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The effects of computer programming on elementary school students' academic achievement and attitudes towards computer

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Abstract. Computer programming education for children in our country, new emerging and bringing together the right ingredients in order to achieve success in this field and application of information about the way the investigation is of utmost importance. According to many studies, the computer is seen by children as an entertainment, a game and a social media tools. Additionally, many individuals consider to be a device that the computer is harmful to children. As a result, some negative thoughts, perceptions and attitudes are seen to occur. In this research, the children of computer programming training aim to reveal the effects of attitudes towards computers. Research, during the spring semester of the 2012-2013 academic year with a total of 58 elementary school students in 7th grade was conducted using a single-group quasi-experimental design. In the research, the academic achievement of the students in computer programming education was calculated according to the t-test analysis with the data obtained pre-test and post-test measurements. It was determined that there was a significant difference in academic achievement scores in favor of post-test. In the study, the attitude scale of the students' attitudes towards computer in the pre-test application mean score [t = 14.23; p <0.05] it was found that there was a significant difference in favour of the last application ($\overline{x}$ =162.55) with a higher mean than pre-test ($\overline{x}$ =106.29). As a result of computer programming education, students' attitudes towards computers has emerged as a positive effect. Furthermore, it was found that there was a positive correlation between students' academic achievement and their attitudes towards computer (Pearson Correlation Coefficient = 0.6).

Keywords: Computer programming, kid's programming, academic achievement, attitudes towards computer

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INTRODUCTION

As life becomes more and more technology oriented everyday; children should now be taught how to make computers, programs and computer games themselves, rather than using computers. Computers can be used not only as games, entertainment and the Internet, but also as a concrete tool for students to develop on current issues such as problem solving, logic development, critical thinking (Url_1).

According to Kurt, Pelin and Arslan (2014), due to the rapid development of information technology, it also increases the number of people benefiting from this technology. In addition, it is stated that children and young people spend most of their time on computer. According to the authors, in a US study, the rate of computer use among children aged 11-14 was 92.6%, while that of children aged 15-17 was 93.4%.

The computer curriculum in primary and secondary schools is concerned with what skills the students should have in the future. According to the program, it is necessary to train individuals with Information Technology education in order to prevent countries from falling behind the age. In order to do this, students in primary schools should be provided with new qualifications as a result of technological developments. These competencies are:

- To use Turkish correctly, effectively and beautifully,
- To have information technologies competencies,

- To be able to think critically,
- To make decisions,
- To manage unexpected situations,
- To be susceptible to team work,
- To have communication skills,
- To have the ability to be multi-faceted (MEB, 2007, 2-3).

The final report of the Information and Communication Technology - ICT subtitle of the PISA 2009 test were evaluated. This report criticizes the Ministry of National Education's elective of the Information Technologies course included in the curriculum of elementary schools and the fact that it has made the course non-credit by reducing the lesson hour to one. The report emphasizes that nowadays, the use of information technologies, which is expressed in the literature as the first stage of "digital cleavage", is now inadequate, and it is important how to be productive with these technologies by moving to the second stage (Özden, 2011).

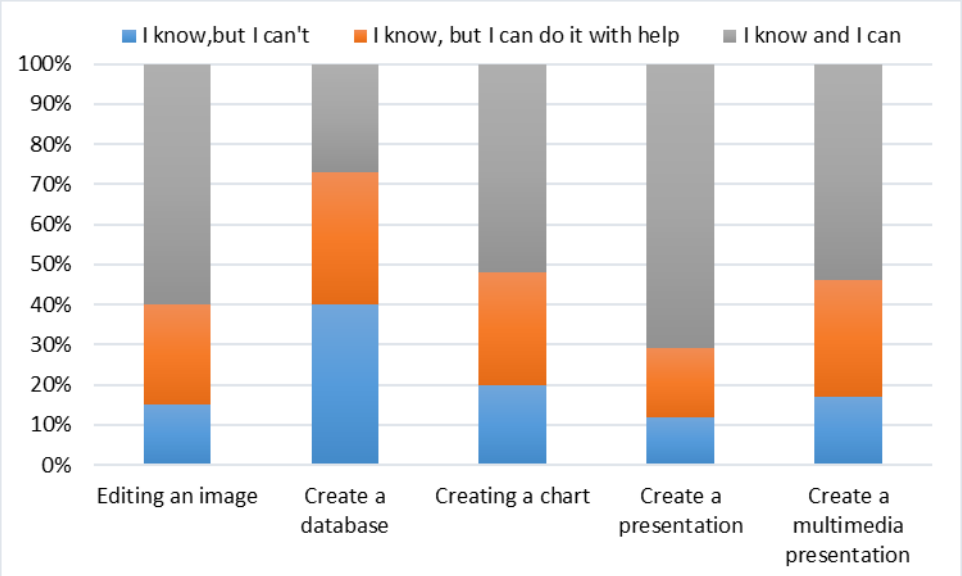

CHART 1. *Information technology skills of students attending PISA 2009 (Özden, 2011)*

Chart 1 shows OECD averages in five headings of the report. While the rate of those who say, "I know and can do" is 61% in image editing, the rate of those who say, "I can create a database" is 27%. The ratio of those who said that I could make graphics using the table was 52%, the ratio of those who said that I could prepare a presentation was 71% and finally the ratio of those who said that I could prepare a multimedia presentation was 54%. Although there was an improvement in our students in the use of spreadsheets, preparing presentations and creating multimedia presentations in the exams held in 2003 and 2009, it is obvious that we are still below the average of OECD countries (Özden, 2011).

In our country, computer programming trainings are given on average in the 20s. Considering the living conditions we live in, the efficiency of the trainings taken at these ages is discussed. Because losses in imagination and creativity, which are not used due to advancing ages, occur. However, in developed countries, these trainings start at a young age and thus large projects and products such as Google, Apple, Facebook and Microsoft appear in their 20s. According to the plan of the UK Ministry of Education to take the software development course into primary school curriculum from 2014, it will start with a simple program coding course for children 7 years and older. Then, a child who is eleven years old is expected to design and develop a mobile application for phones. Finally, it is aimed that secondary school students can develop a program like Su-Doku, capable of solving a complex puzzle (Url_2).

Among the reasons why programming teaching is not widespread in our country in primary education, the following items can be given as examples;

- To think that programming is difficult for children,
- New generation programming languages have complex structures visually and mathematically,
- Not giving much place to teaching programming languages in the curriculum,
- Students and their families have prejudices, wrong attitudes and lack of motivation about programming.
- Information technologies classes fail to provide adequate technological infrastructure standards,
- The teachers' not having enough knowledge and skills about programming topics.

For these and similar reasons, languages called Kid's programming have been developed for children and beginners to be used in programming teaching (Schwartz, Stagner & Morrison, 2006). These languages are basically low level as they are designed as a learning environment, they contain easy commands and spelling rules (Papert, 1993).

It is known that in many countries in the world, programming instruction with these languages is given at the level of primary school or even kindergarten (Saygıner & Tüzün, 2017). Coding training in Turkey, especially after the year 2012, in private and public schools, under the Information Technology and Software name or a different name is located on. This course has been taken into the new training program, starting from the fifth grade and gradually to be increasing to the next grades (Seferoğlu & Sayın, 2016).

In addition to this, although the name is not fully programming, the subject of robotics applications has been started to be covered with the personal efforts of the teachers, in public schools, in the Information Technologies course or within the scope of special events (Şisman & Küçük, 2018).

Examples of languages for Kid's programming developed for children are Small Basic, Lego Minstorm, and Alice. Small Basic, which is among these, is an extremely easy, understandable and fun language for beginners. The main purpose of Small Basic is to use language as a transition phase to more comprehensive languages by alleviating language learning difficulties (Url_1).

According to Li (2004), children and young people generally use the computer and the internet for various purposes such as games, music and studying. In a study by Madell and Muncer (2004), 67% of students using computers were determined to listen to music, 56% to browse the internet and 55% to check emails. Similarly, in a research by Intel asking families about their children's computer use habits in 2009, entertainment was in the first place with a rate of 35% (Intel, 2009).

In addition to scientific research, the results of some studies conducted by Intel, PISA and OECD suggest that students were not able to use information technologies effectively and gain sufficient skills. Among the reasons for this are insufficient information technology lessons in educational programs, deficiencies in children's computer usage habits and negative attitudes towards computer.

The International Association for the Evaluation of Success in Education (IEA) has conducted research on subjects such as Mathematics, Science, French and English by taking samples from different countries. In the study, the correlation coefficients between students' attitudes and their academic achievement in these courses; It was 0.27 in Science, 0.14 in Mathematics, 0.12 in French and 0.09 in English (Bloom, 1979; Parlak, 1991). According to the findings obtained regarding the teaching of the courses listed above, it can be argued that attitudes affect the learning process positively or negatively, in other words, they show a change with the achievements of the students. Based on this approach, researching students' attitudes towards computers as well as their academic success can provide great benefits (Uzunboylu, 2002).

Demonstrating the success in the introduction to programming course, In addition to giving information about what is important for learning to develop software, it can also be used in consultancy studies for students who enter or intend to enter this field. The increasing

number of students interested in this field makes it necessary to develop an individual consultancy plan in this regard. Not only students but also computer science departments, educational institutions, parents and employers can benefit from such a consultancy service. This counseling service can help students make more accurate decisions about their and career plans, by comparing students' interests in programming with their existing skills and combining data with computer attitudes.

Among the factors that affect success in programming trainings are the pre-competencies of students on computer literacy, their attitude towards programming, and the harmony of the language used with the intended skills. One or more of these factors affect students' success in programming as well as preventing these skills from used in different areas. For example, programming skills gained independently from the language, logical thinking, and algorithm creation in the areas such as problem solving skills and even analytical thinking skills (Ersoy, Gülbahar & Madran, 2011).

Attitudes and beliefs are among the important factors predicting the future behavior of the individual according to social psychology (Levine and Donitsa-Schmidt, 1998). Looking at the literature, attitudes are one of the most important factors affecting computer use. It is believed that negative attitudes towards computer will negatively affect motivation and performance. In addition, some individuals have expressed concern that they will move away from computers due to these negative attitudes and that their employment will be limited in the future (Altun, 2011).

The behavior of the individual that arises in the form of likes or dislikes from the computer is his attitude towards the computer. In addition to this definition, attitude; It is a tendency that covers the emotions, thoughts and behaviors developed by the individual regarding the computer, computer use, computer users, the effects of computers on personal and social life (Wang, et al., 2007; Mittra, 1998).

Alshare, Al-Dwairi, and Akour (2003) found that there were significant differences in the perception of the computer towards the user's age. In this study, they found that the attitudes towards the computer were more positive as the user's age advanced. They suggested that they were introduced to computers at an early age. They also found significant differences in the perceptions of those who have a computer at home compared to those who do not have a computer.

Keskin (2006) conducted a research on computer attitudes of gifted and talented children. In this study, it was determined that 1% of students never used the computer, 12% rarely, 55% moderately, and 30% regularly used every day. Then, he revealed that there were significant differences in the frequency of students' use of computers, on their attitudes towards computer and computer lessons.

Çelik and Ceylan (2009) examined the mathematics and computer attitudes of high school students according to gender, school type and their chosen fields. As a result, they stated that there was no significant difference between students' mathematics and computer attitudes according to their gender and school type.

Something needs to be done regarding the need for primary school children to use computer and internet technologies production-oriented rather than consumption-oriented. Despite the fact that mothers and fathers buy computers for their children with great enthusiasm and schools are equipped with computers, scientific research shows that the targeted knowledge and skills in science and technology do not develop in children. The most important reason for this is that children cannot be gained from the perspective that the computer is a production tool and a tool that can be a solution to real life problems rather than a game and communication tool. Children who do not know exactly how to benefit from computers usually spend free time on games, internet and social media. Even though little children, conscious children cannot access guides, resources and useful websites. For this reason, many families delay the purchase of computers for their children or prevent the computers they receive from accessing children (Özdemir, 2012).

Kurt et al (2014) conducted a classification study on 122 primary school students in the 6th, 7th and 8th grades according to their computer use purposes. They determined that 74.6%

of the students use them for game-entertainment and research-learning purposes. They also found that students who use the computer for research and learning purposes are at a lower rate than students who do not use it for this purpose.

Tağci (2019) stated that, as a result of a 6-week coding education for 26 primary school students, they saw the process planned for coding education as useful, instructive and entertaining. Then, he emphasized that there was an increase in the students' interest and motivation to receive programming education in the following process and that they wanted to improve themselves in this field.

As stated above, children should be ensured to benefit from ICT consciously in schools. Thanks to these technologies, they can acquire 21st century skills and gain experiences that can cope with real-life problems that they may encounter in the future. However, it is also known that ICT-supported education that can provide such skills could not be provided in today's primary education curriculum. In addition, it should not be overlooked that the use of computers as a game, social media and entertainment environment may lead to negative perceptions and attitudes in them.

METHODS

This research has a single group semi-experimental pattern model. The research was carried out without any changes in the students' branches, numbers and profiles. As seen in Figure 1, the training carried out by the researcher lasted 12 weeks in total in the computer laboratory of the school in the second term of 2012-2013 academic year, as 2 hours in addition to the daily lesson hours.

FIGURE 1. *A view from the moment of the lesson*

The educational material of this study is a course site developed for the purpose of computer programming education for children and published on bilisimgaraji.com. Lessons were conducted online, web-based. The general view of the web page whose site name is mucitlergaraji.com at the time of training is given in Figure 2. In addition, a book called Programming for Children (Özdemir, 2012) was used to support the lessons on the web and to enable students who do not have internet access outside the school to repeat the lessons and make sample solutions. This book has subject expression and content in parallel with the site content. The examples and problems given to students in programming lessons were carried out practically in Microsoft's Small Basic platform.

In the computer lab of the school, the course site has 14 weeks of subject, where students enter as a member and each student is linked from their own account.

These topics are as follows.

1 - Preparation for Programming
2 - What is the Software and Programming Language?
3 - The Most Basic Food Required by Computers: Data
4 - Condition and Branching - Which Decision Should I Give? What Side Should I Go?
5 - Loops
6 - Working with Graphics
7 - Different Geometric Shapes
8 - Programming with Turtle
9 - Subprograms (Sub Routines)

10 - Arrays - Array Array Variables
11 - Interact with the Computer - Only the Keyboard is Not Enough!
12 - Controls
13 - Using External Applications
14 - Planning a Computer Program Step by Step
15 - Project: Printing the text in the text box on the screen in different sizes
16 - Project: Drawing different shapes in the Textwindow window.

FIGURE 2. *ucitlergaraji.com website's main screen.*

FIGURE 3. *An example course page from mucitlergaraji.com*

Each topic was explained on a weekly basis, supported by examples. The input screen of an example subject is in Figure 3. The students tried to do the problems found at the end of the subject in the classroom.

Participants

The distribution of the students who attended the "Programming for Children" lessons according to some factors were examined. The distribution of 58 students, who constitute the study groups, by gender and classes, was as in Table 1. Students in the group are 7th grade and all are between the ages of 13-14. In addition, 55% of students are girls and the rest are boys.

Table 1. *Distribution of working groups by gender and class*

		Class			
		7A	7B	7C	**Sum**
Gender	Female	11	9	11	32
	Male	9	11	6	26
Total		**20**	**20**	**18**	**58**

Before starting the statistical analysis, it was checked whether the sample had a normal distribution and the feasibility of parametric tests. For this, the h_0 hypothesis was created as "The values of the sample in the Placement Test have a normal distribution". The accuracy of this hypothesis was determined in the light of the values calculated with the Kolmogorov-Smirnov Test.

Table 2. *Distribution test of participants*

Test	**N**	**p_h**	**p**
Kolmogorov-Smirnov	58	0.302	0.05

Since the value of p_h = 0.302 calculated in the test and seen in Table 2 is greater than p = 0.05 significance level, it was concluded that the sample has a normal distribution by accepting the h_0 hypothesis. In addition, it was examined whether the distribution of the students differed by gender. For this, the variance analysis test was applied to the scores that students got from the placement test. ANOVA result of one-way analysis of variance on the exam results have presented in Table 3.

Table 3. *ANOVA results in participants' placement test by gender*

ANOVA						
Placement Test						
		Sum of Square	df	Means of Square	F	**p_h**
Gender	**Between Groups**	3.725	1	3.725	.681	**.413**
	In Groups	306.154	56	5.467		
	Sum	309.879	57			

As seen in Table 3, the pH value calculated at p <0.05 significance level was found to be 0.41 and the F value was 0.68. Because of these values (ph> 0.05), it was concluded that there was no significant difference between the variance test variances of the participant group by gender.

Data Collection Tools

The first of the data collection tools used in this research is the Placement Test, which includes primary ICT topics. With this test, it is aimed to determine the readiness levels of students for computer technologies before they receive computer-programming education. The first of the data collection tools used in this research is the Placement Test, which includes primary ICT topics. With this test, it is aimed to determine the readiness levels of students for computer technologies before they receive computer-programming education. The researcher has prepared the placement test. Care was taken to ensure that this test included the objectives of the main topics given in Table 4 and was composed of a total of 20 questions with 4 options.

Exam questions examined by 3 of the Elementary Computer Formatter Teachers working in Çorum have been revised in line with the opinions and suggestions of the relevant teachers.

Table 4. *Subject coverage of placement test*

	Subjects	Number of Questions
1	Hardware	1, 2, 3, 6, 16
2	Operating System and Usage	4, 5, 7, 20
3	Office software	8, 9, 10, 11, 12, 13, 14
4	Internet Technologies	15, 17, 18, 19

For the reliability analysis of the placement test questions that were prepared, a pre-application was made with a total of 60 students who already knew about the topics discussed. As a result of the application, item analysis was performed, and the test questions were finalized with the corrections deemed appropriate by making the test statistics. As a result of these corrections, the reliability analysis value of the test questions was found to be Cronbach $\alpha = 0.81$ at $p < 0.05$ significance level.

Pre and Post success tests were developed by the researcher in order to measure the academic success levels of the students with the education they received in computer programming. The pre-test and post-test tests, including different questions, consisted of 15 questions each with 4 options. The subject scopes of the success tests are in Table 5 and Table 6.

Table 5. *Subject coverage of Pre-test*

	Subjects	Number of Questions
1	Operating System and Usage	1, 2
2	Computer Software	5, 11, 13, 14
3	Flow chart and Algorithm	8, 12
4	Computer programming	3, 4, 6, 7, 9, 10, 15

Table 6. *Subject coverage of post-test*

	Subjects	Number of Questions
1	Computer Software	3, 5, 10
2	Flow chart and Algorithm	1, 2, 4
3	Computer programming	6, 7, 8, 9, 11, 12, 13, 14, 15

For the reliability analysis of these pretest-posttest academic achievement tests, a total of 60 students in the 8th grade in the same school were applied to these tests. As a result of the application, item analysis was performed, and the tests were calculated and the tests were finalized with the arrangements deemed appropriate. Thus, the reliability analysis value for the pretest was found to be Cronbach $\alpha = 0.81$ and the reliability analysis value for the posttest was found to be Cronbach $\alpha = 0.83$.

Attitude Towards Computer Scale (ACS) selected for use in the research was developed by Deniz (1994). The validity-reliability analysis of the scale was made and it was found that it was aimed to determine the emotions, thoughts and behaviors that the individual developed for the computer, computer use, computer users and personal or social effects of computers. ACS consists of a total of 42 propositions.

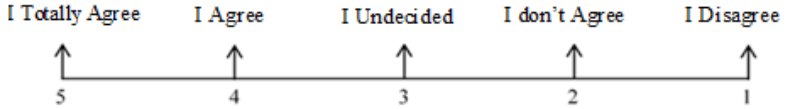

FIGURE 4. *Likert scale rating of students in information technology skills*

The attitude scale is a 5-point attitude scale in likert type as seen in Figure 4. As a result of the grading between "I disagree" and "I totally agree" to these propositions, it reveals an intensity of attitude of the participant. It is seen that the scale of ACS has been used in various studies and continues to be valid.

The measurement invariance of the developed ACS over time was found to be 0.82 ($p < 0.01$). The internal consistency coefficient for the integrity of the scale was found to be 0.92 (Cronbach α), ($p < 0.01$) (Erdoğan, 2005). The reliability analysis value of the scale calculated for this research is Cronbach $\alpha = 0.93$.

Analysis of Data

The statistical operations of the data obtained in the study such as average, standard deviation, t-test and variance analysis were carried out in computer environment with the help of IBM SSPS Statistics v21 program. Findings were evaluated by taking the arithmetic mean, standard deviation and p values into consideration. In addition, all of the calculated data were analyzed and interpreted at the level of $\alpha = 0.05$ significance.

To determine the participant distribution status on the data of the study, Kolmogorov-Smirnov distribution test was performed and the feasibility of parametric tests was demonstrated. Then, for the average differences between the data collected with the help of data collection tools, one-factor variance analysis test ANOVA was used in the t-test and variance analysis. In addition, a correlation test was applied to determine the effect and relationship between variables.

During the applications, the high score of the student from ACS has positive attitudes towards computer; low score shows negative attitudes. Questions with positive suggestions in ACS are (1, 2, 3, 4, 5, 7, 10, 11, 13, 16, 17, 18, 19, 20, 21, 26, 27, 29, 30, 31, 35, 39) . The questions with negative suggestions are (6, 8, 9, 12, 14, 15, 22, 23, 24, 25, 28, 32, 33, 34, 36, 37, 38, 40, 41, 42). Accordingly, when all questions are marked on the scale, the maximum score that can be obtained is 210, while the minimum score can be 42.

RESULTS

In order to determine the academic success levels of the students, t test was applied to the pretest and posttest measurement scores.

Table 7. *Pretest and posttest measurement values of students*

Test	N	$\bar{x}$	SS	Sd	t	p_h
Pre-test	58	5.97	1.498	2.10	18.48	.000
Post-test	58	11.05	1.669			

As seen in Table 7, according to the findings obtained with the t-test on the scores of the students in the pre-test and post-test success tests, there was a significant difference in the average scores of the students in the computer programming success tests [$t = 18.48$; $p < 0.05$]. When the averages are examined, it is seen that the difference between the tests is in favor of the posttest ($\bar{x} = 11.05$) which has a higher average than the pretest ($\bar{x} = 5.97$). It has been observed that computer-programming education offered to 7th grade students has a positive effect on students' academic success.

A t-test was applied to the measurement scores to determine whether the students 'computer programming education made a difference in students' attitudes towards the computer. The values found are given in Table 8.

Table 8. *T-Test results of ACS pre and post application*

Test	N	$\bar{x}$	SS	Sd	t	p_h
Pre-test	58	106.29	13.37	30.06	14.23	.000
Post-test	58	162.55	26.10			

As given in Table 8, it is seen that there is a significant difference in the pre-post-application mean scores used in the measurement of students' attitudes towards the computer [t = 14.23; p <0.05]. When the averages are examined, it is seen that there is a significant difference in favor of the last application ($\overline{X}$ = 162.55) which has a higher average than the pre-test ($\overline{X}$ = 106.29). As a result, It can be said that computer programming education in web environment has a positive effect on students' attitudes towards computer.

The results of 65 previous studies by Liao and Bright (1991) were evaluated through a meta-analysis and the effects of computer programming education on cognitive processes such as problem solving skills were examined. With this analysis, it was concluded that programming languages such as Basic, Logo, Pascal have effects on different levels of problem solving and other cognitive skills. In addition, 58 (89%) of 65 studies revealed that the problem solving and other cognitive effects of programming languages were positive and 7 (11%) did not have a negative or significant effect (Genç & Tınmaz, 2010).

In the study of Keskinsoy (2010), which supports these results, in his experiment by dividing the same computer attitude scale into subgroups, a statistically significant relationship was found between the students' Visual Programming course achievements and their attitude towards computer interest. In addition, Akçay et al. (2008) determined that there was a positive development in students' attitudes towards computer when they used computer-assisted learning method in high school-1 Chemistry course.

Türker and Pala (2018) in their studies, suggest that secondary school students have useful views about coding after coding education and they want to improve themselves in this field. In addition, Demirer and Sak (2019) stated that their programming skills will encourage young students to develop a positive attitude towards school and lesson, and lead them to do research.

Table 9. *The correlation between computer attitude and academic success*

Correlation			
		Post-test	**ACS**
Post-test	Pearson Correlation	1	**.582**
	p		.000
	N	58	58
ACS	Pearson Correlation	.582	1
	p	.000	
	N	58	58

The Pearson Correlation coefficient value between attitude towards computer and academic achievement was 0.582 as shown in Table 9. This value shows that there is a significant, strong, positive and linear relationship between academic success and attitude towards computer. Although this relationship does not show that there is a cause and effect relationship between attitude and success, it says that students who have more positive attitudes towards computers may have higher academic achievements in computer programming education.

Tepe (1999) examined the relationship between academic achievement and attitudes towards learning Science course at primary, secondary and university levels. According to the study result, the correlations were 0.32 at primary level; 0.48 at the secondary school level; 0.61 at high school level; at the university level, it was 0.44. Students who have a positive attitude towards the lesson stated that they consider themselves successful, sufficient and strong and they feel confident. The researcher concluded that students' attitudes positively affect their success in the lesson.

In his study, Uzunboylu (1995), which examined the relationship between computer attitudes and computer learning level, found that students 'attitudes towards computer were generally positive and that students' attitudes towards computer did not differ significantly

according to their gender (t = 0.98 and p> 0.05). The knowledge, comprehension and application steps, which are among the cognitive domain behaviors of the students, and the overall total of these steps, determined that there was a positive and highly significant relationship between each of the attitude scores towards the computer (Demirci, 2006).

Between the achievements and attitudes towards courses such as Mathematics, Science, French and English by taking samples from different countries by the International Association for the Evaluation of Success in Education (IEA); They found correlation coefficients of 0.27 in Science, 0.14 in Mathematics, 0.12 in French and 0.09 in English (Bloom, 1979; Parlak, 1991).

A study conducted by Levis and Shah using Scratch found that students' programming and math test results were related. In addition, it has been suggested that Logo and visual programming trainings are interesting by the students and the teaching methods are positive (Seferoğlu & Sayın, 2016).

DISCUSSION and CONCLUSIONS

In the research, we determined that computer-programming education given to 7th grade students has a positive effect on their academic success in programming education. There was a significant difference between the pre and post application mean scores of the attitude scale in favor of the post application. According to this difference, we found that when their children use the computer for programming, they positively affect their attitudes towards the computer. Then, it was examined whether there is a relationship between academic success and attitude. It was seen that these two variables had a positive correlation with each other. Thus, when students have positive attitudes towards computers, their academic success can increase. Although Başer (2013) says that there is no significant relationship between attitude towards computer and programming, he argues that there is a significant correlation between attitude and exam scores.

Accordingly, when the computer usage habits of children are changed and developed in a production-oriented manner such as programming, the attitude that the computer can be used in this type can be strengthened besides a game, entertainment and social communication tool. In this way, a young generation ready for 21st century computer literacy can be raised. In addition, in accordance with this purpose, lessons such as computer programming can be used more in primary and secondary education programs.

In order to ensure that children use the computer in a way that will contribute positively to their lessons and development, it will be beneficial to develop their views, perceptions and attitudes towards the computer. Accordingly, schools should focus more on programming and coding in Information Technology courses and explain how students should use the computer to solve real life problems.

Türker and Pala (2018) emphasize that students' views on coding are limited to making games and moving characters due to reasons such as lack of sufficient coding in informatics courses, keeping examples and applications limited and limited access to computers. On the other hand, they state that students have positive opinions as well as coding is beneficial, contributing to learning technology and improving their intelligence.

Children of primary and secondary school age have the effect of increasing their motivation when they use the computer to support their education and development. In order for computer programming trainings for children to become more widespread in our country and to achieve success in this field, it is very important to gather the right components and search for information about their application methods. Because in some studies on computer coding in our country, it is seen that coding is still not fully understood and students cannot reach the desired achievements. In addition, it is determined that each of the students, parents and teachers have different views on this issue. Türker and Pala (2018) declare that some students do not have a complete coding in the Information Technologies course; their teachers do not fully address this issue and even they do not have such a lesson.

In a study by Uzgur and Aykaç (2016), they gathered the opinions of 118 Information Technology teachers working in the Aegean Region regarding the Information Technology and

Software course. In this research, the existence of some problems in terms of achievements, content, learning situations and evaluation of the program of information technologies and software course has emerged. They also identified some major shortcomings in some schools, such as lack of IT classes, lack of computer equipment, lack of resource books and crowded of classes.

The results obtained by doing this kind of research on different regions, schools and age groups can be compared. By doing more sample applications, more accurate information about the age of starting computer programming education can be obtained, especially on primary school students. In a study by Strawhacker and Bers (2019) with 67 kindergarten and primary school students using ScratchJr, they say that kindergarten students have problems coordinating meta level control flow blocks and multiple characters. In the study, they showed that first and second year students are more successful in these areas and spend more time with this environment.

In addition, some standards can be determined by measuring variables such as course content, students 'levels, teachers' knowledge and experience, and the technological infrastructure of schools. In addition, before starting the programming and coding lessons, it will be important to measure the knowledge and skills of the students in information technologies and correct their deficiencies and provide a general motivation.

Called 21st century skills; problem-solving, creative and critical thinking, cooperative learning, using technology for their purposes, productive and leadership-capable individuals with computer programming and coding training should be trained (Coşar, 2013; Calao et al., 2015). Kahn, Megasari, Piantari and Junaeti (2018) conducted a research by teaching Artificial Intelligence to 40 high school students aged 16-17. At the end of the training, they stated that 70% of students with basic programming knowledge found block-based Artificial Intelligence training easier. They also emphasized that all students perceive education positively and are eager to receive education. In the light of such research, children are expected to be more successful in these areas when they have early programming skills, even in the learning of robotics and artificial intelligence, which has been seen as one of the areas developing and determining the future.

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