In The Determination Of Self-Efficacy Situations Of Information Technology Teachers' Coding For Middle School Students, Robotic Coding And 3 Dimensional Design Examples Of Sakarya Province

Dr. Metin ÇENGEL
Sakarya University, Educational Faculty
cengel@sakarya.edu.tr

Dr. Ayşe ALKAN
ayshe_alkan@hotmail.com

Esra ÇAYIR
esracayirr54@gmail.com

Abstract
Increasing the quality and effectiveness of education and training, contributing to the social, political and economic structure of the countries is something that educators and educational policy makers are always working on. Increasing the quality of education and training nowadays can be achieved with the development of 21st century skills in the students, the integration of education with technology. The role of technological developments, which provide many conveniences for our everyday life, in education environments is getting more and more effective. In computer training, the use of coding and robotics is becoming a prevailing practice. Coding and robotics based informatics education; has the potential to unravel and shape the real world and to reveal the skills of creating innovative ideas and products through the application of the knowledge they learn to real life problems. The aim of this study is to reveal the opinions of Informatics teachers about the coding and robotics based IT teaching practices. The survey model was used and the study group consisted of 120 information technology teachers working in secondary schools in Sakarya province. These teachers were asked questions about quantitative research on whether they had received any training in robotic applications and coding in their previous lives and whether they would contribute to themselves and their students. The results were interpreted by quantitative evaluation tools.
Key words: *Information, coding, software, original product, robotics, trainer training, robotic coding, self-efficacy perception*

Introduction

We are talking about coding and robotic coding now and we are in a period where we have to talk. It is necessary to speak the same language with computerized systems in order to be able to tell them what to do and to guide them. The coding of this new foreign language of our era is among 21st century skills that are so important that it is no longer a stranger and that our children must win. Our children should meet this dill at the earliest possible age. My children should be given the opportunity to explore themselves in this area. Because at a later age our children are now starting to become more interested. A child who does not have the opportunity to meet with this skill will naturally not be able to develop such an interest. We see how games, social media, videos, and animations are all about our children. Prensky (2001) calls the new generation of individuals "digital natives" because of their clear view of their predisposition to digital technologies. This tendency is convinced that if my children are not educated in place and on time, only a society that consumes technology will remain as a shallow skill that can not go forward. Akpınar and Altun (2014) point out that the educational community can not look at this perspective from the viewpoint that the culture and the skills of the basic media literacy and basic media literacy and the skills of individuals have been developed to become typical consumers of information technology, which can only be a demand from the big commercial sector. We need to transition to a training program where we can raise individuals who produce their own technology from training programs that create a consuming society. In our country, coding education was included in the curriculum of the Secondary School and Imam Hatip Secondary School Information Technologies and Software Course (5th and 6th Grades) curriculum adopted and renewed by the Decision dated 17/07/2017 and numbered 78 of the Ministry of National Education Ministry Talim Terbiye Kurulu. This is an important step on our behalf.

Nowadays, with many block coding programs, children can take part in a more colorful, more entertaining adventure of coding out of complicated code structures that are heavy to them (Resnick et al., 2009). In addition to improving children's problem-solving and logical thinking skills, coding also supports learning in many classes such as mathematics, science and technology. Children learn to design projects and establish connections between ideas and collaborative work. These skills are not only for computer specialists but also for all ages, working people and everyone in the profession (Wing, 2006; Resnick, 2013). Must be found in 21st century individuals;

Basic skills such as problem solving, creativity, algorithmic thinking and computer thinking can be gained by teaching programming and computer science (Karabak and Güneş, 2013, Monroy-Hernández and Resnick, 2008). Thanks to robotic coding practices, they can catch up early on at the chance to observe how the codes they write come together with a piece of hardware. It has been stated that the self-efficacy perceptions of the students' performance on robotic coding activities after coding robotic coding activities significantly changed in the positive direction in the student activities (Kasalak, 2017) regarding the effects and activities of the secondary school students on the coding self-efficacy perceptions. This can be attributed to the fact that in robotic coding activities, children have the chance to see the designs they code. In addition, children's 3D design programs enable children to acquire 3D thinking and design skills at an early age.

A study on the effect of coding education and coding on educational policies as a new 21st century skill (Sayın ve Seferoğlu, 2016) investigated the effects of coding education in the world on the world location, education policies and development plans of the countries and obtained striking results. Even in the development plans that the whole world has emphasized, the encyclopedia that is included in our plans is a problem that we have to pay attention to as a country.

This important skill can be achieved with our teachers in the first place. The adequacy of our teachers to use these programs and tools to cry for children and the method-techniques of presenting them to students are extremely important. Scratch, code.org, mblock The primary purpose of coding in a similar environment is to improve learning outcomes and motivate learners by using coding as a tool to develop other skills, rather than teaching themselves (Resnick, 2013). For this reason, it is extremely important for the teacher to teach the coding, which is seen as the language to come to the competence in these subjects, to love the children and to enter the interests of the children. In this research, it has been tried to determine the self-efficacy of the knowledge teachers in coding, robotics coding and 3D design subjects. In their lectures, how much they are inclined to these topics was evaluated and their opinions about whether these topics were helpful or not were taken.

Purpose of the research

Within the scope of the study; It is to determine the self-sufficiency status of the knowledge teachers working in secondary schools in Sakarya province in terms of coding and robotic coding.

Method

In this section, information about research model, universe and sampling, data collection tool, data collection and analysis will be given.

Model of your research

Survey screening model was applied. The main purpose of screening research is to describe the situation as it exists. Everything that is subject to research is tried to be defined as if it is within its own conditions (Karasar, 2005). The data from the teachers constitute the screening part.

Working group

The universe of the research consists of 120 IT teachers working in Sakarya during the academic term of 2017/2018.

Data Collection and Analysis

In order to collect data in the survey, a questionnaire developed by the researchers was used. The questionnaire consists of two parts. Second part it consists of 30 attitude questions under 3 headings. The data obtained with the means of quantitative data collection in the study were analyzed using the SPSS 24.0 statistical program and descriptive statistics were used in the examination of the quantitative data.

Findings And Comment

Table 1. Gender Main Distributions of Respondents

Gender	Frequency	Percent
Woman	51	%43
Male	69	%57
Total	120	%100

When table 1 was examined, it was observed that the number of males was higher when the teachers participated in the survey were examined in terms of gender. It can be said that men prefer to teach IT.

Table 2. Distribution of Respondents In the Survey

The institution you work for	Frequency	Percent
Public	103	%86
Special	17	%14

Total	120	%100

When table 2 is examined, most of the teachers who participated in the survey were working from the state schools. As the number of specials is low, participation has been realized there.

Table 3. Occupational Seniority Distributions of Respondents

Your professional senior	**Frequency**	**Percent**
0-5	52	%42
6-10	41	%34
11-15	25	%22
16-20	1	%1
Above 21	1	%1
Total	120	%100

When table 3 is examined, it is seen that most of the teachers who participated in the survey are working among 0-10 years. From here, we can say that the informatics teacher branch is a new field.

Table 4. Participants In the Survey were Divided by the Faculties They Graduated From

Your graduate faculty	**Frequency**	**Percent**
Faculty of Education	92	%77
Technical Training	25	%21
Other	3	%2
Total	120	%100

When Table 4 is examined, it is understood that the majority of the teachers who participated in the survey graduated from the Faculty of Education. We can say that the information technology teachers in secondary schools are usually graduated from education faculty.

Table 5. Distribution of Participants In The Survey On The Code.org Application

Are you trained?	**Frequency**	**Percent**
Yes	46	%38
No	74	%62
Total	120	%100

When table 5 was examined, it was observed that the majority of the teachers who participated in the survey did not receive any training from Code.org application. It can be said that teachers do not take such kind of courses in the sections they read.

Table 6. Distribution of Educational Situations In The Field of Scratch Application by Respondents

Are you trained?	**Frequency**	**Percent**
Yes	46	%38
No	74	%62
Total	120	%100

When table 6 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institution related to scratch application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 7. Distribution of Educational Attitudes In The Field of Appinventor Application by Respondents

Are you trained?	**Frequency**	**Percent**
Yes	30	%25
No	90	%75
Total	120	%100

When table 7 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institution related to appinventor application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 8. Distribution of Educational Attitudes In The Field of Arduino Practice by Respondents

Are you trained?	**Frequency**	**Percent**
Yes	35	%30
No	85	%70
Total	120	%100

When table 8 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institution related to arduino application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 9. Distribution of Educational Status In The Field of Mblock-Arduino Application by the Respondents

Are you trained?	Frequency	Percent
Yes	34	%28
No	86	%72
Total	120	%100

When table 9 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institution related to mblock-arduino application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 10. Distribution of Educational Attitudes In the Field of MBot Application of Respondents

Are you trained?	Frequency	Percent
Yes	32	%27
No	88	%73
Total	120	%100

When Table 10 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institutions related to MBot application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 11. Distribution of Educational Attitudes In The Field of Makeymakey Application of the Respondents

Are you trained?	Frequency	Percent
Yes	34	%28
No	86	%72
Total	120	%100

When table 11 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institution related to makeymakey application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 12. Distribution of educational situations in the field of game coding applications of survey participants

Are you trained?	Frequency	Percent
Yes	36	%30
No	84	%70
Total	120	%100

When table 12 is examined, it is observed that the majority of the teachers who participated in the survey did not receive training from any institutions regarding game coding practices. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 13. Distribution of Educational Attitudes In The Field of TinkerCad Application by Respondents

Are you trained?	Frequency	Percent
Yes	30	%25
No	90	%75
Total	120	%100

When Table 13 is examined, it is observed that the majority of the teachers who participated in the survey did not receive training from any institutions related to TinkerCad application. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 14. Distribution of survey participants' 3d design and education in 3D printer area

Are you trained?	Frequency	Percent
Yes	38	%32
No	82	%68
Total	120	%100

When table 14 was examined, it was observed that the majority of the teachers who participated in the survey did not receive training from any institution in the area of 3d design and 3d printer. It can be said that they do not take such kind of courses or courses in the teachers' readings and their later occupations.

Table 15. Distributions of Use of Code.org Application In Participant's Lessons

Do you use it in your lessons?	Frequency	Percent
Yes	52	%43
No	68	%57
Total	120	%100

When table 15 was examined, it was observed that most of the teachers who participated in the survey did not use code.org application in their lessons. The fact that teachers do not receive training on how to integrate the Code.org application into classes has caused them not to use this practice in lessons. Teachers who received training in the subject (46% of the teachers who received the relevant training) or teachers who had knowledge in their own interest achieved the course gains by using the code org application in information technology and software lessons.

Table 16. Distribution of Usage of Scratch Application In The Courses of Participants In The Survey

Do you use it in your lessons?	Frequency	Percent
Yes	63	%52
No	57	%48
Total	120	%100

When table 16 was examined, it was observed that the majority of the teachers who participated in the survey used scratching in their lessons. It can be said that the fact that the teachers were educated about the subject caused the increase in the usage rate.

Table 17: Distribution of Usage of Appinventor Application In The Subjects of The Survey Participants

Do you use it in your lessons?	Frequency	Percent
Yes	4	%3
No	116	%97
Total	120	%100

When table 17 was examined, it was observed that the majority of the teachers who participated in the survey did not use appinventor practice in their lessons. Teachers should not be trained on how to integrate appinventor practice into lessons, which can be said to have caused them not to use this practice in lessons.

Table 18. Distribution of use of arduino practice in the subjects of the survey participants

Do you use it in your lessons?	Frequency	Percent
Yes	7	%6
No	113	%94
Total	120	%100

When table 18 is examined, it is observed that most of the teachers who participated in the survey did not use arduino practice in their lessons. It can be said that the majority of the teachers do not take an education about arduino practice, so they do not use this subject in the lessons.

Table 19. Distribution of Mblock-Arduino Usage In The Subjects of the Survey Participants

Do you use it in your lessons?	Frequency	Percent
Yes	10	%8
No	110	%92
Total	120	%100

When Table 19 is examined, it is observed that most of the teachers who participated in the survey did not use mblock-arduino practice in their lessons. It can be said that the majority of the teachers do not use MBLOCK-arduino training in their lessons.

Table 20. Distributions of Using MBot Application In The Courses of Participants In The Survey

Do you use it in your lessons?	Frequency	Percent
Yes	6	%5
No	114	%95
Total	120	%100

When table 20 is examined, it is observed that the majority of teachers who participated in the survey did not use MBot application in their lessons. It can be said that the majority of teachers do not take an MBTot training and do not use this topic in their lessons.

Table 21. Usage Distributions of Makeymakey Application In The Courses of Participants of The Survey

Do you use it in your lessons?	Frequency	Percent
Yes	8	%7
No	112	%93
Total	120	%100

When table 21 was examined, it was observed that the majority of the teachers who participated in the survey did not use makmakmaki in their lessons. It can be said that the majority of teachers do not take an education on makeymakey practice, which causes them not to use this subject in the lessons.

Table 22. Usage Distributions of Game Coding Applications In The Courses of Participants In The Survey

Do you use it in your lessons?	Frequency	Percent
Yes	32	%27
No	88	%73
Total	120	%100

When table 22 is examined, it is observed that the majority of the teachers who participated in the survey did not use the game coding practices in their lessons. It can be said that the majority of the teachers do not take an education about game coding practices, so they do not use this subject in the lessons.

Table 23. Use Distributions of TinkerCad Application In The Subjects of The Survey Participants

Do you use it in your lessons?	Frequency	Percent
Yes	14	%12
No	106	%88
Total	120	%100

When table 23 was examined, it was observed that the majority of the teachers who participated in the survey did not use the TinkerCad application in their classes. It can be said that the majority of teachers do not take an education on the application of TinkerCad, which causes them not to use this subject in the lessons.

Table 24. Distributions of Using 3d Design and 3d Printer In The Subjects of The Survey Participants

Do you use it in your lessons?	Frequency	Percent
Yes	12	%10
No	108	%90
Total	120	%100

When Table 24 is examined, it is observed that the majority of the teachers who participated in the survey did not use 3d design and 3d printer lessons. It can be said that the majority of the teachers do not use these subjects in their lessons if they do not receive an education on these subjects.

Table 25. Opinion Distributions of Respondents Regarding Code.org Implementation

Do you think it will be useful to students?	Frequency	Percent
Yes	116	%96
No	4	%4
Total	120	%100

When table 25 was examined it was observed that the majority of the teachers who participated in the survey thought that the implementation of code.org was beneficial to the students. If practical training is given to teachers related to the subject, it can be said that the potential of teachers to use code.org in their lessons is very high.

Table 26. Opinion Distributions of Respondents Regarding the scratch Application

Do you think it will be useful to students?	Frequency	Percent
Yes	118	%98
No	2	%2
Total	120	%100

When table 26 is examined, most of the teachers who participated in the survey indicated that they think that scratch application is beneficial to the students. If a hands-on training is given to the teachers concerned, it can be said that teachers' scratching practice will have a very high use potential.

Table 27. Opinion Distributions of Respondents Regarding Appinventor Application

Do you think it will be useful to students?	Frequency	Percent
Yes	97	%81
No	23	%19
Total	120	%100

When table 27 is examined, the majority of teachers who participated in the survey indicated that they think that appinventor application is beneficial to the students. If practical training is given to the teachers related to the subject, it can be said that the usage potential of teachers' appinventor in their lessons is quite high.

Table 28. Participants' Opinions About Arduino Practice

Do you think it will be useful to students?	Frequency	Percent
Yes	102	%85
No	18	%15
Total	120	%100

When table 28 is examined, the majority of the teachers who participated in the survey indicated that arduino practice is beneficial to the students. If practical training is given to the teachers related to the subject, it can be said that the usage potential of the teachers in the courses of arduino training will be quite high.

Table 29. Opinion Distributions of Respondents Regarding Mblock-Arduino Application

Do you think it will be useful to students?	Frequency	Percent
Yes	112	%93
No	8	%7
Total	120	%100

When table 29 is examined, the majority of the teachers who participated in the survey indicated that they think MBLock-arduino application is beneficial to the students. If practical training is given to the teachers related to the subject, it can be said that the usage potential of mblock-arduino teachers in their lessons is very high.

Table 30. Opinion Distributions of Respondents Regarding MBot Application

Do you think it will be useful to students?	Frequency	Percent
Yes	107	%89
No	13	%11
Total	120	%100

When table 30 is examined, the majority of the teachers who participated in the survey indicated that they think MBot application is beneficial to the students. If practical training is given to teachers related to the subject, it can be said that the usage potential of the MBot application is very high.

Table 31. Opinion Distributions of The Respondents Regarding Makeymakey Application

Do you think it will be useful to students?	Frequency	Percent
Yes	107	%89
No	13	%11
Total	120	%100

When Table 31 is examined, the majority of the teachers who participated in the survey stated that they think that makeymakey application is beneficial to the students. If practical training is given to the teachers related to the subject, it can be said that the use of makeymakey in their lessons will be quite high.

Table 32. Opinion Distributions Related to Game Coding Practices of Respondents

Do you think it will be useful to students?	Frequency	Percent
Yes	115	%95
No	5	%5
Total	120	%100

Table 32 shows that the majority of the teachers who participated in the survey think that the game coding practices are useful to the students. If practical training is given to the teachers related to the subject, it can be said that the use of the game coding practices by the teachers is very high.

Table 33. Opinion Distributions of Respondents Regarding TinkerCad Implementation

Do you think it will be useful to students?	Frequency	Percent
Yes	102	%85
No	18	%15
Total	120	%100

When Table 33 is examined, the majority of the teachers who participated in the survey indicated that they think TinkerCad application is beneficial to the students. If practical training is given to the teachers related to the subject, it can be said that the use of TinkerCAD by teachers is very high.

Table 34. Participants' Opinions About 3d Design and 3d Software

Do you think it will be useful to students?	Frequency	Percent
Yes	102	%85
No	18	%15
Total	120	%100

When Table 34 is examined, the majority of teachers participating in the survey indicate that 3d design and 3d printer applications are useful to the students. If practical training is given to the teachers related to the subject, it can be said that the teachers use 3d design and 3d printer applications in their lessons.

Conclusion And Discussion

120 information technology teachers working in secondary school participated in the research. 77% of our teachers are graduates of the Faculty of Education. Approximately 70% of our teachers on programs that make children's coding learning experience more enjoyable such as Code.org, scratch, appinventor, arduino, mblock-arduino, mbot, makeymakey, oyuncodlama, tinkercad, 3d design, robotics applications and 3D designs He has been receiving. Therefore, our teachers who do not have sufficient knowledge about these subjects use about 20% in their practice. It can be said that there are hardware deficiencies in the reason why these subjects are not used in the lessons. When our teachers were asked if these practices were beneficial to their students, they said that 90% would be useful. This shows to us that if our teachers take trainings on these subjects, their potential to practice in their courses will be quite high.

Suggestions

Most of our teachers do not have any training related to coding, robotics coding and 3D design for middle school students in university years and later occupations. For this reason, it can be rearranged according to the needs of today by observing the curriculums of the universities. In addition, in-service trainings can be revised again in the light of these topics. It can be planned that the trainings related to these topics will be made at a frequency that can reach wider masses because there will be an intense demand.

An average of 30% of teachers have knowledge about these topics and there are various reasons why 20% of them use them in their lessons. The absence of information classes and the inadequacy of hardware in information classes can be seen among these reasons. In addition, when these trainings are given, it can be thought that it is inadequate for the teachers to give only the contents of the topics to the teachers about how these topics can be given to children and with which activities. For this reason, such trainings need to be well organized and well designed.

We see that our teachers have very positive views on coding, robotic coding, and 3D design. According to other countries, our greatest advantage in coding is that we do not have trained teachers in this area. For this reason, the necessary infrastructure for the use of this potential in the positive direction, the design and realization of the trainings as soon as possible will be beneficial for our country and our future.

References

Akpınar, Y.,&Altun, A. (2014). *Bilgi toplumu okullarında programlama eğitimi gereksinimi*.ElementaryEducation Online, 13(1), 1-4.

Karabak, D.,& Güneş, A. (2013). *Ortaokul birinci sınıf öğrencileri için yazılımgeliştirme alanında müfredat önerisi*. Eğitim ve Öğretim AraştırmalarıDergisi, 2(3),21.

Karasar, N. (2005). *Bilimsel Araştırma Yöntemi.* (14. Baskı).Nobel Yayın Dağıtım, Ankara.

Kasalak, İ.(2017). *Robotik Kodlama Etkinliklerinin Ortaokul Öğrencilerinin Kodlamaya İlişkin Öz-Yeterlik Algılarına Etkisi Ve Etkinliklere İlişkin Öğrenci Yaşantıları*. Hacettepe ÜniversitesiBilgisayar ve Öğretim Teknolojileri Eğitimi Anabilim Dalı Yüksek Lisans Tezi.

Monroy-Hernández, A.,&Resnick, M. (2008). *Empowering Kids toCreateandShareProgrammable Media*. interactions 15,2, (pp. 50-53).[Çevrim-içi:http://arxiv.org/pdf/1507.01282.pdf, Erişim tarihi: 13.07.2018].

Prensky, M. (2001). *Digitalnatives, digitalimmigrants*. On TheHorizon, 9(5), 1-6.

Resnick, M.(2013).Learntocode, codetolearn. How programmingprepareskidsformorethanmath. EdSurge 8.
Resnick, M.,Maloney, J., Monroy-Hernández, A., Rusk, N., Eastmond, E., Brennan, K., Kafai, Y.(2009). *Scratch: Programming forall*. Communications of the ACM, 52(11).
Sayın Z. ve Seferoğlu S. (2016). *Yeni Bir 21. Yüzyıl Becerisi Olarak Kodlama Eğitimi ve Kodlamanın Eğitim Politikalarına Etkisi*. Akademik Bilişim Konferansı 2016, 3-5 Şubat 2016.
Wing, J. M. (2006). *Computationalthinking*. Communications of TheAcm, 49(3), 33-35.