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**Research Paper**

# The Effect of Secondary School Students' Perceptions of Computing Technologies and Self-Efficiency on Attitudes towards Coding

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**ABSTRACT**

The aim of this study is to examine middle school students' perceptions of information technology self-efficacy and their attitudes towards coding according to various variables and to determine the difference between secondary school students' perceptions of information technology self-efficacy and their attitudes towards coding. The study was carried out with 63 students attending 5th and 6th grades in a state school in Hakkari in the 2019-2020 academic year. Pre-test-post-test quasi-experimental design was used in the study. The work carried out lasted 6 weeks. “Information Technology Self-Efficacy Scale for Secondary School Students” and “Attitude Scale Towards Coding for Secondary School Students” were used as data collection tools. The information technologies self-efficacy scale and attitude scale towards coding applied to students in the first week were re-applied as a post-test without changing the contents after the end of 12 class hours and the results were analyzed. According to the findings obtained from the study, it was determined that the posttest scores of the experimental group were higher than the posttest scores of the control group in the posttest of information technology self-efficacy perceptions applied to the experimental and control groups, and the study was found to be in favor of the experimental group. In the attitude towards coding posttest applied to the experimental and control groups after the application, it was determined that the posttest scores of the experimental group were higher than the posttest scores of the control group, and it was observed that the study was in favor of the experimental group. In the study, it was determined that providing basic information technologies and coding training to the experimental group in addition to the curriculum has a large effect on the perception of information technologies self-efficacy and attitude towards coding.



## INTRODUCTION

Today, the development of science and technology continues at an unpredictable speed. Since the development of the first electronic computer, computer technologies have been developed continuously and their use by individuals has become very common. Technologies that contribute positively to every aspect of our lives change and develop especially in the field of information and communication, causing individuals to use these technologies in their daily lives. With the developing technology, it has become easy to obtain information, change the information reached and carry it, and this has made technologies preferred by individuals in large areas (Yalmancı & Aydın, 2014). Therefore, today's individuals should have the ability to use technology up-to-date and accurately.

With the development of technology, people's perceptions of self-efficacy regarding the use of these tools and equipment are also subject to research. Bandura (1997) defines the concept of self-efficacy as “an individual's self-judgment about his / her capacity to organize and fulfill the activities required to show a certain performance”. When this concept is adapted to the field of computers, it appears as "individuals' judgment about computer use skills" (Compeau & Higgins, 1995). Defining the self-perception of the person while using a computer as the perception of computer self-efficacy, and the people who are highly competent in this subject were also eager in studies and activities that included computers (Akkoyunlu & Orhan, 2003). Miura (1986) stated that the perceptions of individuals who take computer lessons in high school and university education towards using computer technologies are positively affected. Seferoğlu and Akbıyık (2005) stated in their study on the perception of computer self-efficacy of primary school teachers that people with a high perception of computer self-efficacy are more willing to participate in activities that include computer studies, and that the expectations of success from the activity are higher.

The development and change of technology in all areas has brought the use of information technologies in the education process (Bektaş & Semerci, 2008; Balanskat & Engelhardt, 2014). As a result of developments in information and communication technologies, thinkers like Daniel Bell (1973) argued that positive changes will occur in areas such as education, economy and health. All these developments and changes are ultimately affected by the structure of societies, and when these societies integrate technologies into their lives, they become ahead of other countries. The most basic way to achieve this is through the process of systematically rearranging education, that is, learning and teaching processes, and integrating it with an education that includes technology (Çelik & Kahyaoğlu, 2007; Cox, 2008; Balanskat & Engelhardt, 2014).

Countries have made efforts to include information technologies in their educational environments in order to experience development and solve existing problems in education (Ourbe, 2007; Henkoğlu & Yıldırım, 2012; Virvou, Katsionis, & Manos, 2005). Efforts in this field in Turkey started with making the courses included in the curriculum of computer and computer labs. In this context, the first studies started with the establishment of computer laboratories in 100 schools selected as a pilot in 1986, and the course was added to secondary education programs as an elective (Keser, 2011). The use of technology in the education process plays a major role in raising individuals who can realize 21st century skills as well as increasing the quality of teaching (Pierson, 1999; Köseoğlu, Yılmaz, Gerçek, & Soran, 2007). The objectives of the information age are to raise individuals with skills such as media literacy, problem solving, information literacy, technology literacy. For this purpose, acquisitions regarding programming education were added to the information technologies and software course curriculum in our country in 2012. Coding education has benefits such as analyzing, gaining thinking skills and supporting cognitive development (Tağci, 2019). There are studies in the literature showing that coding education should be given in order to gain high-level thinking skills (Akpınar & Altun, 2014).
The series of commands consisting of special words and symbols that enable the machines to be programmed to perform the desired operations is called coding (programming) (Ersoy, Madran, & Gülbahar, 2011). In addition, it is one of the results obtained in the studies that students with programming skills and knowledge have developed their ability to produce solutions to problems (Resnick, Silverman, 2005). According to Cutter and Kocabaş (2001), computer programming consists of certain stages and these stages consist of the following 5 steps.
(1) Definition of the Problem
(2) Determination of Solution Way (Preparation of Algorithm)
(3) Coding the Program
(4) Program Interpretation and Compilation
(5) Identification and Elimination of Errors in the Program

Programming education emerges as an important field of education that ensures the existence and continuity of software studies, one of the building blocks of information technologies (Kert & Uğraş, 2009). Depending on the development of the digital world, Anderson (2016) and Cameron (2005) consider individuals' coding education as a need like literacy education. However, coding involves complex mental processes, so it is very difficult to teach software with traditional programming languages to young children. Children and people with no training in coding find traditional programming languages difficult and boring. At this point, many block-based coding tools that will make students love and fun are available today for children and those who want to learn the software.

Nam, Kim, and Lee (2010) provided students with coding training with Scratch, a block-based coding tool, and then examined the effect of this education on coding skills and problem solving skills. 60 students attending the 6th grade of secondary school participated in the study. The study group was divided into two groups as experimental and control groups, and both groups received coding training for 4 weeks. While the experimental group students were taught over the block-based coding tool Scratch, the control group students were given coding training with traditional methods. After the application, it was concluded that there was a positive increase in the coding and problem solving skills of the experimental group students who received coding training with Scratch compared to the control group students. Franklin et al. (2017) conducted a 5-week study. In their study, they investigated the effect of block-based and traditional text-based programming languages on students. At the end of the application, they concluded that the students who received education with the block-based coding tool increased in their attitudes towards the course and their level of interest compared to the students who received education with the traditional programming tool.

Block-based coding tools are visual-based and, by their nature, prevent memorizing codes, making it easier to teach programming logic to individuals. To give an example of block-based programming tools, Scratch, which has been used a lot by children recently, and suitable for the 8-16 age group, is a platform designed by the Massachusetts Institute of Technology (MIT) where simple programs can be made by combining ready-made code blocks. Since coding education is seen as difficult to teach and learn by individuals, many problems encountered with this platform have been eliminated. This platform, which is currently serving all age groups, has a very simple interface. The fact that Scratch is simple and understandable has made it easier to use and has caused the coding to be of interest to children. The ease of Scratch has increased the frequency of students to use this platform (Çatlak, Tekdal, & Baz, 2015). After the introduction of the programming approach with drag-and-drop code blocks, interest in visual programming has increased and programming languages have been produced that even people with limited programming skills can program easily (Hsu & Ching, 2013).

Block-based Code.Org is a platform that was initiated in 2013 by two brothers named Ali Partovi and Hadi Partovi and advocating that all children in the world should be taught computer lessons such as mathematics, biology, physics, and offers individuals the opportunity to learn coding. The non-profit online code learning platform Code.org is powered by Amazon, Facebook, Google, Infosys Foundation, and Microsoft. It aims to teach children coding through games. For this reason, it increases students' interest in coding by making various codes, animations and puzzles of Minecraft, Angrybirds, FlappyBird and Starwars characters that will attract the attention of children.

Google Blockly is the Google library that enables learning coding visually. This coding platform, built in 2012, allows the creation of codes and the completion of the task with the drag and drop method. Children and anyone who wants to learn coding can learn the JavaScript language from coding languages with this tool. Since it is an open source coding tool, coding can be done independently.

In Turkey, there are similar tools. Hacker Can Turkey Pamukkale University is established coding training at Technopolis within the platform. This platform, which enables students to write code and develop software in Turkish, now appeals to children and individuals who can read, write and teaches a language in the CoffeeScript model. Hacker Can supports both Turkish and English language. It aims to provide individuals with game-based algorithm logic and basic programming skills.
The aim of this study is to examine secondary school students' perceptions of information technology self-efficacy and their attitudes towards coding according to various variables and to determine whether there is a significant relationship between secondary school students' perceptions of information technology self-efficacy and their attitudes towards coding.

In line with this general purpose, the information technology self-efficacy perceptions and attitudes towards coding of secondary school students,

1. Their gender
2. Computer ownership
3. Internet access statuses
4. Does it show a significant difference according to daily computer usage times?
5. Is there a statistically significant difference between the pre-test scores of the control group and the experimental group students from the Information Technologies Self-Efficacy Scale and the Attitude Towards Coding Scale before the application?
6. Is there a statistically significant difference between the posttest scores of the control group and the experimental group students obtained from the Information Technologies Self-Efficacy Scale and Attitude Towards Coding Scale after the application?

## METHOD

The study to be conducted to determine whether there is a significant relationship between the information technology self-efficacy perceptions of middle school students and their attitudes towards coding was designed according to the control group pre-test and post-test quasi-experimental design.

### Sample / Study Group / Participants

The working group of this research consists of 63 middle school students studying in a state secondary school in Hakkari in the 2019-2020 academic year. Classes 5A and 6A constitute the experimental group with 33 students, and classes 5B and 6B constitute the control group with 30 students.

**Table 1.** Study group demographic data

| | | N | % |
|---|---|---|---|
| **Gender** | Female | 34 | 54.0 |
| | Male | 29 | 46.0 |
| **Do you have your own computer at home?** | Yes | 32 | 50.8 |
| | No | 31 | 49.2 |
| **Do you have internet at home?** | Yes | 39 | 61.9 |
| | No | 24 | 38.1 |
| **Your daily computer usage time?** | 1 hour or less. | 40 | 63.5 |
| | 1-3 hour | 13 | 20.6 |
| | 3 hours and more. | 10 | 15.9 |
| **Your daily internet usage time?** | 1 hour or less. | 35 | 55.6 |
| | 1-3 hour | 19 | 30.2 |
| | 3 hours and more. | 9 | 14.3 |
| **How long have you been able to use a computer?** | 1 year or less. | 11 | 17.5 |
| | 1-2 years | 23 | 36.5 |
| | 3 years | 13 | 20.6 |
| | 4 years and more | 16 | 25.4 |
| **TOTAL** | | **63** | **100.0** |

Considering the demographic data, it is seen that 54% of the students participating in the study are female students and 46% are male students. While 50.8% of the students participating in the study have their own computer at home, 49.2% do not have their own computer at home. 61.9% of students have internet at home and 38.1% do not have internet at home. When looking at the daily computer usage time, it is seen that 63.5% of the students use computers for 1 hour or less, 20.6% for 1-3 hours, 15.9% for 3 hours or more. When the daily internet usage times of the students participating in the study were examined, it was seen that 55.6% of them used the internet for 1 hour or less, 30.2% for 1-3 hours, 14.3% for 3 hours or more. While 17.5% of the participants have been using a computer for 1 year or less, 36.5% have been using a computer for 1-2 years, 20.6% for 3 years and 25.4% for 4 years or more.

**Data Collection Tools**

In this study, the Personal Information Form in which the demographic information developed by the researchers were collected, and the Information Technologies Self-Efficacy Scale for Secondary School Students developed by Göçer, Türkoğlu (2018) was used to determine the self-efficacy perceptions of middle school students. The Attitude Scale Towards Coding for Secondary School Students, developed by Akkuş, Özhan and Kan (2019), was used to determine the attitudes of middle school students towards coding.

**Collection of Data**

In the 2019-2020 academic year, a study was carried out with 63 students studying at a state secondary school in the central district of Hakkari province. 33 of 63 middle school students are in the experimental group and 30 are in the control group. The study period covers 6 weeks. In the first week, in order to determine the self-efficacy perceptions of middle school students towards information technologies and their attitudes towards coding, the information technologies self-efficacy scale for middle school students and the attitude scale towards coding for middle school students were administered to the students as a pre-test. After the 6-week process and 12 lesson hours, the self-efficacy perception scale and attitude scale were re-applied as a post-test without changing the contents of the self-efficacy scale and the results were evaluated. During the 6-week period, curriculum subjects were taught to the experimental and control groups. In the control group, the curriculum subjects were taught on an activity-based basis based on the textbook, while in the experimental group, in addition to the curriculum, the subjects determined for basic information technologies and coding were taught in practice and students were able to learn. At the end of the application, information technology self-efficacy scale for middle school students and attitude scale towards coding for middle school students were applied to the experimental and control groups as a post-test. The data collected at the end of the application process was analyzed.

**Analysis of Data**

Demographic information, frequency, percentage, arithmetic mean, and standard deviation of the study group students were explained with descriptive statistics. In the quantitative dimension of the study, the statistical package program SPSS 22 (Statistical Package for Social Sciences) was used to analyze the numerical data collected after the experimental process.

**RESULTS**

The findings on whether the information technology self-efficacy perceptions (ITSEP) and the attitude towards coding (CGT) of the experimental and control groups differ significantly according to the gender variable are given in Table 2.

**Table 2.** The t-test results of the (ITSEP) and (CGT) states of the experimental and control groups according to the gender variable

| | GENDER | N | $\overline{X}$ | S | sd | t | p |
|---|---|---|---|---|---|---|---|
| **Coding pretest** | Female | 34 | 33.76 | 9.773 | 61 | -.454 | .651 |
| | Male | 29 | 34.83 | 8.615 | | | |
| **Self-efficacy pretest** | Female | 34 | 35.18 | 10.845 | 61 | -1.381 | .172 |
| | Male | 29 | 38.90 | 10.424 | | | |

As can be seen in Table 2, according to the findings obtained using the t-test for unrelated samples, the coding pre-test and self-efficacy pre-test status of the experimental and control groups do not show a significant difference according to the gender variable ($p > .05$). In other words, the coding pre-test and self-efficacy pre-test status of the experimental and control groups do not change according to the gender variable.

The findings on whether the information technology self-efficacy perceptions (ITSEP) and the attitude towards coding (CGT) of the experimental and control groups show a significant difference according to computer ownership status are given in Table 3.

**Table 3.** T-test results according to the computer ownership status of the ITSEP and CGT states of the experimental and control groups

| | Computer Ownership Status | N | $\overline{X}$ | S | sd | t | p |
|---|---|---|---|---|---|---|---|
| **Coding pretest** | Yes | 32 | 33.22 | 9.213 | 61 | -.906 | .368 |
| | No | 31 | 35.32 | 9.214 | | | |
| **Coding posttest** | Yes | 32 | 106.72 | 15.168 | 61 | -1.699 | .094 |
| | No | 31 | 114.00 | 18.717 | | | |
| **Self-efficacy pretest** | Yes | 32 | 38.00 | 10.451 | 61 | .833 | .408 |
| | No | 31 | 35.74 | 11.066 | | | |
| **Self-efficacy posttest** | Yes | 32 | 115.47 | 23.838 | 61 | 1.457 | .150 |
| | No | 31 | 106.29 | 26.157 | | | |

As can be seen in Table 3, according to the findings obtained using the t-test for unrelated samples, there is a significant difference between the experimental and control groups' coding pre-test, coding post-test, self-efficacy pre-test and self-efficacy post-test according to computer ownership status. does not show (p> .05). In other words, the coding pre-test, coding post-test, self-efficacy pre-test and self-efficacy post-test of the experimental and control groups do not change according to the computer ownership status. The t-test results of the experimental and control groups according to the Internet ownership status of the information technologies self-efficacy perception and attitude towards coding are given in Table 4.

**Table 4.** T-test results of the ITSEP and CGT statuses of the experimental and control groups according to their internet ownership

| | Internet Ownership Status | N | $\overline{X}$ | S | sd | t | p |
|---|---|---|---|---|---|---|---|
| **Coding pretest** | Yes | 39 | 33.21 | 10.242 | 61 | -1.157 | .252 |
| | No | 24 | 35.96 | 7.068 | | | |
| **Coding posttest** | Yes | 39 | 109.49 | 17.066 | 61 | -.474 | .637 |
| | No | 24 | 111.63 | 17.866 | | | |
| **Self-efficacy pretest** | Yes | 39 | 36.54 | 10.607 | 61 | -.328 | .744 |
| | No | 24 | 37.46 | 11.135 | | | |
| **Self-efficacy posttest** | Yes | 39 | 107.77 | 23.391 | 61 | -1.283 | .204 |
| | No | 24 | 116.13 | 27.694 | | | |

As can be seen in Table 4, according to the findings obtained using the t-test for unrelated samples, there is a significant difference between the coding pre-test, coding post-test, self-efficacy pre-test and self-efficacy post-test status of the experimental and control groups according to internet ownership. does not differ (p> .05). In other words, the coding pre-test, coding post-test, self-efficacy pre-test and self-efficacy post-test of the experimental and control groups do not change according to the internet ownership status. The results of one-factor analysis of variance (ANOVA) regarding whether the experimental and control groups' perception of information technologies self-efficacy and attitude towards coding for middle school students show a significant difference according to daily computer usage time are given in Table 5.

**Table 5.** One-factor analysis of variance (ANOVA) results of the experimental and control groups according to the daily computer use time of ITSEP and CGT

| Daily Computer Usage Time | Source of Variance | Sum of Squares | sd | Mean Square | F | p |
|---|---|---|---|---|---|---|
| **Coding pretest** | Between groups | 682.249 | 3 | 227.416 | 2.939 | .040 |
| | Within-group | 4565.688 | 59 | 77.385 | | |
| | Total | 5247.937 | 62 | | | |
| **Self-efficacy pretest** | Between groups | 124.145 | 3 | 41.382 | .133 | .940 |
| | within-group | 18353.125 | 59 | 311.070 | | |
| | Total | 18477.270 | 62 | | | |
| **Coding posttest** | Between groups | 371.532 | 3 | 123.844 | 1.080 | .365 |
| | Within-group | 6768.690 | 59 | 114.724 | | |
| | Total | 7140.222 | 62 | | | |
| **Self-efficacy posttest** | Between groups | 1309.270 | 3 | 436.423 | .675 | .571 |
| | Within-group | 38159.587 | 59 | 646.773 | | |
| | Total | 39468,857 | 62 | | | |

As can be seen in Table 5, according to the findings obtained from different samples for unrelated samples, there is a meaningful study between the daily computer usage time of the study group and the scores they got for the coding pretest [F(3-59)= 2.939, p < 05]. In other words, the pre-test scores of coding change according to the daily computer usage time of the study group. As a result of the LSD test conducted to determine which groups caused this difference, in other words, which groups made the difference, the difference was between 1 and 2 (in favor of 2) and between 1 and 3 (in favor of 3); Between 2 and 1 (in favor of 2); It is seen that it is between 3 and 1 (in favor of 3).

In addition, there was no significant difference between the daily computer use time of the study group and the scores they got for the coding posttest [F(3-59)= 1.080, p < 05]. In other words, coding posttest scores do not change according to the daily computer usage time of the study group.

There is no significant difference between the daily computer usage time of the study group and the scores they got for the self-efficacy pretest [F(3-59)= .133, p < 05]. In other words, the self-efficacy pre-test scores do not change according to the daily computer use time of the study group. The results of the comparison of the pre-tests and post-tests performed to determine the status of the experimental group students as a result of the application of the information technology self-efficacy scale for secondary school students are given in Table 6.

**Table 6.** Experimental group ITSEP scale pretest-posttest comparison results

| | Test | N | $\overline{X}$ | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| **Experimental group** | pretest | 33 | 112.64 | 16.002 | 32 | 40.436 | .000 |
| | posttest | 33 | 131.27 | 13.363 | | | |

*p<0.05

Experimental group pretest-posttest scores (pre-test mean $\overline{X}$ =112.64; post-test mean $\overline{X}$ =131.27) were found to be statistically different for *p <.05 significance level (p <0.05). It was determined that the experimental group students increased their self-efficacy perceptions as a result of the basic information technologies and coding training they attended.

The results of the comparison of the pre-tests and post-tests performed to reveal the status of the control group students as a result of the application of the information technology self-efficacy scale for secondary school students are given in Table 7.

**Table 7.** Control group ITSEP scale pretest-posttest comparison results

| | Test | N | $\overline{X}$ | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| **Control group** | pretest | 30 | 88.60 | 13.312 | 29 | 31.927 | .000 |
| | posttest | 30 | 107.73 | 18.482 | | | |

*p<0.05

It was observed that there was a statistically significant difference between the pre-test and post-test scores of (pre-test mean $\overline{X}$ =88.60; post-test mean $\overline{X}$ =107.73) the control group for *p <.05 significance level (p <0.05). As a result of the information technologies course, which is taught in accordance with the curriculum of the control group students, it was seen that there is a significant difference in the information technology self-efficacy perceptions.

The results of the comparison of the pre-tests and post-tests performed to determine the status of the experimental group students as a result of the application of the attitude scale towards coding are given in Table 8.

**Table 8.** Experimental group CGT scale pretest-posttest comparison results

| | Test | N | $\overline{X}$ | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| **Experimental group** | pretest | 33 | 34.61 | 9.931 | 32 | 20.018 | .000 |
| | posttest | 33 | 43.03 | 7.312 | | | |

*p<0.05

It was seen that the experimental group pre-test-post-test scores (pre-test mean $\overline{X}$ =34.61; post-test mean $\overline{X}$ =43.03) were statistically different for * p <.05 significance level (p <0.05). It was determined that the experimental group students increased their attitudes towards coding education as a result of the application of basic information technologies and coding education.
The results of the comparison of the pre-test and post-tests performed to reveal the status of the control group students as a result of the implementation of the attitude scale towards coding are given in Table 9.

**Table 9.** Control group CGT scale pre-test-post-test comparison results

| | Test | N | $\overline{X}$ | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| Control group | pretest | 30 | 30.13 | 9.853 | 29 | 21.885 | .000 |
| | posttest | 30 | 33.87 | 8.476 | | | |

*p<0.05

It was observed that there was a statistically significant difference between the pre-test and post-test scores (pre-test mean $\overline{X}$ =30.13; post-test mean $\overline{X}$ =33.87) of the control group for *p <.05 significance level (p <0.05). It was observed that there was a significant difference between the control group students' attitudes towards coding education as a result of the information technologies course taught in accordance with the curriculum.

When the students who are given basic information technologies and coding training in addition to the curriculum (experimental group) and the students who are not given (control group) are compared, the result is given in Table 10.

**Table 10.** Between groups ITSEP scale posttest comparison (t - test) results

| Groups | | N | $\overline{X}$ | S | Sd | t | p |
|---|---|---|---|---|---|---|---|
| Posttest | Experimental group | 33 | 131.27 | 13.363 | 61 | 12.682 | .000* |
| | Control group | 30 | 88.60 | 13.312 | | | |

In the post-tests performed on the experimental and control groups after the application, * p <.05 is .00 <.05 for the significance level and the result is significant. In other words, the information technologies self-efficacy posttest showed a significant difference compared to the experimental group and control group students. In the posttests performed (experimental group posttest mean = 131.27; control group posttest mean = 88.60), it was determined that the posttest scores of the experimental group were higher than the posttest scores of the control group. This result shows that the application performed is in favor of the experimental group. In addition, the eta squared value was examined to determine the effect size of the environment in which basic information technologies and coding training was given in addition to the curriculum on the perception of information technologies self-efficacy for secondary school students. Effect size values were calculated as η2 = .139. In this case, considering the effect size value (η2 = 0.139), it can be said that providing additional basic information technologies and coding training to the curriculum has a "large" effect size on the perception of information technologies self-efficacy for secondary school students.

When the attitude scale towards coding was compared to the students (experimental group) who were given additional basic information technologies and coding training to the curriculum (experimental group) and the students who were not given (control group), the result was given in Table 11.

**Table 11.** CGT scale posttest comparison (t - test) results between groups

| | Groups | N | $\overline{X}$ | S | Sd | T | p |
|---|---|---|---|---|---|---|---|
| Posttest | Experimental group | 33 | 43.03 | 7.312 | 61 | 5.935 | .000* |
| | Control group | 30 | 30.13 | 9.853 | | | |

In the post-tests performed on the experimental and control groups after the application, * p <.05 is .00 <.05 for the significance level and the result is significant. In the posttests performed, it was determined that the posttest scores (experimental group posttest mean $\overline{X}$ = 43.03; control group posttest mean $\overline{X}$ = 30.13) of the experimental group were higher than the posttest scores of the control group. This result shows that the application performed is in favor of the experimental group. In addition, the eta squared value was examined in order to determine the effect size of the environment in which basic information technologies and coding training are given in addition to the curriculum on coding attitude. Effect size values were calculated as η2 = .141. In this case, considering the effect size value (η2 = 0.141), it can be said that the environment in which basic information technologies and coding training are given in addition to the curriculum has a "large" effect size on attitude towards coding.

## DISCUSSION AND CONCLUSION

It was determined that before the application, the numbers of the study groups were equal and the statistical tests performed, both groups applied to the information technology self-efficacy scale for middle school students were equal before the research. At the end of the application, it was determined that the experimental group students increased their self-efficacy perceptions as a result of the basic information technologies and coding training they attended. In addition, it was observed that there is a significant difference in the information technology self-efficacy perceptions of the control group students as a result of the information technologies course, which is taught in accordance with the curriculum. After the application, it was determined that there was a significant difference in the posttests of the experimental and control groups, and the posttest scores of the experimental group were higher than the posttest scores of the control group in the posttests of information technologies self-efficacy perception. As a result, it was seen that the study was in favor of the experimental group. In order to determine the effect of providing basic information technologies and coding training to the experimental group in addition to the curriculum on the perception of information technology self-efficacy, the eta square value was examined and it was determined that this training had a large effect size on the information technology self-efficacy perceptions of middle school students. Since the basic information technologies and coding trainings in addition to the curriculum with the experimental group enable students to use technology practically, it can be said that the information technology self-efficacy perception of the student, whose use of technology increases, is positively affected. It has been stated in the studies that computer-oriented training increases the computer self-efficacy perception of individuals (Barbeite & Weiss, 2004). Individuals' perceptions of computer self-efficacy are affected by the social environment in which the person is and the experiences he / she has (Karsten & Roth, 1998). The result obtained in the study is similar to the work done by Tekerek, Ercan, Udum and Saman (2012). Tekerek, Ercan, Udum, and Saman (2012), in their study on determining the computer self-efficacy perceptions of information technologies teacher candidates, concluded that 3rd and 4th grade students have higher computer self-efficacy perceptions than 1st grade students, and this result and that it depends on the content of vocational courses in the field of instructional technology education.

Information technology self-efficacy pre-test status of middle school students did not differ significantly according to gender variable. This finding is similar to the studies conducted (Tekerek, Ercan, Udum, & Saman, 2012; Balta, 2009; Tuncer and Tanaş, 2011). The self-efficacy post-test status of the experimental and control groups varies according to the gender variable. This finding is in line with the study of Seferoğlu and Akbıyık (2005), who wanted to determine primary school teachers' self-efficacy perceptions towards computers. Sam, Othman, and Nordin (2005) concluded that there is no significant difference between gender and computer self-efficacy in their study. Pre-test and post-test results of secondary school students' perceptions of information technology self-efficacy do not change according to their computer ownership status. This finding is similar to the result of Çelik and Çevik's (2010) study on determining the computer self-efficacy perceptions of 58 unemployed young people who attended a basic computer course at Siirt University. In the study, the self-efficacy pre-test and self-efficacy post-test status of the experimental and control groups do not change according to the Internet ownership status.

In addition, the self-efficacy pre-test and post-test scores do not change according to the daily computer use time of the study group. There are studies that support this finding (Karsten & Roth, 1998). This finding is inconsistent with the result that Aşkar and Umay (2001) reached in their study on computer self-efficacy perceptions of primary school math students' low use of the computer and their inexperience cause low computer self-efficacy perceptions. Also, Chen (2012) found that there is a significant difference between the frequency of computer use of individuals and their perception of computer self-efficacy.

Before the application, it was determined that the number of study groups were equal and from the statistical tests that both groups applied to the attitude scale towards coding were determined before the study. As a result of the implementation of the attitude towards coding scale, it was seen that the experimental group students' attitudes towards coding education were increased as a result of the pre-test and post-test comparisons made to determine the status of the experimental group students. In addition, as a result of the comparison of the pre-test and post-tests conducted to reveal the status of the control group students, it was found that there was a significant difference between the control group students' attitudes towards coding education as a result of the information technologies course taught in accordance with the curriculum. In the posttests performed after the application, it was determined that the posttest scores of the experimental group were higher than the posttest scores of the control group. This result shows that the application performed is in favor of the experimental group. In addition, the eta square value was examined to determine the effect size on the attitude towards coding of the environment in which basic information technologies and coding training were given in addition to the curriculum, and it was seen that the environment where additional basic information technologies and coding training were given to the curriculum had a large effect size on attitude towards coding. The result obtained is similar to the work done by Yiğit (2016). In addition, the result obtained is similar to the work done by Martin-Ramos et al. (2018). Martin-Ramos et al. (2018) provided 44 students with coding training both theoretically and practically. At the end of the training, they found that students' attitudes towards coding increased. Fesakis & Serafeim (2009) concluded that the participants' attitudes towards coding were positive at the end of their study with the Scratch program.

When the status of the attitude towards coding according to the gender variable was examined in the study, the coding pre-test and coding post-test results of the experimental and control groups did not show a significant difference according to the gender variable. This finding is similar to the studies of Erol, Kurt (2017). For unrelated samples made to see whether the coding pre-test and coding post-test results of the experimental and control groups differ according to the computer ownership status according to the results of the T-test, it was seen that the coding pre-test and coding post-test cases of the experimental and control groups did not differ significantly according to the computer ownership status. According to the results of the T-test for unrelated samples performed to see whether the coding pre-test and coding post-test results of the experimental and control groups differ according to the Internet ownership status, the coding pre-test and coding post-test status of the experimental and control groups were significantly The result was obtained that it does not differ.

Coding pre-test scores vary according to the daily computer usage duration of the study. As a result of the LSD test conducted to determine which groups make the difference, the difference is between 1 and 2 (in favor of 2) and between 1 and 3 (in favor of 3); Between 2 and 1 (in favor of 2); It is seen that it is between 3 and 1 (in favor of 3). The coding post-test, self-efficacy pre-test, and self-efficacy post-test scores do not change according to the daily computer usage time of the study group.

## Suggestions

According to the findings obtained in the study, the following suggestions were made:

- In this study, data were collected with the answers given by the students to the scales before and after the application. In addition, data can be enriched with observation forms, interviews and similar techniques.
- This study was conducted for secondary school students. It can also be done by students of other education levels.
- By adding different age groups to the study, the differences between age groups can be compared.
- The effect of coding activities on academic achievement, attitude and motivation can be investigated.

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