



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

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ABSTRACT

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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 & Taşçı, 2016; Bostan Sarıoğlu & 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 (Ari, 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.

Research Purpose

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 purposive 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).

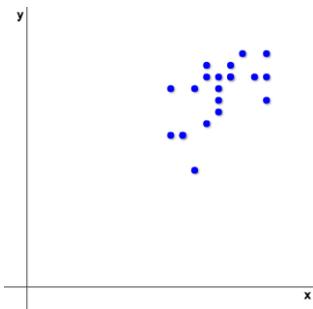


Figure 1. *Half Test Correlation* ($r = .73$)

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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