching purposes. Facebook can contribute to intercultural development through information sharing (Vurdien & Puranen, 2020). About eighty percent of Internet users use Facebook and access Facebook on average eight hours a day (Greenwood, Perrin & Duggan, 2016). Many people around the world frequently engage in intense social interaction on Facebook by posting updates or following updates of others (Brailovskaia et al., 2020).

The use of social sites like Facebook is becoming more and more common in today's life (Sindermann, Duke & Montag, 2020). Facebook is a social networking site where people can share

photos, personal information and friends in general (Cabada et al., 2009). Facebook has the highest number of users among all social networks, and has more than 2.2 billion monthly active users and more than 1.5 billion active users worldwide (Rajesh & Rangaiah, 2020). These social networks, which we benefit from with the influence of the internet and developing technology, may have negative consequences from time to time. What we mean by is that these digital environments are also used by malicious people. This led to the need to improve security and privacy settings. Since Facebook was founded in 2004, constant updates and improvements have been made in terms of privacy and security. Although the legal age limit required to become a member of Facebook is 13, it is thought that many students ignore this limit.

It is considered important that secondary school students comply with the security principles in the use of Facebook. It is thought that knowing the security principles to be considered while using Facebook will contribute to protecting them from the dangers in social media.

Purpose of the Research

The purpose of this study is to investigate the Facebook security awareness of secondary school students. In this context, the sub-goals are as follows:

1. What is the level of awareness of secondary school students' Facebook security?
2. Do the secondary school students' Facebook security awareness differ according to gender, monthly income, computer ownership, father and mother education level?

METHOD

This study, designed to determine Facebook security awareness of secondary school students, is designed in a survey model. The research is based on the singular survey model. The situation in the survey model is tried to be described as it is.

Study Group

The universe of the research is Pendik district, 700 students from Yıldırım Beyazıt Secondary School and Prof. Dr. Erol Güngör Secondary School attend who are 7th and 8th grades. 266 randomly selected students constitute the sample of the study. In the survey conducted, the forms of 7 students who were found to have deficiencies and errors were not included in the scope of the study and the forms of 259 students were analyzed. The characteristics of the working group are shown in the table below.

Table 1. *Demographic information of students*

Variables		n	%
Gender	Female	112	43.2
	Male	147	56.8
Multiple Facebook Accounts	Available	74	32.3
	Not	155	67.7
Father's Educational Status	Primary School	41	16.2
	Secondary School	72	28.5
	High School	105	41.5
	University	35	13.8

112 of the students participating in the study are female and 147 of them are male. It was seen that fathers the most of the secondary school students (41.5%) who participated in the research were high school graduates of their father at.

Research Instruments and Processes

The data collection tool consists of two parts. In the first part, demographic information (gender, family income, computer usage time, etc.) were collected. For the questions in the second part of the research, based on Facebook's Cybercrime Fighting page, what is paid attention to in terms of Facebook security were examined and a questionnaire was created afterwards.

There is a Social Media Security tab on the Anti-Cyber Crimes website of the Police Headquarters. The Facebook Security module was looked at as the subtitle of this tab and 15-item security topics were examined one by one (EGM, 2018). These items are as follows:

- Never share your password with anyone.
- Be sure to log out on the shared computers.
- Get to know your privacy settings.
- Check who you are sharing with before sharing anything.
- Learn how to block people.
- The fastest way to communicate with Facebook is by complaint tools.
- If you are the manager of a page or group, YOU CAN REMOVE the content shared by your fans.
- Do not click on suspicious links in your news source.
- Search the answers to your questions in the Facebook Help Center.
- Keep pages in your management safe.
- Check how your profile looks to other people.
- Think before you tag someone and check the content you are tagged in.
- Ask people to remove the content.
- Review your transactions breakdown.
- Check the status of the content you have complained on the Support Board.

Among the items given above, those that are not suitable to be asked to children under the age of 13 have been eliminated and the remaining 6 items have been converted into 3-point Likert type items and a questionnaire has been created.

Table 2. *Survey items*

Item 1	Does your mother, father or family know your Facebook password?
Item 2	I log out of my accounts I entered from computers used in common areas
Item 3	I know the privacy settings on Facebook
Item 4	I know how to block people who bother me
Item 5	I review how the content I post on my Facebook profile looks to others
Item 6	I can request that photos shared be deleted without my knowledge

In the questionnaire, Never (1), Sometimes (2) and Always (3) options were used. The highest average score that can be taken from the survey is 3, and the lowest average score is 1. The high average score indicates that students' Facebook security awareness is high, while the low average score indicates that the awareness is low.

Data Analysis

Criteria have been determined for the evaluation of the data collected within the scope of the research. The 2 values obtained by subtracting the minimum score (1) from the maximum score (3) that can be obtained while determining the criteria are divided into three equal parts. Points are divided into 3 equal parts (2: 3 = 0.67). By adding this value to the lowest score, the criteria are created.

Table 3. *Evaluation criteria of collected data*

Score range	Evaluation criteria
1.00-1.66	Low
1.67-2.33	Medium
2.34-3.00	High

An average of 20 minutes was given to the students for the questionnaire, which was sufficient to answer the questions. The collected data were tabulated in Microsoft Excel program and then transferred to IBM SPSS Statistics 21 and made ready for analysis. Independent sample t-test was conducted to determine whether Facebook security awareness varies according to gender and computer ownership. One-way analysis of variance was carried out to determine whether there is a difference between

Facebook security awareness according to family income and parent education level or not.

FINDINGS

The Distribution of the Students' Average Scores from Facebook Security Awareness

The distribution of the scores of the students participating in the research from their Facebook security awareness is given in Figure.1 below.

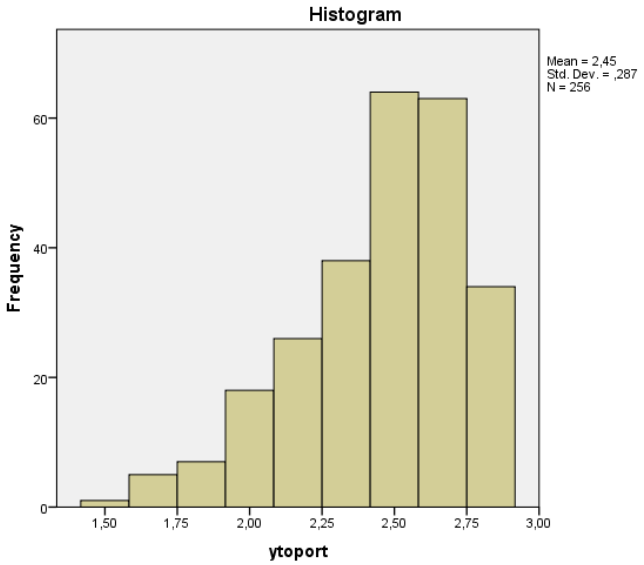

Figure 1. *Graphical view of the data in the research*

When Figure 1 is examined, it is seen that the arithmetic average of Facebook security awareness of secondary school students participating in the research is close to the normal distribution. As a result of the analysis, it was found that the skewness and kurtosis value was between -1 and +1. (Skewness = -,808; Kurtosis = ,255)

The distribution of the scores obtained from the measurement tool used in the research is shown in Table 4.

Table 4. *Average of the scores students received from each item*

	Never		**Sometimes**		**Always**		**Mean**	
	n	%	n	%	n	%	Mean	SD
Item 1	99	38.2	——	——	157	60,6	1,61	,49
Item 2	27	10.4	26	10,0	206	79,5	2,69	,65
Item 3	23	8.9	63	24,3	173	66,8	2,58	,65
Item 4	9	3.5	12	4,6	238	91,9	2,88	,42
Item 5	24	9.3	108	41,7	127	49,0	2,40	,65
Item 6	23	8.9	68	26,3	168	64,9	2,56	,65
Total Mean							2.45	.29

It is seen that the average is low by looking at Item 1 in Table.4. In terms of other items, it can be said that secondary school students' Facebook security awareness is high. When Table 4 is analyzed, it is seen that the secondary school students participating in the research mostly share their passwords with families.

Facebook Security Awareness Analysis by Gender

Independent sample t-test was conducted to determine whether the Facebook security awareness of secondary school students participating in the study varies according to gender.

Table 5. *Analysis of substances by gender*

	Gender	N	Mean	SD	t	p
M1	Female	112	1.57	.49	-1.155	.249
	Male	147	1.64	.48		

M2	Female	112	2.66	.67	-.463	.644
	Male	147	2.70	.63		
M3	Female	112	2.53	.67	-.938	.349
	Male	147	2.61	.63		
M4	Female	112	2.91	.34	.897	.370
	Male	147	2.86	.46		
M5	Female	112	2.49	.60	2.021	.044
	Male	147	2.32	.68		
M6	Female	112	2.57	.62	.249	.804
	Male	147	2.55	.67		
Mean	Female	112	2.45	.28	.215	.830
	Male	147	2.44	.29		

Facebook security awareness of secondary school students participating in the study does not change according to gender. However, in the Item 5, the awareness of the girls participating in the research, 'I review how the content I share on my Facebook profile looks like by others', has been found high.

Facebook Security Awareness Analysis According to Ownership of Computer

Independent sample t-test was conducted to determine whether the Facebook security awareness of the secondary school students participating in the research varies according to their ownership of the computer. The result of the analysis is given in Table 6.

Table 6. *Analysis of substances according to ownership of computer*

	Status	N	Mean	SD	t	p
M1	Not Owner	118	1.60	.49	-.379	.705
	Owner	136	1.62	.48		
M2	Not Owner	120	2.55	.75	-3.016	.004
	Owner	136	2.80	.52		
M3	Not Owner	120	2.45	.70	-2.902	.005
	Owner	136	2.68	.57		
M4	Not Owner	120	2.85	.46	-1.693	.092
	Owner	136	2.93	.32		
M5	Not Owner	120	2.40	.62	215	.830
	Owner	136	2.38	.67		
M6	Not Owner	120	2.59	.64	.586	.559
	Owner	136	2.54	.65		
Mean	Not Owner	118	2.40	.30	-2.477	.014
	Owner	136	2.49	.26		

Facebook security awareness of secondary school students participating in the research varies according to the status of having a computer. Accordingly, it can be said that those who enter the social networks from the computer have higher awareness of Facebook security than others.

Facebook Security Awareness by Monthly Income

The monthly income of the families of the children participating in the study is divided into 4 categories. Those who are lower than 1500 are grouped as low, those who are between 1501-2499 are moderately low, those who are between 2500-3500 are moderately high and those that are higher than 3500 are high. One-way analysis of variance was conducted to determine whether Facebook security awareness of the secondary school students participating in the study changed according to their monthly income. The result of the analysis is given in Table 7.

Table 7. *Facebook security awareness analysis according to the monthly income of the families of children*

		Sum of Squares	df	Mean of Squares	F	P
M1	Between Groups	.398	3	.133	.563	.640
	Within Groups	53.051	225	.236		
	Total	53.450	228			
M2	Between Groups	.526	3	.175	.424	.736
	Within Groups	94.353	228	.414		
	Total	94.879	231			
M3	Between Groups	1.036	3	.345	.827	.480
	Within Groups	95.240	228	.418		
	Total	96.276	231			
M4	Between Groups	.425	3	.142	.881	.452
	Within Groups	36.661	228	.161		
	Total	37.086	231			
M5	Between Groups	2.312	3	.771	1.834	.142
	Within Groups	95.787	228	.420		
	Total	98.099	231			
M6	Between Groups	1.895	3	.632	1.446	.230
	Within Groups	99.583	228	.437		
	Total	101.47	231			
Mean	Between Groups	.297	3	.099	1.187	.315
	Within Groups	18.781	225	.083		
	Total	19.078	228			

According to the monthly income of the families of the students who participated in the study, there was no significant difference between Facebook security awareness.

Facebook Security Awareness Analysis According to Father's Education Status

Father education levels of the students participating in the research are classified under 4 headings. These categories are; primary school, secondary school, high school and university. One-way analysis of variance was conducted to determine whether the Facebook security awareness of secondary school students changed according to their father's educational status. The result of the analysis is given in Table 8.

Table 8. *Facebook security awareness analysis table according to father's education level*

		Sum of Squares	df	Mean of Squares	F	P	Difference
M1	Between Groups	.540	3	.180	.750	.523	-----
	Within Groups	59.044	246	.240			
	Total	59.584	249				
M2	Between Groups	1.869	3	.623	1.457	.227	-----
	Within Groups	106.463	249	.428			
	Total	108.332	252				
M3	Between Groups	4.205	3	1.402	3.365	.019	a-d
	Within Groups	103.693	249	.416			
	Total	107.897	252				
M4	Between Groups	.554	3	.185	1.047	.372	-----
	Within Groups	43.889	249	.176			
	Total	44.443	252				
M5	Between Groups	.918	3	.306	.709	.548	-----
	Within Groups	107.556	249	.432			
	Total	108.474	252				
M6	Between Groups	.676	3	.225	.521	.668	-----
	Within Groups	107.743	249	.433			
	Total	108.419	252				
Mean	Between Groups	.614	3	.205	2.508	.060	-----
	Within Groups	20.078	246	.082			
	Total	20.692	249				

a-primary school b-secondary school c-high school d-university

As a result of the analysis made by looking at the education level of the father, there is a difference between the children of the parents who are primary school graduates and university graduates in Item 3. Facebook security awareness of those whose father is primary school graduate is higher. In other items, no statistically significant difference was observed between Facebook security awareness.

Facebook Security Awareness Analysis According to Mother's Education Status

The educational status of the secondary school students who participated in the research are given in 3 categories. These; primary school, secondary school and high school and above. Accordingly, one-way analysis of variance was conducted to determine whether Facebook security awareness changes. The result of the analysis is given in Table 9.

Table 9. *Facebook security awareness analysis table by mother's education status*

		Sum of Squares	df	Mean Square	F	P
M1	Between Groups	.521	2	.261	1.090	.338
	Within Groups	58.539	245	.239		
	Total	59.060	247			
M2	Between Groups	.114	2	.057	1.37	.872
	Within Groups	102.874	248	.415		
	Total	102.988	250			
M3	Between Groups	1.202	2	.601	1.437	.240
	Within Groups	103.706	248	.418		
	Total	104.908	250			
M4	Between Groups	.507	2	.253	1.456	.235
	Within Groups	43.143	248	.174		
	Total	43.649	250			
M5	Between Groups	.110	2	.055	.128	.880
	Within Groups	106.050	248	.428		
	Total	106.159	250			
M6	Between Groups	1.017	2	.508	1.179	.309
	Within Groups	106.896	248	.431		
	Total	107.912	250			
Mean	Between Groups	.053	2	.027	.329	.720
	Within Groups	19.818	245	.081		
	Total	19.871	247			

As a result of the analysis, the Facebook security awareness of the secondary school students who participated in the research according to the education level of the mothers does not differ statistically.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Facebook serves seventy-five languages around the world. Although Facebook was a social network that first appeared to meet the needs of limited students, today it has become a platform where millions of students check their pages, spend their hours and arrange meetings. (Tiryaki, 2015, pp. 120-121).

In this study carried out; Secondary school students' Facebook awareness levels were found to be high. No statistically significant difference was found between awareness levels of girls and boys. According to the educational status of the mother, no difference was found between the Facebook awareness levels of the students. Facebook awareness levels of those with a primary education level were found to be higher. It was found that Facebook security awareness of students with computers is higher than those without computers.

- This study was conducted with volunteers from the public-school students in Turkey's only one province.
- In order to generalize the findings in the study, it may be suggested to repeat on different samples.
- In addition, the research can be deepened with a more detailed interview with the students who have participated in the research and have been given permission from their parents.

- The research was carried out from the social networks only by considering Facebook.
- Security awareness of secondary school students in different social networks can be investigated.
- It is thought that the data obtained in the research will contribute to students' security awareness studies on Facebook and social media.

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Investigation of Students' Summer Vacation Activities Based on Coding & Robotic and Forgetfulness Level of Summer Vacation Return*

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ABSTRACT

The activities of the students during the summer holidays, learning losses or the forgetfulness of the return of the holidays have been discussed in the educational sciences for a long time. However, very little research is being done and has little place in educational policies. This is especially important in applications and continuity courses such as coding and robotics. This is because out-of-school learning environments for skills that require this type of practice remain limited or not available to all students. The aim of this study is to determine whether secondary school students are doing any learning activities during the summer holidays for the subjects of Information Technologies and Software (ITS) and to determine whether there are learning losses during the summer holiday return. For this purpose, a working group was formed with 5th and 6th grade students. For the determination of summer holiday activities, interview form and knowledge test for the determination of forgetfulness were developed and applied to students before and during the holiday return. According to the results of the research, it is seen that middle school students perform many out-of-school activities for ITS during the summer holidays. Coding and robotics are at the top of the topics. It was determined that the most block-based coding activities were among the activities. When the levels of forgetfulness are addressed, it was seen that there was no learning loss.

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INTRODUCTION

The innovative objectives of education include creating a human model that knows where and how to use information, can effectively use its previous knowledge in producing new information by discovering its own learning method (Nuhoğlu, 2004), learning, researching, questioning and creative thinking skills. Meaningful learning is supported by the individual's experiences and their responses in daily life. The fact that learning takes place only in school settings may give individuals the impression that learning is activities that are abstracted from daily life and away from naturalness. But learning takes place anytime and anywhere. These learning, which helps to achieve planned, regular, necessary gains that go beyond the walls of the school, are named as extracurricular activities (Karademir, 2013). These activities consist of practices that relate what students learn in the formal education process to life. These activities encountered during the learning process are extra-curricular activities conducted outside the curriculum. The aim of extra-curricular activities is to create learning environments in which students activate a large number of sensory organs, and gain knowledge and skills by living and living. Academic and social-emotional skills increase as the experiences related to the course increase. Extracurricular activities are known to increase students' interest in lessons (Erten & Taşçi, 2016; Bostan Sarıoğlan & Küçüközer, 2017). Extracurricular activities also contribute to the well-being of students with positive psychological effects such as self-esteem, self-control, self-control (Akar & Nayir, 2015).

It is a known fact that students will gain the best learning experience when education is continuous. Conditions such as epidemic diseases and long holiday periods hinder the continuity of education and forget the information, and when students return to school, the time spent by reminding them before the holiday causes great loss of information. This situation shows itself more especially in special students with special educational needs (Cooper, 2003). Memories, academic knowledge or psychomotor skills should be easily remembered and used. This process involves calling learning that is stored in long-term memory in various ways and processing it in short-term memory. Memorization, knowledge, skills or experiences can not be remembered, that is, the fact that it cannot be brought from short-term memory to short-term memory can be expressed as forgetting or loss of learning. In situations where education is interrupted, knowledge and skills that are not supported regularly will be lost and many students reversed, especially during the summer holidays. In this case Turkey, such as Germany and the United States are available in many countries (Meyer, Meissel & McNaughton, 2015; Shinwell & Defeyt, 2017).

Summer vacation is a very important phenomenon for students due to various reasons such as an intense academic year and warming of the weather. Turkey throughout the country during the period until mid-June to mid-September summer vacation is applied. For a few months, the skills of an artist or athlete who do not have any work in their field weaken for a while. Students, especially teachers, will see that some knowledge and skills are lost or weakened after the end of the long summer holidays (Kerry & Davies, 2003). Great effort will be required to achieve the old performance (Fairchild & Boulay, 2002). This situation which is experienced during long summer holidays is defined as learning loss. The concept of learning loss experienced during the summer holidays is the difficulty of remembering the information acquired by the students during the academic year (Arı, 2005). Summer vacation learning losses increase the difference in academic achievement among students gradually (Patton & Reschly, 2013). Learning losses experienced affect each lesson differently. This situation has more negative results in applied and skillful lessons. Summer learning losses for a learned practice will lead to loss of skills in that lesson and not being remembered.

Purpose and Importance of Research

In this study, it was investigated what are the extra-curricular summer vacation activities that students make individually in relation to the coding and robotic foundations of the units in the 5th and 6th levels of the ITS Course Curriculum. In addition, the levels of forgetfulness of the students regarding the coding and robotic applications that were taught before the summer vacation were examined.

In this context, summer school student experiences related to ITS course at secondary school level were investigated, and pre-test post-test oriented knowledge test was applied in order to measure the permanence of coding / robotics information before and during the holiday. In this way, the permanence of learning, the recall status of the activities, the activities carried out by the students in the extracurricular learning environments, the summer holiday activities for the content of the course and the summer holiday learning losses after the education period are discussed. Some suggestions have been presented for this.

In order to achieve this goal, the following questions were sought:

1. What are the views of the participant students regarding the summer vacation activities for ITS course?
2. What is the level of forgetfulness related to ITS course?

METHOD

The research focuses on the extracurricular activities and summer vacation learning losses that secondary school students carry out regarding the ITS curriculum subjects during the summer vacation period. The pattern of the research is a converging parallel mixed method in which qualitative and quantitative approaches are used together. Quantitative and qualitative data obtained in this research design are collected recently. Data analysis can be done separately, and the results obtained can be interpreted by integrating (Fetters, Curry, & Cresswell, 2013). In the research, out-of-school activities of the students were examined with a structured interview form, and the learning losses experienced during the summer holidays were evaluated with knowledge tests.

Study Group

In this study, the study group was formed by criterion sampling, which is a puroosive sampling technique, which is one of the non-random sampling methods. Criterion sampling is the creation of participants from people or situations with qualifications determined according to their research problems (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2018). The reason for choosing this method is the necessity to select students who have made extracurricular activities with individual efforts for coding and robotic acquisitions in the ITS curriculum during the summer holidays. The research was carried out with students in the 6th and 7th grade (students who have studied at the 5th and 6th grades in the previous school term) who are studying in a secondary school selected for the purpose of the research in Sakarya province at the beginning of the 2019-2020 academic year. The number of students in the study group is limited to 30 due to similar answers (reaching the satisfaction point). Information on the working group is given in Table 1.

Table 1. *Distribution of Students by Gender and Grade Level*

Variables	Options	f	%
Gender	Female	10	33.4
	Male	20	66.6
Class level	5th grade	14	46.66
	6th grade	16	53.33
	Total	**30**	**100**

Data Collection Tools and Analysis

In this research, two data collection tools were used. The first data collection tool is taken during a meeting of the coding forms of ITS courses and students' opinions about the made-curricular activities related to robotics. The second data collection tool is the knowledge test prepared to determine the students' summer learning losses.

The research addresses two different educational dimensions: extracurricular activities for summer holidays and learning losses on vacation. As a result of the literature review for extracurricular activities, it was determined which methods to be followed in what order and the preparation of the interview form

was started. In accordance with the purpose of the research, a question pool was created and the language and content validity of 4 main interview questions, which were determined in line with the opinions of a field expert academician and two IT teachers, were tried to be provided. Scope validity is the capacity to measure the phenomenon or situation desired to be measured with the measurement tool and method to be used in the research. Thanks to ensuring the scope validity of the developed measurement tool, the focused subject is cleared of external irrelevant expressions and items with high power to represent the subject are included (Ayre & Scally, 2014). Interview questions were sent to the students in the study group as an online form. Descriptive analysis method was found appropriate in the analysis of the collected data in order to determine the general studies related to extracurricular activities. In the descriptive analysis, the main purpose is to present the findings in a summary and interpretation to the reader without disrupting the original structure of the obtained data (Karadağ, 2010). The data obtained from the interviews are summarized and interpreted according to the themes determined before or during the research (Yıldırım & Şimşek, 2018). In this context, the primary purpose of the research is the general framework of descriptive analysis. Themes were determined and interpreted in accordance with this purpose. As a result of data analysis conducted by both researchers separately, a reliability study was conducted for consensus. The reliability ratio of the themes was found to be 92% with the help of the formula of the ratio of the number of opinions with consensus to the total amount of opinions, and consensus was achieved for each theme. In the analysis of qualitative data, it is emphasized that reliability should be at least 70% (Yıldırım & Şimşek, 2018).

The second dimension of the research is to determine students' summer vacation learning losses. For this purpose, knowledge test including ITS course coding and robotics topics was applied to students both before and after the holidays. The test in the development phase was applied and scored to 81 students who were not included in this practice in the second semester of the 2018-2019 academic year. Test questions were created by researchers and two field course teachers in accordance with the table of statements prepared for coding and robotics, and language and content validity were provided according to expert opinions. The multiple-choice test consists of 20 questions. In order to determine the reliability level of the test, the test, which was divided into two numbers as odd and even questions with Split Half method, was applied to this group of students one after another. In this model, the correlation of both form scores was used to determine the reliability of the test. The reliability coefficient of the test was calculated with the Spearman-Brown formula ($r_{xy} = 2r_{xy} / 1 + r_{xy}$). Accordingly, the correlation of the tests divided into two halves as 1 half and 2 halves was calculated as r = .73 and the graph was obtained as shown in the figure. Therefore, Spearman-Brown reliability coefficient of the test was determined as r_{xy} = .84. This result shows that the reliability level of the test is quite high (Field, 2005; Büyüköztürk, 2011).

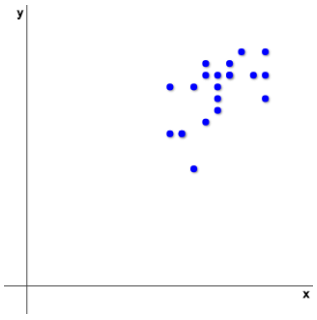

Figure 1. *Half Test Correlation (r = .73)*

In the analysis of the data, matching of the information tests that students answered in June and September was made. Except for the answers of 30 students who participated in the interview, other answers were not included in the analysis. In the test, each correct answer was calculated as 5 points, and false and empty answers as 0 points. Minimum 0 and maximum 100 points can be obtained from the test. In addition, during the analysis phase, 10 questions were divided into two as basic coding and 10 robotic coding skills. The test scoring for both skills is tabulated with 100 points in total. Whether the students

experienced any learning loss during the summer vacation period, the knowledge test scores applied in June and September were evaluated using the dependent sample t-test.

FINDINGS

In this part of the study, descriptive analysis findings of the students' answers to the interview questions are presented as themes. Then, the findings related to the knowledge test applications, which are carried out to examine whether there is a learning loss, are given.

Students' evaluations about extracurricular activities during the summer holidays

The answers of the students regarding the extracurricular activities that they made most during the summer vacation for ITS course are given in Table 2.

Table 2. *ITS Subjects that Students have done Most Activities*

EVENT TOPICS	f	%
Block-based coding activities	30	100
Smart home automation events	14	46,66
Arduino circuit board activities	12	40
Basic coding activities	10	33,33

In Table 2, it is seen under which topics the activities of the students participating in the research on the subjects of the ITS course during the summer holidays are gathered. Accordingly, it is seen that all of the students spend time during the summer holidays with block-based coding activities. It is observed that almost half of the students are interested in smart home automation activity (14 students) and Arduino circuit board (12 students). The number of students dealing with other basic coding activities taught in the courses is 10.

The students were asked about their views on how much coding and robotic activities were done according to extracurricular activities for other ITS subjects. Findings related to this are given in Table 3.

Table 3. *Status of Coding and Robotics Activities Compared to Other Subject Activities*

ACTIVITIES MADE…	f	%
More than other units	24	80
Same rate as other courses	4	13,33
Less than other courses	2	6,66

Table 3 shows how much emphasis is placed on the coding and robotics studies of the students during the summer holidays. Accordingly, it is observed that the number of activities related to coding and robotics is higher than the subjects in other units (80%). It was found that only two students worked less on coding and robotic activities than other subjects.

The students were also asked about their opinions about the family responses to extra-curricular activities during the summer holidays for the ITS course. Findings related to this are given in Table 4.

Table 4. *Evaluation of Family Reactions Related to Summer Activities*

FAMILIES REGARDING THE EVENTS…	f	%
They think that students should be given the opportunity to actively use tablets, smartphones and computers at home in coding and robotic activities.	26	86,86
He thinks project assignments should be given.	14	46,66
He says that the summer activities should be evaluated at the beginning of the school year.	14	46,66

In Table 4, the opinions of the families regarding the summer holiday activities of the students are examined through the eyes of the students. Accordingly, the vast majority of students (86.86%) stated that their family supported him to increase their coding skills. In addition, almost half of the families state that students should be given project assignments and emphasize that the activities done during the summer holidays should be evaluated at the beginning of each new year.

Finally, the students were asked about their views on the problems they faced during the out-of-school activities they did during the summer holidays and the findings related to this were given in Table 5.

Table 6. *Opinions About the Problems Encountered During Activity-Based Work*

THEMES	f	%
In order to understand the logic of the activity, there should be a guide such as a teacher.	12	40
Teamwork becomes more efficient	10	33,33
Technical problems at home and lack of materials	8	26,66

Table 5 contains information on what problems students encounter during summer vacation activities. Accordingly, the most common problems are as follows: The need for guidance of the teacher in understanding the activities and the guidance of the student (40%). Decreased activities to be done when there is individual work, so need for teamwork (33.33%). Presence of technical problems in out-of-school environments and insufficiency of robotic materials (26.66%).

Findings about the forgetfulness of students during the summer vacation return

The distribution of the students' scores on the basic coding skills in the achievement test applied in June and September is given in Table 6.

Table 6. *Basic Coding Skills of Students Pretest and Posttest Scores*

TEST TIME	GROUP of STUDENTS	50-75 p	76-100 p
June	5th grade	4	10
	6th grade	10	6
	Total	**14 (%)**	**16 (%)**
September	5th grade	4	10
	6th grade	8	8
	Total	**12 (%)**	**18 (%)**

Accordingly, in the scoring for the basic coding skills gains in the first knowledge test conducted in June, it is seen that the scores of 5th grade students are accumulated in the range of 76-100 points. In the first test points of the 6th grade students, there is an accumulation in the range of 50-75 points. According to the results of the last knowledge test conducted in September, the distribution of the 5th grade students' scores remained the same, while the distribution of the scores of the 6th grade students changed in favor of the posttest. According to this, 14 students were included in the 50-75 score range among 30 students, according to the first test results, this number decreased to 12 as a result of the post-test, while there were 16 students in the 76-100 score range, this number was 18 as a result of the post-test.

The distribution of the students' scores on the robotic coding skills in the knowledge test applied in June and September is given in Table 7.

Table 7. *Robotic Coding Skills of Students Pretest and Posttest Scores*

TEST TIME	GROUP of STUDENTS	50-75 p	76-100 p
June	5th grade	2	12
	6th grade	13	3
	Total	**15 (%)**	**15 (%)**
September	5th grade	1	13
	6th grade	9	7
	Total	**10 (%)**	**20 (%)**

According to Table 7, in the scoring for the content of robotic coding skills in the first knowledge test conducted in June, it is seen that the scores of 5th grade students mostly gathered in the range of 76-100 points. In the first test points of 6th grade students, the general accumulation is in the range of 50-75 points. According to the results of the last knowledge test conducted in September, the distribution of the grades of 5th grade students showed a slight increase in favor of the posttest, while the distribution of the grades of the 6th grade students showed a greater change in favor of the posttest. According to the results of the test, there were 15 students according to the first test results in the range of 50-75 points, this number decreased to 10 as a result of the last test, while there were 15 students in the range of 76-100, this number increased to 20 as a result of the post-test.

Table 8. *t-test Results Related to Students' Learning Losses*

SUBJECT	JUNE		SEPTEMBER		t	sd	p
	X	s	X	s			
Basic coding	78.00	11.26	80.83	10.91	-4.26	29	.00
Robotic coding	78.66	12.72	82.33	10.06	-4.25	29	.00

Dependent sample t-test results related to the knowledge test scores of students applied before and during the summer holidays are given in Table 8. Accordingly, the students' basic coding skills [t (29) = -4.26, p <.05] and robotic coding skills [t (29) = -4.25, p <.05] were included in the achievement test scores in June. It is observed that it is significantly higher. Accordingly, it can be said that the students did not forget about both ITS subjects.

DISCUSSION AND CONCLUSION

In this study, it was investigated whether the extra-curricular activities of the students on the ITS course subjects during the summer vacation and the return of the summer vacation had any learning loss related to these subjects. The qualitative findings of the research showed that the students had practical activities for coding and robotic skills during the summer holidays. Among the activities carried out, mostly block-based coding tools, basic coding and robotic coding product oriented studies were preferred. Block-based coding activities increase students' self-efficacy regarding coding (Mazman & Altun, 2013). There are studies in the literature that coding instruction has a positive effect on individuals' computational thinking skills (Zhang & Nouri, 2019). Robotic and coding trainings are placed in the curriculum worldwide and it is important to gain these skills at an early age (Ospennikova, Ershov & Iljin, 2015). Robotic coding is the process of programming a robot to perform desired operations, and it has an algorithm that creates meaningful integrations. The algorithm is to reach the solution of any problem or goal with the right steps. Individuals who grasp the logic of the algorithm will also have the ability to produce solutions for every problem they may encounter in their lives (Tübitak, 2019). In general, it is known that software knowledge is an area that requires continuous improvement and application. Therefore, the more needed and exposed to a technological application, the more success is achieved. In this context, performing the robotic and coding activities mostly based on team work, can gain many skills such as seeing different perspectives, discovering different solutions. Because knowledge is formed by the active interaction of the individual with his environment. In a study, it was determined that basic robotic education has a positive effect on students' problem-solving skills (Buckley & Lee, 2018) and that students continue to do robotic based activities after their education (Kırkan, 2018). However, Coulangeon (2018), on the other hand, stated that even though extracurricular activities have a positive effect on applied skills, they do not have a positive effect only on information-based cognitive processes.

The opinions of students about ITS subjects, where the most time was allocated during the extra-curricular activities during the summer vacation, were examined and the results were obtained according to the findings obtained. Students devoted most time to robotic coding activities in out-of-school activities for ITS subjects. It is thought that this is due to the fact that the selected topics are an applied field that activates many different skills within the ITS curriculum. In a study in which students' geography lesson extracurricular activities were examined, it was determined that the most frequently applied extracurricular activity was internet researches about lesson subjects. In addition, it has been determined that the activities for preparing visual presentations are frequently preferred by students (Karakuş, Aksoy & Gündüz, 2012).

According to the students' views on how parents view the extracurricular coding and robotic activities during the summer holidays, it was seen that the majority of the families supported these activities of the students. Parents said that they should be given the opportunity to use their own tablets, smartphones or computers for extracurricular activities. In addition, it was determined that they wanted such extra-school activities to be followed by teachers and that these activities should be evaluated when the holiday ends. Therefore, families are of the opinion that the extra-curricular activities of their students during the summer holidays are in their interest. In a study conducted in Finland, families think that their children's participation in extracurricular activities will raise them as good citizens (Berg & Pertola, 2015). Teachers participating in

the study of Ertuğrul & Karamustafaoğlu (2020) stated that extracurricular activities provide students with a variety of learning opportunities on a number of topics that cannot be learned in the school environment. All of the parents of students in the field of this study have low and medium socioeconomic level. Almost all of the students in the study group, who are doing extracurricular activities, are the children of parents with moderate socioeconomic level. There may be many reasons why students with low socioeconomic level did not engage in extra-curricular activities on coding and robotics. One of them may be the inequality that these families experience in accessing information technology tools. Because almost all coding and robotic activities need information technology tools and robotic materials. Similarly, in some studies, it was determined that children of families with middle socioeconomic level attend such out-of-school activities while children of families with lower socioeconomic level did not participate in these activities (Fredericks & Eccles 2010; Snellman, Silva, Frederick & Putnam. 2015).

Students' views on the difficulties encountered while doing extracurricular activities on robotics and coding were examined and some results were revealed. It has been emphasized that the activities and project-based studies carried out by the students are accompanied by a specialist guide, that teamwork is more useful than the individual work, and the lack of tools and equipment. In a study examining the opinions of teacher candidates for extracurricular activities of Mertoğlu (2019), it was stated that this situation is an important problem since every student's economic situation is not equal. It is observed that there are some problems such as the reluctance of administrators and teachers, excessive legal responsibilities and procedure in extra-curricular activities to be organized by the school (Malkoç, 2014). It is observed that infrastructure, teacher and budget problems are encountered in coding and robotic activities as well as in extracurricular activities (Arıkan & Ünsal, 2019). Although coding and robotics studies are interesting and exciting areas, it is important that teacher support continues to a certain learning threshold in the learning process.

In addition, the quantitative findings obtained from the research revealed that students did not experience any learning loss in the coding and robotic skills of the ITS course during the summer vacation return. Şen (2009) examined the primary school third grade students' summer vacation learning losses and concluded that there was no meaningful learning loss in Turkish lesson. As the ITS course is an application-oriented course, it is more sensitive about learning losses than other courses. Therefore, while learning losses that are likely to be experienced during the summer holidays are expected to affect the following subjects more negatively than other lessons, the level of recall of the subjects is at a good level. However, in many of the studies on language skills, which are also practice-based, it is determined that there are learning losses during the summer vacation return (Shinwell & Defeyter, 2017). In the literature, the main reasons for the students' learning losses during the summer holidays are the duration of the holiday and the activity levels of the students during the summer holidays. At this point, since the 2014 summer semester learning to minimize losses in Turkey there is a building. Support and Training Courses, which are opened throughout the year in schools and institutions affiliated to the Ministry of National Education, also support teaching during the summer holidays depending on the need (MEB, 2014). In addition, individual extracurricular activities to be carried out by students, as seen in the results of this study, have the power to prevent learning losses that may occur in periods such as summer holidays, such as long periods of education.

The results of this study reveal that orthocultural students have many extracurricular activities for coding and robotic skills from ITS lesson topics during the summer vacation and they do not experience any learning loss for these skills during the summer vacation. The effectiveness and success of coding and robotics education is an increasingly important issue in our country. In terms of coding skills, it is a general belief that students should be at a level comparable to their peers in other countries upon graduation. It is therefore important that coding and robotics teaching be handled in all respects. Especially the fact that this kind of sustainable activities in countries such as Turkey, have long summer holidays is desirable for everyone. Children who do not encounter an activity related to the use of technology in the family and its surroundings can forget the information they have gained during the summer holidays. This situation is observed by the teachers, and the students have to remember the information they learned in the previous year in the new

academic year. Students who face deeper subjects in the curriculum in the new academic year may lose their motivation towards the lesson by feeling themselves incomplete because they are away from the lesson subjects due to the loss of learning.

It was found that coding and robotic applications were generally more common among 6th grade students among the students in the study group. In addition, it is seen that block-based coding tools are preferred more than other coding tools and robotic applications. It has been determined that the families of students doing coding and robotic-based extracurricular activities during the summer holidays have positive, supportive and even more demanding views towards these activities. Among the difficulties encountered by students during extra-curricular activities, it is shown that there is no expert support to guide the applications, there is a problem of access to technology due to technical problems and socioeconomic reasons. The findings obtained from the literature show similarities with the results of the research. It is thought that out-of-school coding and robotic activities to be carried out on holidays where learning loss is frequently experienced will provide more effective learning. Even if there is no full support of academic knowledge, organizing various educational activities during the summer holidays can prevent the possible learning losses. At this point, learning designs can be prepared with online synchronous (simultaneous) or asynchronous (asynchronous) distance education activities. In addition, this research has explicitly analyzed extracurricular activities and learning losses during the summer holidays. The effect of various extracurricular activities to be applied during the summer holidays on the learning losses can be examined experimentally.

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