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Reflections from Robotic Coding Trainer Training: Teacher Opinions

Ümmühan Avcı[1]
Bartın University

Rıza Başaran[2]
Ministry of Education

Abstract

In this study, it is aimed to examine how the teachers evaluated the robotic coding trainer training they received, the problems in the training, how they transferred the training to their lessons and their opinions on the practices. Seventeen teachers working at the Ministry of National Education in Ankara and receiving "Robotic Coding Trainer Training" participated in this research, which was designed as a qualitative case study. The data were collected by preparing a semi-structured interview form consisting of 15 questions in line with the purpose of the study. The data were analyzed by descriptive analysis method. According to the results of the research, it is seen that teachers participate in this training because it supports the education process and contributes to their personal development. It has been observed that teachers receive training to teach students, apart from peer training, which is the main purpose of trainer training. When the positive opinions of the teachers about the robotic coding education were examined, the themes of contribution to personal development, information about robotic education, acquiring programming skills, cooperation and reward emerged. Inadequate time, inadequacy of materials and application were reflected as negative opinions. With the results of this research, it is aimed to contribute to the training of trainers, one of the most important aims of which is dissemination.

Key Words

Robotic coding • Trainer training • Teachers

[1] **Correspondance to:** Bartin University, Faculty of Economics and Administrative Sciences, Bartın, Turkey, E-mail: ummuhanavci@gmail.com **ORCID:** 0000-0001-7007-1478
[2] Ministry of Education, Ankara, Turkey, E-mail: basaranrz@gmail.com **ORCID**: 0000-0002-3470-1724

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In this day that we face a global system based on high technology, technological innovations such as artificial intelligence, machine learning, and the internet of things, in which robots are involved in the production with digitalization, gets ahead of societies. It can be said that this situation forces the education systems of the countries to change, transform and innovate with a new paradigm. The most apparent aspect of this challenge is the inability of traditional education systems to respond to production systems based on high technology. It is assumed that individuals and societies can acquire the skills of the 21st-century world and realize the digital transformation, with this change to be made in the context of education.

Artificial intelligence and the internet of things show that the enabling of digital transformation with industry 4.0 will bring about the unification of things and people in a sense. While this transformation and innovation necessarily make a series of intellectual processes discuss how people should be raised with philosophy in the field of education, in practice, the spread of coding practices in schools makes it necessary to prepare for the digital world of the future. Robotic coding practice, which we can say a prestudy for competencies such as "design, formation, creation, and invention", stands before us, not just individuals and societies who use what is done about the digital world. In this context, it can be said that the coding skill not only paves the way for learning to solve the problems encountered in daily life but provides the students with competencies such as strategy formation, design and creation as well. The inclusion of robotic equipment in coding education contributed to 21st-century skills. Coding skills is seen that among "21st century skills" according to the European Commission. It is presented a learning environment that can be understood the logic of both smart devices and the internet of things with tangible practices. According to the reports which have been prepared, "information - operational thinking" is taking part among the most basic skills of the future labor force and this requirement will direct to employment of Specialist of Information Technologies (Richards & Terkanian, 2013; Bidwell, 2013). This situation has qualification that makes easier the employment of the instructors who will education in the field of robotic coding.

Robotic coding applications offer the opportunity to directly observe how a piece of hardware or a large number of hardware works with software, which is an abstract process. In this respect, educators prefer the way of diversifying coding teaching with such hardware supports. With the inclusion of robotic equipment in coding education, which contributes to the computational thinking skill, which is considered among the 21st-century skills, a teaching environment is provided in which the logic of both smart devices and smart devices communicating with each other (internet of things) can be understood with concrete applications (Kasalak, 2017). Robotic coding applications develop creativity along with imagination. Chambers and Carbonaro (2003) pointed out that integrating robotic technologies into schools is a difficult process and even today educators find this task challenging. Software processes are difficult to understand because they require abstract operations. With robotic coding, it is possible to embody and directly observe how the codes can work with hardware after compilation. Learners, who encounter this opportunity to observe at a young age, can present products with their creativity. While this situation provides them with self-confidence, it also brings the individuals of the digital world of the future to grow. As stated in the 2023 Education Vision (MEB, 2018) targets, it has gained importance to produce content for the development of digital skills and to conduct teacher training (training for trainers).

Coding training was included in the Information Technologies and Software Course (5th and 6th Grades of Secondary School) curriculum (TTKB, 2012) in 2012, and in the Computer Science Course program (TTKB, 2016) at the high school level in 2016 in the studies carried out in our country in the adaptation of technology to education. The information technologies and software course (Secondary School 5th and 6th Grades) included programming logic in the curriculum with the expression "to acquire and develop problem-solving and computational thinking skills" (TTKB, 2018).

When the literature is examined, it is seen that the studies are generally on coding education, and there are few studies on the training of teachers who will give robotic coding training. Çömek and Avcı (2016) examined the aspects of teachers about robotics applications in science education in their studies made together. They stated that the use of robotic applications in science education has a positive effect on students' participation in the course and their attitudes towards the course. Göncü et al. (2018) examined the aspects of prospective teachers on coding training in their research. They stated that prospective teachers' aspects on coding education were limited. Türker and Pala (2018) in their study to get the opinions of secondary school students, teachers, and parents of students about coding, some of the teachers who participated in the research stated that they did not see themselves as sufficient in coding or did not consider them sufficient at a basic level. In their study, Bütüner and Dündar (2018) discussed the use of robots in coding education and taking the experiences and opinions of teachers in robotic coding trainer education. They stated that teachers were given positive feedback about the training they received and that they were successful by preparing a project at the end of the training. Göksoy and Yılmaz (2018) examined the opinions of information technology teachers and students about the robotics and coding course in their study. Most of the teachers stated that robotics and coding courses improved the analytical thinking skills of the students, made them comprehend the logic of algorithms, and increased their multidimensional thinking skills. Schina et al. (2021) found that there was no uniformity in their study regarding the duration and requirements of training programs, and that information on trainer profiles was not always documented. According to the researchers, robotic coding teacher training programs are generally not based on theory.

In this respect, in this study, it was aimed to examine how the teachers who received robotic coding trainer training evaluated the coding training they received, the problems they saw in the training; how they transferred the training they received to their lessons and their views on the practices. The research problem was determined as follows:

What are the teachers' opinions on the robotic coding trainer training and applications they receive?

1. What are the teachers' opinions on robotic coding trainer training?

2. What are the teachers' opinions on the process of transferring the robotic coding trainer training to their colleagues?

3. What are the teachers' suggestions to the teachers who will receive this training?

Method

This study, which examines the opinions of teachers about the robotic coding trainer training they receive and their reflections in their lessons, is a qualitative case study. According to Yıldırım and Şimşek (2016), qualitative research is defined as a research method in which qualitative data collection methods such as interviews, observations, document analysis, and reports are used and a qualitative process is followed to reveal the events realistically and holistically.

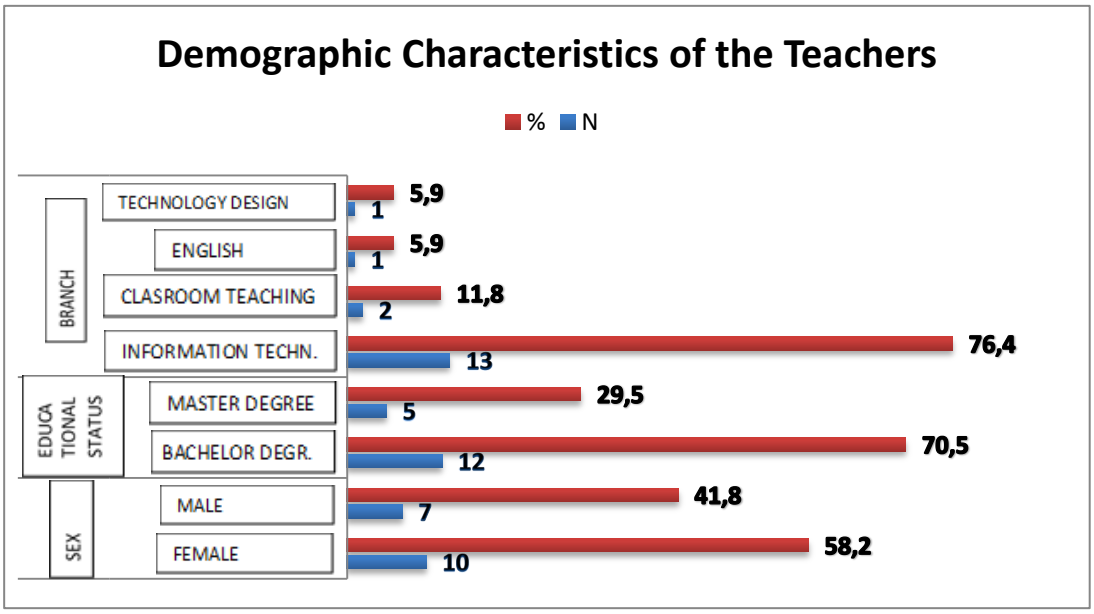
Participants

In this study, the criterion sampling method, which is one of the purposive sampling types, was used. The criterion accepted in this study is that the participants had previously received coding training and robotic coding trainer training. The study group of the research consists of 17 teachers working in the Ministry of National Education in Ankara and receiving "Robotic Coding Trainer Training".

The demographic characteristics of the teachers are given in Figure 1.

Figure 1

Demographic Characteristics



When the information in Figure 1 is examined, 58.2% of the teachers are female (N=10) and 41.8% are male (N=7). Considering the educational status of the teachers, it is seen that 70.5% of them are undergraduate (N=12) and 29.5% are graduates (N=5). When examined in terms of the branch variable, it consists of 76.4% information technologies and software teachers (N=13), 11.8% classroom teachers (N=2), technology design teachers (N=1), and English teachers (N=1). A limited number of teachers were reached due to reasons such as the very small number of teachers who received training, which is our research subject, and data collection voluntarily in the province of Ankara.

Data Collection Tools and Data Collection

In the process of preparing the interview questions created by the researchers, a literature review was conducted and a semi-structured interview form consisting of 15 questions was prepared in line with the purpose of the study. The prepared questions were asked to a specialist teacher who received this training and arrangements were made in accordance with his opinions. Firstly, interrelated questions were combined and long questions were rearranged. The interview form was sent to 2 academicians to get an expert opinion. Taking into account the suggestions of the academicians, the questions were corrected and the form was given its final form. Interview form questions were transferred to Google Forms and 3 more teachers who received robotic coding trainer training were sent to determine the intelligibility of the form and they were asked to fill in the form, and the answers given were evaluated. After it was understood that there was no need for any change at this stage, the interview form was sent to the participants and they were asked to respond. The questions in the semi-structured interview form are as follows:

1. Write down your reasons for participating in the robotic coding trainer training.
2. Could you explain the positive aspects of the robotic coding training program?
3. Could you explain the negative aspects of the robotic coding training program?
4. Was the robotic coding training program you received sufficiently in terms of content? Explain with reasons.
5. What are your suggestions for the development of the robotic coding training program in terms of content?
6. Did you have the opportunity to explain the robotic coding training you received to your colleagues within the scope of the training?
    a. If your answer is yes:
        i. Write down your positive experiences.
        ii. Write down your negative experiences.
    b. If your answer is no:
        i. What do you think are the possible reasons why you cannot find this opportunity?
        ii. What are your suggestions for solving this problem?
7. What are your suggestions to teachers who plan to receive robotic coding trainer training in the future?

Data Analysis

The data obtained through the interview form were analyzed with the descriptive analysis method. Descriptive analysis is a type of qualitative data analysis that includes summarizing and interpreting the data obtained by various data collection techniques according to predetermined themes. In the descriptive analysis, direct quotations are frequently used to reflect the views of the individuals interviewed or observed strikingly. The purpose of this type of analysis is to present the findings to the reader in an organized and interpreted form. For this purpose, it is necessary to conceptualize the collected data first, then organize it logically according to the emerging concepts and determine the themes that explain the data accordingly (Yıldırım & Şimşek, 2016). Percentage and frequency were used to digitize the data.

Findings

In this part, after the analysis of the data, the themes and sub-themes were determined, tables were created, and the opinions of the teachers who received robotic coding trainer training were presented and interpreted.

Teachers' Opinions on Robotic Coding Trainer Training

Learning how well the teachers met their expectations of the training that you got has been considered important in terms of an overview of the research questions. The majority of the participants who participated in the research said that this training met their expectations (N=10), and about 1 of 3 (one-third) said that it did not meet their expectations (N=5). Two teachers abstained. The majority (about 2/3) of the teachers who attended the training were satisfied with the training.

Reasons for teachers to participate in robotic coding trainer training

Teachers' opinions on the reasons for participating in robotic coding trainer training; were gathered under the themes of professional development, personal development, support for the education-teaching process, and perception of benefit.

Table 1

Reasons for Teachers to Participate in Robotic Coding Trainer Training

Themes	Sub-themes(codes)	f
Professional Development	Obtaining a certificate	2
	Making projects	2
	Professional development	1
	Total	**5**
Self-Improvement	Getting information	3
	Self-development	3
	Request/Interest	2
	Total	**8**
Support for the Education-Training Process	Preventing wrong education	1
	Training students for competitions	1
	Recitation to students	6
	Training the student	1
	Guiding the student	1
	Making projects with students	2
	Total	**12**
Benefit perception	Benefiting students	1
	Benefiting the school	1
	Total	**2**

When looking at the details, they stated that they mostly supported the education process (f=12), followed by personal development (f=8), and participated in professional development (f=5). It was seen that the idea of teaching students a lesson came to the fore in the title of support for education. This situation is inconsistent with the priorities of training of trainers. Priorities in supporting or encouraging robotic coding, training of trainers by institutions, and dissemination activities are very important for the realization of these priorities. Within the scope of the dissemination activities of this training, the very priority was determined as the teacher's training to his colleagues

and the second priority as telling his students. However, the second priority became prominent in this study. The teachers did not mention about teaching to their colleagues. From this point of view, it can be stated that teachers do not know the priority objectives of the "training of trainers" program. Some of the quotations containing the opinions of the teachers that they aim to inform their students by using the education they receive in their lessons are as follows:

T6: I give a lesson of Information Technologies and software course; I wanted to teach my students with new information.

T11: To learn and to explain to my students/to be knowledge itself.

T7: To train students for competitions in the field of robotics.

The second prominent theme is the professional development theme. Regarding this matter; it is seen that teachers participate in trainer training because they are interested in gaining knowledge, improving themselves, and robotic coding training.

The answers of the relevant teacher 15, teacher 16, and teacher 17 on this subject are as follows;

T15: To improve myself.

T16: To improve myself in my field.

T17: To improve myself.

Positive opinions of teachers about the robotic coding program

When the sub-themes related to the positive opinions of the teachers about robotic coding education were examined, the themes of contribution to personal development, information about robotic education, acquiring programming skills, cooperation and reward emerged (Table 2).

Table 2

Positive opinions about the robotic coding training program

Themes	Sub-themes(codes)	f
Contribution to Personal Development	Pleasure of learning	1
	Sense of achievement	1
	Eye-opening	1
	Contributing to personal development	1
	Learning how to learn	2
	Contributing to development	1
	Developing self-confidence	1
	Self-sufficiency	1
	Total	**9**
Information on robotic education	Getting information	2
	Sequential learning	2
	Ability to adapt to student level	1
	Project-oriented work	1
	Proper training in a short time	1
	Trying again and again	1
	Electronic circuit creation	1
	Getting to know the robotics training set	2
	Total	**11**
Gaining Programming Skills	Learning coding techniques	2
	Learning to code Adriano with C#	1
	Total	**3**
Cooperation	Friends to cooperate	1
	Exchange of ideas with friends	1
	Total	**2**
Reward	Robotics training set	1
	Awarding product	1
	Total	**2**

As can be seen in Table 2, teachers' positive opinions about the education they received are grouped under the headings of personal development, information about robotic education, acquiring programming skills, cooperation and rewards. The most prominent among these are information about robotics education (f=11) and contribution to personal development (f=9). When we browse at the opinions of teachers about robotic education, the most prominent ones are; recognizing the robotics training set, learning sequentially, and acquiring knowledge. In the light of this information, the teachers' recognition of the robotics training set with this training was reflected as a positive opinion. Some of the quotations containing the opinions of the teachers on the subject are as follows:

T4: Being systematic, proceeding sequentially. Having the test feature, being able to try again no matter how many mistakes are made. Providing an opportunity for project-oriented work.

T8: I developed my self-confidence for creating electronic circuits; I had the opportunity to cooperate by establishing useful friendships.

T15: I learned more about robotics.

After the information about robotic education, teachers reported the most positive opinion in the theme of "contribution to personal development (f=8)". Teachers stated that this training contributed to their personal development. Some of the quotations containing opinions about contribution to personal development are as follows;

T2: We learned about many subjects.

T9: I had a basic knowledge of this subject. The fact that the trainer giving the training included high-level information contributed to my development.

T17: It has contributed to my personal development.

While teacher 13 of the participants expressed a positive opinion about education, he/she expressed his opinions on the themes of knowledge about robotic education, gaining programming skills and cooperation as follows:

T13: We exchanged ideas with the participating friends; we got to know the robotics training set. We learned about programming techniques.

Two of the teachers who expressed a positive opinion about the education program stated that they were given a gift robotic set and product (robotic set) in education. It is seen that the fact that these teachers receive a gift set is an important reason for satisfaction in expressing positive opinions about the content of the program.

T11: They gifted us a reward kit.

T12: Learning outcome and product.

Negative opinions of teachers about the robotic coding training program

When teachers' negative opinions about robotic coding trainer education are examined, their themes emerge in terms of educator, teaching process, and content (Table 3). All three teachers stated that they did not have negative opinions about robotic coding trainer training.

Table 3

Negative Opinions about the Robotic Coding Training Program

Themes	Sub-themes(codes)	f
In terms of trainer	The inexperience of the trainer	2
	The fact that the instructor is outside of his or her area of expertise	1
	Insufficient knowledge of the trainer	1
	Total	**4**
In terms of the education process	Lack of time	4
	Lack of materials	3
	The fact that the trainees do not possess the same level of knowledge	2
	Lack of practice	3
	The fact that projects remained no more than a theory	1
	Lack of applicability	1
	Failure to embody education	1
	Total	**15**
In terms of contents	Lack of contents	1
	Lack of presentation	1
	Lack of project samples	2
	Content redundancy	1
	Total	**5**

When Table 3 is examined, the theme for the teaching process comes to the fore the most (f=15). Looking at the sub-themes of this theme; lack of time (f=4), lack of materials (f=3), lack of practice (f=3), the fact that the trainees do not possess the same level of knowledge (f=2), the fact that projects remained no more than a theory (f=1), lack of applicability (f=1) and failure to embody education (f=1). Among these opinions, the lack of time (hour) was expressed the most. The content of the training is 4 days and 32 hours. It can be stated that this time is not enough for teachers. The lack of practice and the lack of materials are among the negative aspects for teachers. The lack of practice may also be due to the lack of time.

Some of the quotations containing opinions on the subject are as follows;

T1: The fact that most of the trainees remain in the position of spectators since many projects remain no more than a theory, lack of practice, and material problems.

T2: There was not enough time.

T3: It can't reflect on the students in the superficial classroom, the instructor is far from teaching, the content is a fiasco, the content presentation is a fiasco, and the use of the material is a fiasco. There were many mistakes and deficiencies in the prepared material, and he did not even give us a tool to apply the examples he described.

T7: 30 hours is not enough time.

T12: There could have been more lecture hours and sensor work.

Teachers (f=5) who gave negative opinions in terms of content mentioned the inadequacy of the content and presentation and the scarcity of project examples. One teacher also stated that the content was too much. Quotations containing opinions on this theme are as follows:

T1: Many of the trainees were mere spectators since many projects remain no more than a theory, lack of practice, and material problems...

T17: The time is not enough, the examples should be increased, the practices should be a lot, and the content was too much.

Teachers (f=4) who had negative opinions about the educator stated that the educator was inexperienced and had insufficient knowledge. In addition, they stated that the fact that the educator is outside the area of his/her expertise is negative in terms of education. The opinions of teacher 8 and teacher 11 on this subject are as follows:

T8: The training given on coding and the attitude of the teacher showed that he was not fully experienced.

T11: The fact that narrator is an engineer; therefore he goes into the next topic regardless of whether everyone understands it or not during the application.

Teachers' opinions on the proficiency of the robotic coding education program in terms of content

It was seen that 6 teachers found the robotic coding training program they received sufficient and 11 teachers did not find it sufficient in terms of content. 4 of the 6 teachers, who found it sufficient, that is, gave a positive opinion, explained their opinions with their reasons, while 2 of them did not explain or give a reason (Table 4). Teachers who did not find the content of the training sufficient explained why they did not find it sufficient. When the opinions of the teachers were examined, it was determined that most of them did not find the educational content sufficient.

Table 4

Competence Status and Reasons for the Content of the Robotic Coding Training Program

Positive reasons	**f**	**Negative reasons**	**f**
Information is given to students	1	Lack of time	4
Serves the purpose	1	The fact that the instructor is not a teacher	3
Basic knowledge	1	Lack of equipment	2
Learned by process	1	Lack of awareness	2
		Lack of technical knowledge	2
		Lack of practice	1
		Lack of concrete examples	1
Total	**6**	**Total**	**11**

When Table 4 is examined, and when the reasons for expressing positive opinions of teachers who expressed positive opinions are examined; they stated that teaching the information explained to the students, being an education that serves its purpose, provides basic information and knowledge to be learned by process, that is, it will be learned over time. Quotations containing these views are as follows:

T4: It was highly sufficient.

T6: It was sufficient. I learned more than I could share with my students, so it was a satisfying education for me that served my purpose.

T9: I think it was enough since I have basic knowledge of this subject. However, when I think of those who do not know this subject, I can say that they may have difficulty understanding the content.

T10: The content was satisfying. Robotics is a discipline that grows as you do it in the process.

T11: It was sufficient.

When the positive opinions of the teachers about the content were examined, they stated that the content of the education was sufficient since they would explain to their students and receive a basic education.

When the opinions of the teachers who did not find the content of the education sufficient were examined, they mostly cited the duration and the fact that the educator was not a teacher as the reasons for not finding it sufficient. The opinions of the teachers on this subject are as follows:

T2: It was not enough. It was insufficient in terms of hours and space.

T7: Insufficient. It remains at the basic level due to the duration.

T8: The content was too much for the given time, I do not think the course instructor was sufficient, especially in terms of transferring the content to us, although he is an expert in his field as an engineer.

T15: The instructor was not an expert in his field.

The other reasons why the teachers did not find the training program sufficient in terms of content were the lack of equipment and technical knowledge. The opinions of the teachers on this subject are as follows:

T1: It was not enough; there should have been a more comfortable classroom environment with more practice and sufficient equipment.

T13: No, it could have contained more technical information.

Suggestions for developing the content of the robotic coding training program

When the suggestions of teachers about developing the content of the robotic coding training program are analyzed, themes that are related to education, content, and practice emerged (Table 5).

Table 5

Suggestions for Developing the Content of the Robotic Coding Training Program

Themes	**Sub themes (codes)**	**f**
Related to education	Time should be increased	4
	It should be an education that is taught to children	1
	There should be a preliminary	1
	There should be beginner and advanced levels	1
	It should provide the trainer education	1
	Trainee level must be the same	1
	Total	**9**
Related to content	The content should be prepared from simple to difficult	1
	The content should be simple and clear	1
	The content should be reduced	2
	Arduino basic should be explained	1
	Coding logic should be comprehended	1
	The content is adequate	1
	The content should be goal-oriented	1
	Total	**8**
Related to practice	Robotic projects should be done at the end of the course	2
	The practice should be more	2
	The practice hours should be increased	1
	Original project examples should be given	1
	Feasible projects should be increased	2
	There should be examples that different branches will use	1
	Total	**9**

When Table 5 is analyzed, suggestions for the developing the content of the robotic coding training program were gathered under the themes of education (f=9), content (f=8) and practice (f=9). Among these, it is seen that education and practice themes are the most common. Considering the opinions about education, they stated that mostly the education period should be increased (f=4). Direct quotations containing opinions on the subject of education are given below:

T7: Extending the time

T8: Our training required preliminary knowledge for the content, I think it is quite challenging for those who do not know. The course could be divided into two as beginner and advanced level.

T10: The time can be increased. Learning will be more permanent with more practice.

When the opinions of Teacher 8 are examined; it is seen that there are suggestions about content as well as suggestions about education.

When teachers' views on practice are examined, mostly the opinions that robotic projects should be done at the end of the course (f=2), practice should be more (f=2) and applicable projects should be increased (f=2) come to the fore.

When the content of the training is examined, there are sample practices related to the given topics. It is seen that these sample practices are given in the lesson, but they are not sufficient and the teachers want more practices. Quotations containing the opinions of teachers on this subject are given below:

T1: Increasing the applicable projects, understanding the coding logic instead of memorizing…/the practice should be more.

T14: Theoretical foundations should be given, but they should not dominate the majority of the education. I prefer to give hands-on training with original projects rather than having the standardized practices that are made in everywhere.

T15: Providing education such that projects with robots can be made at the end of the course.

T17: The implementation time should be increased. The content should be reduced.

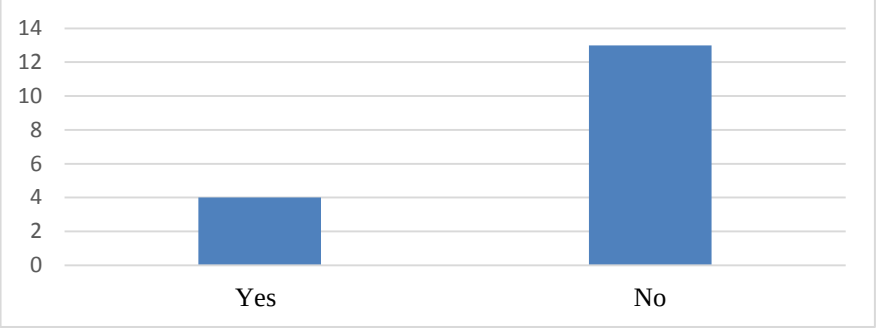
When the opinions of the teachers on this subject were examined, they stated that the training period is not sufficient and the duration should be increased.

Teachers' opinions on the process of transferring robotic coding trainer training to colleagues

In the second sub-problem, it was tried to determine the opinions of the teachers about the process of transferring the robotic coding trainer training to their colleagues. The situation of transferring the robotic coding trainer training to their colleagues is given in Figure 2.

Figure 2

Transfer of Training to Colleagues



When Figure 2 is examined, it was seen that 4 teachers conveyed the education they received to their colleagues and 13 teachers did not. It was understood that most of the teachers could not transfer the education they received to their colleagues. This situation contradicts the aims of trainer education. The first priority of trainer training is to transfer the training received to colleagues. The teacher who receives this training should make a plan with the school administration after starting to work and ensure that the teachers in the school receive this training. From this point of view, it can be stated that teachers do not know the primary objectives of the "training for trainers" program.

Positive and negative experiences of teachers during the education process

When the positive and negative experiences of the teachers who teach their colleagues at their schools are examined, the positive and negative experiences of 4 teachers in this training process are given in Table 6.

Table 6

T*he positive and negative experiences that you had during the education that you gave*

Positive	**f**	**Negative**	**f**
Concretization of the coding	2	Crowded groups	1
Providing practicality	1	Difficulty in supplying material	1
Using in their lessons	1	To be tiring	1
Making projects	1	Unwillingness of trainees	2
Positive feedbacks	1	Lack of coding background	1
Total	**6**	**Total**	**6**

Teachers, who told their colleagues about the education they received, stated that they gained practicality in coding, the feedback was positive, coding became concrete with the sample practices and they used it in their friends' lessons. In line with these views, it can be interpreted that the teachers who provide education carry out the dissemination activities of the education they receive. 4 teachers who teach their colleagues in their schools stated their positive experiences as follows:

T3: When the teachers lit the first led lamp, they started the engines for the first time, and they started the car for the first time, they were very happy.

T4: Seeing the output of the coding in concrete form is the biggest advantage of this training"

T5: It helped me to be more practical while conveying the subjects.

T10: Their feedback was very positive. The information is being transferred actively because the audience I teach is generally made up of ICT teachers.

Four teachers who teach their colleagues in their schools stated their negative experiences as follows:

T4: It is difficult to work in large groups. It is difficult to obtain piece materials. Since it is a hands-on training, it can be tiring to check, help. Both practice and coding can be tiring for the trainee, extra effort is required. Therefore, trainees must be willing and able to spare time.

T5: What will this information do for us in real life?

T13: There is no pre-learning; there are people with low coding skills.

One of the teachers who gave training said that he did not have a negative experience.

T10: I did not have a negative experience.

When the negative experiences of the teachers about the education they provide are examined, the trainees' lack of prior knowledge and motivation, difficulties in obtaining materials and the difficulty of the learning process are stated as negative opinions.

Possible reasons and solution suggestions of teachers who cannot provide education

The reasons for the teachers who could not find the opportunity to provide education (N14)) and their views on the solution of this situation are given in Table 7.

Table 7

Possible Reasons of Teachers Who Could not Find the Opportunity to Provide Education and Their Opinions to Solve This Problem

Reasons	**f**	**Solution suggestions**	**f**
Lack of demand	5	It should be done at the appropriate time	6
Time problem	3	Necessary equipment should be provided	2
Intense work schedule	3	Basic education should be given	1
Insufficient training set	1	Informatics course should be given importance	1
Absence of IT class	1	Block coding should be supported	1
		It should be given to willing teachers	1
		Trainer training should be planned	1
Total	**13**	**Total**	**14**

When the possible reasons for the teachers who could not explain the education they received to their colleagues at their schools within the scope of a training were examined; the themes of lack of demand (f=5), time problem (f=3) and intense working schedule (f=3) emerged. Since the teachers are not given enough information about the activities they will do after the trainer's training, they expect a request from their colleagues in this direction. However, due to the education they received, they should start working with the school administration by making a plan without waiting for any demand for robotic coding education in their schools. From this point of view, it is understood that this plan was not made.

In this regard, teachers stated their opinions as follows:

T2: There was no such opportunity.

T6: Common time problem

T8: There was no demand since the teaching of ide codes would cause difficult times for teachers who do not have a programming foundation. Lack of physical means, workload.

T11: Not enough sets at school, old IT class and workload at school.

T12: Lack of relevant friends in my environment.

T14: Timelessness.

T17: The teachers' schedule is too busy/my busy work pace.

When the suggestions of the teachers who could not explain the education they received to their colleagues at their schools within the scope of a training, for the solution of this problem; the opinions which say that it should be done at the appropriate time (f = 6) and necessary equipment should be provided (f = 2) came to the fore more. The opinions of the teachers on the subject are given below;

T1: Necessary tools and equipment should be provided for robotic coding projects.

T14: Time is needed for us to give these trainings to other branches in our school. Maybe a certain time can be allocated to this subject in teacher seminars and it can be made compulsory for schools by the Ministry of National Education.

T15: It should be done within the appropriate time

S16: It is necessary to open it through public education, as the trainees have to go to school after the lesson, the sufficient number cannot be reached.

T17: A course plan can be made for willing teachers.

When the solution suggestions of the teachers on the subject are examined; it can be stated that they have time problems and have difficulties in obtaining materials. They also stated that they should have basic knowledge before starting the training and that the training should be supported by block coding.

Recommendations of teachers to their colleagues who will receive robotic coding trainer training

When the suggestions of the teachers to their colleagues who will receive robotic coding trainer training (Table 8) are examined, it is seen that various suggestions such as basic level knowledge, not falling behind technology, making projects, allocating time, useful and certificate.

Table 8

Teachers' Suggestions to Their Colleagues Who Will Receive Robotic Coding Trainer Training

Suggestions	**f**
Basic level knowledge	8
Not falling behind technology	5
Making a project	4
Time allocations	3
Beneficial	3
Certificate	2
Researching the instructor	1
Researching the institution	1
Asking questions to the instructor	1
Material requirement	1
Branches other than information technologies should also take	1
Professional development	1
Total	**29**

When the details were examined, most of them stated the suggestions such as basic level knowledge (8), not falling behind the technology (5), making projects (4), allocating time (3), beneficial and certificate (2).

In this regard, teachers stated their opinions as follows:

T2: First, they should receive basic education.

T4: They should act not because they are popular, but by considering their contributions to the students.

T6: They should definitely receive such an education.

T6: They should definitely learn, even if possible, they should do research and at least get training by recognizing the interfaces; this will be very useful for them.

T9: I suggest that they study the subject at the basic level, review the programming concepts in the coding part, try to do the subjects and projects themselves, and ask questions to the instructor.

T10: First of all, getting basic knowledge will make the education they will receive more efficient.

T11: I definitely recommend taking this training. It should be in other disciplines, not just IT. I recommend them to develop interdisciplinary projects after the training.

T16: They should approach the process with a project focus.

T17: They need to allocate time; continuity in education and practice is required.

Teachers explained to their colleagues that they should definitely take this training, they must receive a basic coding training before starting this training (knowing the interfaces in advance, having received beginner training, Mblock, Aurdino, etc.), making and maintaining interdisciplinary projects, and also allocating enough time for this training.

The opinions of two teachers on the subject of certificates drew attention in their suggestions to their colleagues about robotic coding trainer training. He/she stated that they should not participate in paid certificate programs, that they should receive training if they have an interest and background in the subject, and if they are not interested, they should not attend these trainings just to get a certificate. While he/she said, "*Not for the certificate, if there is really interest and some background, they should participate (T7)*", another teacher said, "*I recommend them not to participate in paid certificate programs (T15)*". However, getting a certificate in these trainings is very important. A certificate is needed to provide this training in his/her own institution and in other institutions.

Discussion, Conclusion and Recommendations

In this study, it is aimed to examine the opinions of the teachers who participated in the robotic coding trainer training about the training they received and how they applied this training. For this purpose, data were collected from the teachers who participated in the robotic coding trainer training by using a semi-structured interview form with a qualitative approach. Teachers stated that they participated in this training to support the education-teaching process and to improve their personal development. It has been observed that teachers participate in the education process to teach their students. However, after the training of trainers, teachers are expected to train their colleagues. However, in the study, it has been observed that teaching students was mentioned but not teaching colleagues.

When the positive opinions of the teachers about the robotic coding education were examined, the themes of contribution to personal development, information about robotic education, acquiring programming skills, cooperation and reward emerged. The most prominent among these is the information about robotics education: recognizing the robotic training set, learning sequentially and obtaining information. In this context, the teachers' recognition of the robotics training set was effective in expressing positive opinions.

When the opinions of the teachers about the robotic coding trainer education were examined, the lack of time, lack of materials and inadequacy of practice were reflected as negative opinions. This result is similar to Aksu (2019). In Aksu (2019), teachers expressed the negative points of the use of educational robots in education as cost, hardware inadequacy and lack of course hours.

In addition, while teachers stated their negative opinions about education, they stated that education could not be embodied. When the literature is examined, similar suggestions are offered. According to Ersoy et al. (2011) it is thought that being able to observe physically the working state of the code will help to embody the concepts related to programming. According to Bütüner and Dündar (2018), facilitating education can only be achieved by embodying the concepts and processes that are taught.

Teachers expressed the content of the education as adequate as they were given basic education and information to teach to the students. However, most of the teachers stated that the training content was insufficient due to reasons

such as lack of time, trainer not being a teacher and not raising awareness. When the teachers' suggestions for developing the content of the robotic coding training program were examined, it was seen that they wanted to increase the training period and to have more practices. As similar, Gültepe (2018) emphasizes the need to increase and diversify the training of trainers.

It was observed that 4 teachers conveyed the training they received to their colleagues, and 13 teachers did not. It was understood that most of the teachers could not transfer the education they received to their colleagues. Teachers, who explained their colleagues about the education they received, stated that they gained practicality in coding, the feedback was positive, coding became concrete with the sample practices and they used it in their friends' lessons. According to Ersoy et al. (2011), learning to program requires developing a different mindset, and facilitating this process is only possible by embodying the concepts and processes that are taught.

When the negative experiences of the teachers about the education they provide are examined, the trainees' lack of prior knowledge and motivation, difficulties in obtaining materials and the difficulty of the learning process are stated as negative opinions. When the studies in the literature are examined, it is seen that there are studies supporting this result. According to Ceylan and Gündoğdu (2018), the most important factor among the difficulties experienced in coding education is that the infrastructure and equipment of the schools are not suitable for teaching the current coding course.

When the possible reasons for the teachers who could not explain the education they received to their colleagues at their schools within the scope of training were examined; the themes of lack of demand, time problem and intense working tempo emerged. It was observed that the teachers did not have enough information about the activities they would do after the trainer training, they did not make a plan for the educational activities with the school administration and they were waiting for a request.

When the teachers' suggestions to the teachers who will receive robotic coding trainer training were examined, they suggested that they have basic level knowledge, that they should learn and make projects. When the literature is examined, similar suggestions are offered. Sayın and Seferoğlu (2016) stated that coding should be given more place in education programs in order for Turkey to keep up with technological developments and to meet the need for trained human power to meet the economic needs of the age. They also suggested that they attend the training if they have the background, not to get a certificate. In this context, it has seen that teachers recommend this training to their colleagues; also they suggested that they should have basic knowledge before coming to training, make projects about education and spare time.

As a result, it was observed that the teachers were satisfied with the education they received and left with positive thoughts, but it was observed that the teachers had problems in transferring the education they received to their colleagues. This does not coincide with the aims of educational training. One of the most important purposes in the trainers training given by development agencies within the scope of technical support and trainers training by the Ministry of National Education is dissemination. It is expected that the teachers who receive this training will train the teachers in their schools and the teachers in the schools around them, and these in turn will train their students. It has been observed that teachers organize very little training for their colleagues.

Robotic coding training is very important in order to raise generations with 21st century skills and to use the developments in technology in the education process. In order to provide such training, teachers should be supported on these issues and robotic coding trainer training should be disseminated. In addition, the preparation of a booklet that will explain the activities and practices to the teachers participating in the robotic coding training will contribute to the achievement of the trainers training.

Ethic

This research was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and ethical standards.

Author Contributions

All stages of the study were organized and conducted by the authors.

Conflict of Interest

The authors declare that they have no conflict of interest.

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