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Research Article

Robotic Coding Attitudes and Opinions of Pre-service Teachers about Robotic Coding Applications with Tinkercad

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Abstract

Technological innovations that we have come across in recent years affect every aspect of our lives. It is possible to see the effects of technology in almost every field and every age group. Innovative technologies, which are becoming more important and integrated into our lives day by day, appear with technological developments in the field of coding and robotics. It is predicted that the technological developments experienced in line with the researches will continue on coding and robotics. The aim of this study is to investigate the attitudes and opinions of Pre-Service Teachersabout robotic coding applications made with Tinkercad. 33 science Pre-Service Teachers participated in the 6-week study. In this study, mixed research method was used. For the analysis of quantitative data, robotic coding attitude scale was applied to teacher candidates. The study was carried out in the form of pretest-posttest. Analyzes were made by applying the t test for dependent samples. In the analysis of qualitative data, semi-structured interview questions were applied. According to the findings of the study, it is seen that there is a positive significant difference in robotic coding attitudes of teacher candidates. Tinkercad and robotic coding trainings were given and 5 applications related to robotic coding were made within the scope of these trainings. As a result of these practices, pre-service teachers stated that their problem solving and high-level thinking skills improved. They stated that robotics and coding gave the pre-service teachers self-confidence and that the pre-service teachers who received robotic coding training had different skills and imagination. When the answers given in this direction are evaluated, it is seen that the robotic teaching of the teachers creates positive attitudes and opinions on the teacher candidates, and very effective and successful results are obtained.

Keywords: Robotic Coding; Tinkercad; Robotic Coding Attitude

Introduction

Our living standards and perspective on life are changing day by day in parallel with the rapidly developing technology. This situation also affects the desires and purposes of individuals to use technology. Today, individuals have started to use technology with the aim of reaching information, sharing information and producing information. Considering this use of individuals and the effect of technology on every field, it is seen that traces of technology are also encountered in the field of education [9,14]. Considering today's age of science and technology, the use of technology in education and technology integration in education come to the fore in order to increase the quality of education and facilitate learning [3].

It is inevitable to use technology together with education in order to improve the quality of education and training in order to improve the existing Turkish education system, in which Pre-Service Teachers are encouraged to research and it is aimed to train qualified teacher candidates. Robotic technologies, which emerged with the increase in innovations in education technology with today's technology, are increasing their use in our country in order to improve the quality of education [16]. With the spread of robotic technologies, the importance of raising individuals who can use these technologies and have knowledge about technologies is increasing day by day. In this context, it is an inevitable fact that knowledge of coding and robotics is an important factor in education [2].

Coding and robotics teaching, which are among the innovative applications that come to the fore in education, are increasing their importance day by day. It is argued that coding and robotics teaching improves pre-service teachers' skills such as problem solving and high-level thinking [12]. For this reason, the importance of coding and robotics teaching is increasing day by day and is used in the field of education in order to support the versatile development of teacher candidates. With the inclusion of robotic technologies in education, coding and robotics teaching in the field of education comes to the fore and gains importance [5].

Coding and robotics have emerged as the most up-to-date subject of recent years and are the 21st century. among his skills. However, for more comprehensive information about coding and robotics, the concept of robotics should be understood first. At this point, if the definitions in the literature are examined, robotics emerges as a current concept that is formed by the merger of several main engineering and science branches [6].

It is a study to determine the importance of coding and robotics teaching, to determine what popular robotic technologies are, to summarize their perspective on coding and robotics teaching, and to determine the views of pre-service teachers about coding and robotics teaching and robotic technologies. With the study, it is aimed both to reveal the existing level of knowledge about robotic technologies, coding and robotics teaching and to develop interdisciplinary educational materials on robotic technologies with pre-service teachers. In this respect, the study is considered important as it will be among the first examples examined in the literature and will guide subsequent studies [7]. In addition, since the study aims to design interdisciplinary educational materials to set an example for the integration of robotic technologies into education, it is thought that coding and robotics teaching will be of higher quality and this situation is expected to contribute to science and education, as well as to the literature. In this respect, the study is important [7].

Changes in the last years of the information age supported the use of innovative technologies in education, and coding and robotics teaching, which are frequently used in education, came to the fore. Coding and robotics teaching has been integrated into education, as coding and robotics teaching has been rapidly adopted by Pre-Service Teachers, teachers and families and considered important [11,13].

It is thought that robotics and coding teaching will teach children continuity in interest and motivation [17]. It is thought that another acquisition learned in coding and robotics teaching is the habit of problem solving. Coding teaches the child that he/she should be a productive person in the society and that time is valuable, so that there is a better way to produce children and he/she gains classification skills by learning to plan. In order to realize all these, coding and robotics provide the child with high-level, algorithmic, computational and relational thinking skills since they will take an active part in the thinking processes [15,10].

Research problem

What are the robotic coding attitudes of pre-service science teachers about Robotic coding applications made with Tinkercad? How does the robotic coding awareness level of science Pre-Service Teachers change about Robotic coding applications made with Tinkercad? What are the opinions of pre-service science teachers about robotic coding about Robotic coding applications made with Tinkercad?

Research questions

- What are the robotic coding attitudes of Pre-Service Teachersabout Robotic coding applications made with Tinkercad?
- What are the opinions of pre-service teachers about robotic coding about Robotic coding applications made with Tinkercad?

Method

In this study, mixed research method was used. The mixed research method includes a mixture of qualitative and quantitative approaches at many stages of the research process, and philosophical assumptions that guide the direction of data collection and analysis. Quantitative research method is to measure the social behaviors of individuals objectively through observation, experiment and test and to explain them with numerical data. Qualitative research method, The studies that aim to find the meanings of the cases and events outside the laboratory environment in a holistic way are called qualitative studies [4].

Sample

33 science Pre-Service Teachers from a state university participated in the research on a voluntary basis.

Data collection tools

Robotic coding attitude scale

Robotic coding attitude scale was developed by Altun Yalçın, Kahraman and Yılmaz [1]. Robotic Coding Attitude Scale consists of 22 items. The purpose of the scale was to develop and validate the Robotic Coding Attitude Scale. The scale was prepared in 5-point Likert type. 1- Strongly Disagree, 2- Agree, 3- Undecided, 4- Agree, 5- Strongly Agree. rated accordingly.

Semi-Structured Teacher Candidate Interview Questions

- What are your views on the importance of robotic coding?
- What are the advantages and disadvantages of robotic coding?
- What are the difficulties you experience in robotic coding?

Data analysis

SPSS (21.00), one of the analysis programs, was used to analyze the quantitative data of the study. In order to test the problem situation in the research, the standard deviations of the scores and the significant difference between the averages of these scores were examined. It was observed that the scores showed a normal distribution. Because of this situation, t-test was applied for dependent samples from parametric tests. It was seen that the data obtained showed a statistically significant difference between the pre-test and post-test. In the analysis of qualitative data, feedback was obtained by asking semi-structured pre-service teacher interview questions.

Application

In this research, a training program, which was prepared for science Pre-Service Teachersand made the education process fun, simple and efficient, was implemented using robotic coding activities made with Tinkercad. The content of this program lasted for 6 weeks and a total of 24 hours (2+2) hours per week. Tinkercad and Arduino programs were taught in robotic coding activities with Tinkercad. This application was made in the form of pre-test and post-test. A brief summary of the activities carried out is shown below and the work schedule is given in table 1.

A Brief Summary of the Event:

- In the first week, pre-service teachers received membership on the Tinkercad page. Afterwards, Tinkercad and Arduino programs were taught (Figure 1).
- In the second week, Tinkercad 1st application was made to the teacher candidates. Traffic lights were implemented with robotic coding (Figure 2).
- In the third week, Tinkercad 2nd application was made to the pre-service teachers. Pır sensor application was made with robotic coding (Figure 3).
- In the fourth week, Tinkercad 3rd application was made to the pre-service teachers. Ultrasonic distance sensor application was made with robotic coding (Figure 4).
- In the fifth week, Tinkercad 4th application was made to the teacher candidates. DC motor control application was made with robotic coding (Figure 5).
- Tinkercad 5. Application was made to the Pre-Service Teachersin the sixth week. Servo motor control application was made with robotic coding (Figure 6).

Table 1: Weekly Schedule of Robotic Coding Applications Made with Tinkercad.

Week	Subjects
Week-1	Tinkercad Program Introduction
Week-2	Tinkercad Practice 1: Traffic Light Application
Week-3	Tinkercad 2. Application: Pır Sensor Application
Week-4	Tinkercad 3. Application: Ultrasonic Distance Sensor Application
Week-5	Tinkercad 4. Application: DC Motor Control Application
Week-6	Tinkercad 5. Application: Servo Motor Control Application

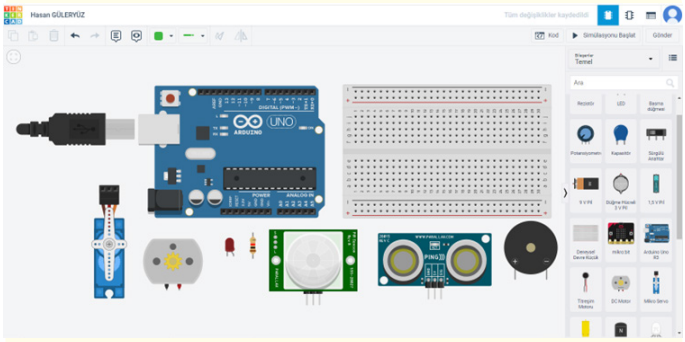

Figure 1: Tinkercad Program.

In this research, robotic coding applications were made using Tinkercad program.

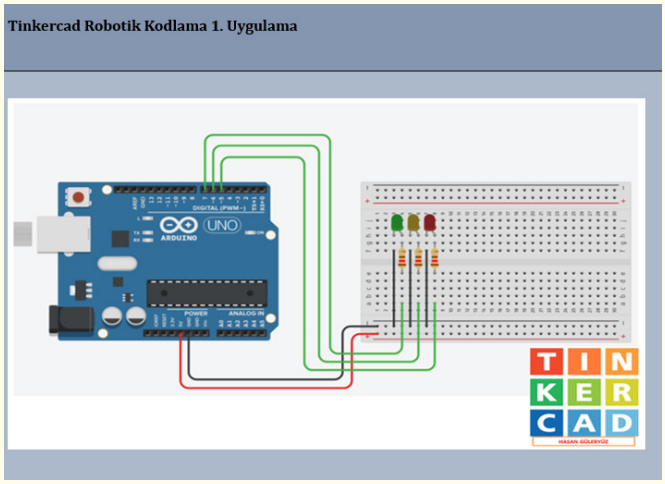

Figure 2: Traffic Light Application.

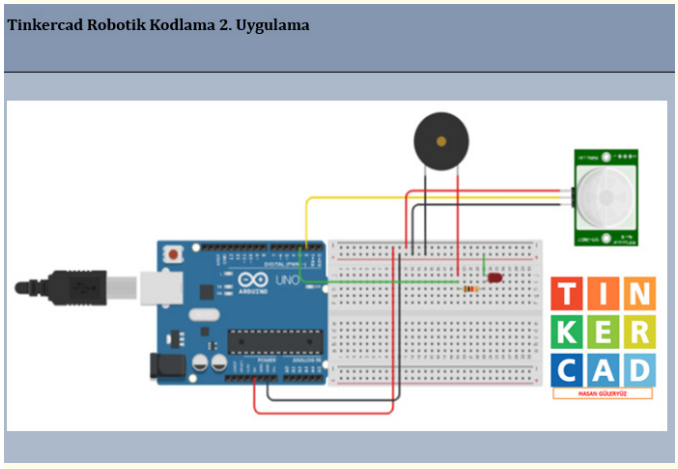

Figure 3: PIR Sensor Application.

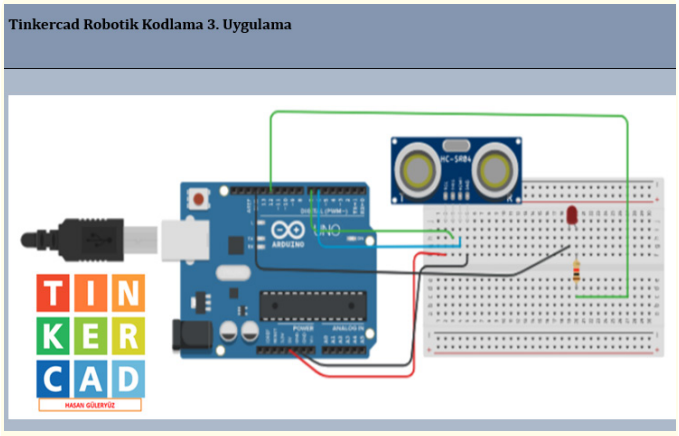

Figure 4: Ultrasonic Distance Sensor.

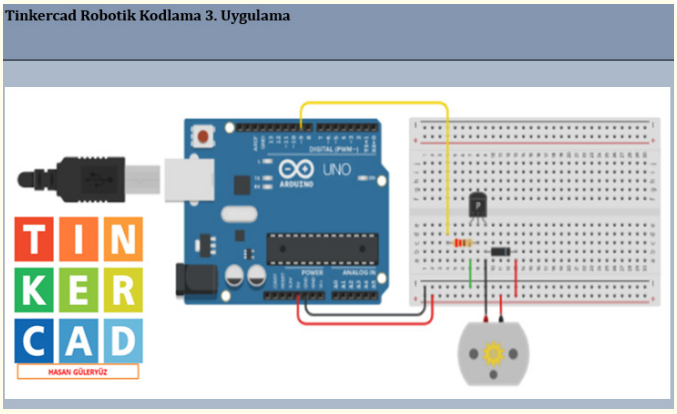

Figure 5: DC Motor Control Application.

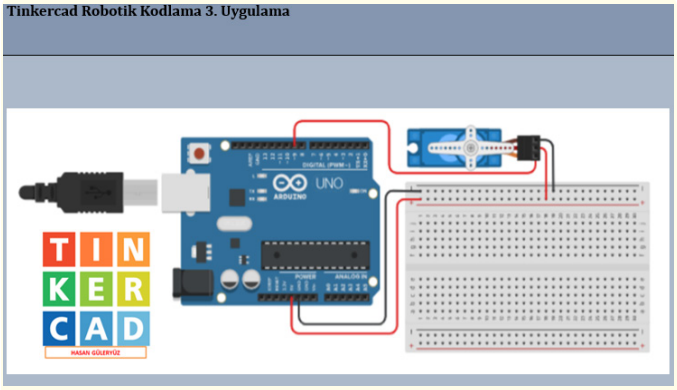

Figure 6: Servo Motor Control Application.

Results

In this research, there are analyzes of teacher candidates' robotic coding attitudes about Robotic coding applications made with Tinkercad.

Table 2: Numerical Data Showing the Sample.

Female	14
Male	19
Total	33

When table 2 is examined, it is seen that 19 male and 14 female Pre-Service Teachersparticipated in the research.

Table 3: Robotic Coding Attitude Dependent Samples T-Test.

	$\bar{x}$	n	ss	sh_x
Pre Test	62.12	33	6.17	.90
Post Test	74.28	33	6.39	.94

When table 3 is examined, when the results of the robotic coding attitudes of Pre-Service Teachersabout Robotic coding applications made with Tinkercad are examined, it is seen that there is an increase in the averages of $\bar{X}$pretest = 62.12 and $\bar{X}$posttest = 74.28. In the results, it is seen that there is a progress in favor of the posttest average scores.

Table 4: Robotic Coding Attitude Dependent Samples Test.

	$\bar{x}$	ss	sh_x	Lower	Upper	t	df	p
Pre Test-Post Test	-9.18	6.07	0.89	-9.65	-7.39	-9.19	33	0.000

When table 4 is examined, as a result of the dependent samples t-test analysis, it is observed that there is a statistically significant increase in the pre-test and post-test results of teacher candidates' robotic coding attitudes about Robotic coding applications made with Tinkercad; t(33) = -9.19, p = 0.00). Based on this finding, it can be concluded that the robotic coding applications made with Tinkercad have a positive effect on the robotic coding attitudes of the teacher candidates.

In this research, there are opinions of pre-service teachers about the use of robotic coding applications made with Tinkercad. PST4 (Pre-Service Teachers) In the interviews with the pre-service teachers, the feedbacks received from the pre-service teachers are included.

- PST3, PST10, and PST24 "… I gained confidence through robotic coding practices…"
- PST5 and PST23 "… I gained many skills such as creative thinking and problem solving with robotic coding…"
- PST9, PST31and PST33 "…. I realized that with robotic coding applications, metacognitive thinking skills are improved…"
- PST17, PST23, PST12 and PST3 " … I can now make a project about robotic coding and produce a product…"
- PST20 and PST21 "…. As teachers of the future, we must have 21st century skills and keep up with the digital age…."
- PST25 and PST29 "…. Materials to be used in robotic coding applications are very expensive…"
- PST14 and PST28 "…. It is difficult to find expert educators in robotic coding applications…"
- PST7 and PST27 "…. I am aware that my imagination is developing…"
- PST15, PST16, PST22, PST32, PST4 and PST17 "…. I can do projects that will be useful in our daily life…"
- PST8, PST14, PST17, PST23, PST25, PST27, PST30 and PST32 "…. I wish we could have received robotic coding training at an earlier age..."

Discussion

According to the results of the analysis conducted to determine the changes in the robotic coding attitudes and views of the pre-service teachers about the robotic coding applications made with Tinkercad, it was seen that there was a positive and significant change in the robotic coding attitude scores of the pre-service teachers.

Güleryüz and Dilber [10]. Güleryüz and Dilber [11]. Güleryüz etc. al [12]. When we look at the studies done, it is similar to the study about the opinions of Pre-Service Teachers about coding education in robotic coding applications. Looking at these studies, pre-service teachers expressed the necessity of having 21st century skills and keeping up with the digital age. It has been observed that

coding and robotics applications, which are among the 21st century skills, increase the motivation, attitude and interest of pre-service teachers in learning. It provides the concretization of information, making learning more meaningful.

In the study of Korucu and Taşdöndüren [17], it was concluded that the secondary school teacher candidates' taking robotic coding course affected their attitudes about robotics and coding, and the attitudes of pre-service teachers who took robotics and coding courses were higher. Similar views were obtained in the study of Sayın and Seferoğlu, [18] Examining the place of coding education as a 21st century skill in education policies. When the study was examined, it was seen that pre-service teachers included coding in their curriculum in order to develop their logical thinking and problem-solving skills and some of them to support employment in the sector. They obtained similar results with the study of Şişman and Küçük [22]. In the study, it is seen that the robotic attitude levels of the secondary school Pre-Service Teachers increase with the robotic coding practices. Accordingly, they said that the secondary school Pre-Service Teachers do robotic and robotic coding activities lovingly and adopting them. It is said that these applications are fun and enjoyable. When the literature is examined; It is seen that similar results have been obtained in studies in the fields of robotics and coding education. Welch and Huffman, [23] ; Datteri, etc. get. [8]; Senol and Buyuk, [20]; Gultepe, [14]; Senol and Demirer, [21]; Güleryüz, etc. al., [10]; Güleryüz [9].

Conclusion

As a result, in this study, the attitudes and opinions of pre-service teachers about robotic coding applications made with Tinkercad were examined and a positive perspective was formed in the attitudes and opinions of pre-service teachers towards robotic coding applications. There was a significant difference in the analyzes performed on the robotic coding attitude scale. With these results, consistent results were obtained with the feedback received from the interviews with the teacher candidates. Pre-Service Teachers generally used high-level thinking and problem solving expressions in their answers. They stated that robotic coding gives pre-service teachers self-confidence and that the pre-service teachers who receive robotic coding training have different skills and imagination. Considering the answers given, it can be said that the pre-service teachers formed a positive opinion about robotic coding applications, and very effective and successful results were observed. When the suggestions of Pre-Service Teachers regarding robotic coding applications are evaluated, the need for robotics and coding education at an early age emerges as a common opinion. With this education, which will be given at an early age, the prospective teachers' perspectives on life will change, their imaginations and high-level thinking skills will develop. Based on this result, it can be said that providing pre-service teachers with opportunities for robotics and coding education at an early age is extremely important in terms of gaining different skills and involving them in thinking processes.

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