Instructor Views on Technology Use and Coding Training

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Abstract

With the inclusion of the Information Technology and Software course in elementary and middle school curricula in Turkey, the Ministry of National Education has started to offer Technology Use and Coding courses. In this study, opinions of 12 instructors who taught Technology Use and Coding courses were consulted. The study aimed to determine the level of comprehension of the trainees through the evaluation of in-service training. The study was conducted as a case study, one of the qualitative research designs, and the data were collected using a semi-structured interview form. The data were analyzed using the MaxQDA 2020 software. As a result, it was determined that the trainees who attended the courses voluntarily were more willing to learn. The trainees who voluntarily attended these courses stated that they preferred these courses due to the popularity of coding training. While the duration of the course was found to be sufficient, it was determined that offering the courses after work hours caused a decrease in the motivation of the trainees. Inconvenience of training centers, lack of educational materials and insufficient number of instructors were stated as problems encountered in courses. It was observed that the attendees of the course liked the algorithm and block-based coding subjects, and that the instructors did not give enough importance to the subject of coding without computers.

Keywords: In-Service Training, Algorithm, Coding Without Computers, Block-Based Coding, Robotic Coding

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INTRODUCTION

When we look at the list of the largest companies today, it is seen that the majority of the top ten companies are those that produce technology and software. This reveals the importance of digital technologies and software in the development of countries and their economies and shows that countries investing in this field will have a voice in the world in the future. Countries that produce technology will survive unlike those that are consumers. Countries have begun to integrate software, programming, and robotic coding into their curricula to invest in their future. In the United States of America, coding has been included in the curriculum in 24 states at the middle school level (Öymen, 2014). England started to provide coding education to students between the ages of 5-16 in elementary and middle schools in 2014 (European Schoolnet, 2015). The European Union (EU) declared 2013 as the year of software drawing the attention of the member countries to coding education, and in 2014, it was integrated into the curriculum of K-12 schools in 16 member countries (European Schoolnet, 2015). In the education reform implemented in Finland between 2012 and 2014, informatics competency of students was included in 1st – 2nd grades, and coding and programming was included starting from the 3rd grade, (Kwon & Schroderus, 2017). Coding education in China started in 2017, and artificial intelligence subjects were included in curricula of elementary and middle school levels in 2019 (Chunying, 2019). South Korea is trying to make software courses a part of the curriculum in elementary, middle, and high school levels with the education reform initiated in 2015 (Kwon & Schroderus, 2017).

Coding, which many countries try to integrate into their education systems around the world, is a tool for students to adopt a problem-solving approach with the thinking techniques they have acquired in programming rather than being expert programmers (Seğmen, 2017), and plays a fundamental role in the development of technology literacy (Lau & Yuen, 2011). Coding, which is the heart of digital technologies, is the act of writing codes and creating programs, and the ability to understand the world and its structures (Dufva & Dufva (2016). Programming is one way of thinking and turning thoughts into a product (Saygıner & Tüzün, 2017).

Programming skills are not only related to informatics, but also support the skills such as creativity, collaboration, awareness and critical thinking that individuals should have in the 21st century (Howard, 2002), and provides problem solving and engineering skills that emerge with the combination of science, mathematics and technology (Gura,2012). PISA (Program for International Student Assessment) exams, which are implemented in 70 countries around the world, are conducted in three areas, namely reading skills, mathematical literacy and science literacy, and it is considered to add a fourth area that is algorithmic thinking (computational thinking) skills, which are the basis of programming and coding, in 2021 (PISA, 2021).

The increasing importance of coding and software in Turkey as well as around world have also increased the demand for trained manpower in this field. Efforts are made in Turkey as well as around the world to make students like coding and get them started in this process at an earlier age (Karabakan & Sun, 2013). In 2017, the Turkish Ministry of National Education (MoNE) published the 2023 Vision Document which includes strategies to be implemented for the next five years. This document emphasizes the importance of digital learning materials that teachers need to develop, and states that it is planned to include 3D design, electronics and coding in the learning processes of IT production in order to improve the information production skills of teachers and students (MEB, 2017). For this purpose, MoNE included the Information Technologies and Software Course in middle schools as a mandatory course in 5th and 6th grades and as an elective course in 7th and 8th grades in 2018 and published the education program. In primary schools, the Information Technologies and Software course was included in the curriculum for 1st – 4th grades starting in the 2018-2019 academic year (Gökbulut, 2019).

While basic computer programming education is usually provided in vocational high schools, vocational schools, and engineering departments in Turkey, it has become more common with its

inclusion in high school and elementary school curricula (Seğmen, 2017). Programming education at the elementary and middle school level is provided by information technology teachers (Mazman, 2013). With the inclusion of Information Technologies and Software course in the curricula of 1st – 4th grades, these courses are planned to be taught by classroom teachers, not by information technologies teachers. Teachers need professional support to follow new technologies and integrate them into their classrooms (Top, Baser, Akkus, Akayoglu, & Gurer, 2020; Williams, 2017) because the levels of Information Communication Technologies (ICT) education that teachers receive during their university years are quite low (Gudmundsdottir & Hatlevik, 2018; Türker & Pala, 2018). Even if the education they received during their university years is sufficient, considering the rapid changes in information technologies, teachers should be given the opportunity to improve themselves through in-service training for information communication technologies and coding (Türker & Pala, 2018). Planning ICT activities and dedicating extra time on solving possible technical problems increase teachers' workload and at the same time, teachers need both technological and administrative support when using technological devices and platforms (Top, Baser, Akkus, Akayoglu, & Gurer, 2020). Training on basic computer use were offered to teachers by the Ministry of National Education, and courses such as coding and programming were planned for IT teachers or vocational teachers working in technical schools. In the last few years, MoNE has started to provide in-service training on "Basic Coding and Technology Use" to teachers working in elementary, middle, and high schools (Gökbulut, 2019). Although teachers attend these courses, their competence levels in providing coding training to students vary. Teachers' negative beliefs and attitudes towards technology can negatively affect technology integration into classroom environments (Top, Baser, Akkus, Akayoglu, & Gurer, 2020). There is a bi-directional relationship between teachers' use of technology and their pedagogical beliefs (Tondeur, Van Braak, Ertmer & Ottenbreit-Leftwich, 2017). Although coding is offered to elementary school teachers in China, it was observed that teachers were not sufficient in providing this education to students (LaLonde, 2019). The technology-based courses provided may not always be sufficient to achieve technology integration (Top, Baser, Akkus, Akayoglu, & Gurer, 2020). Therefore, it is very important to train teachers who will teach computational thinking to students (Göncü, Çetin, & Ercan, 2018). While most of the teachers participating in coding training consider themselves incompetent in providing coding education, very few consider themselves competent at a basic level (Türker & Pala, 2018).

Robotic coding, which started worldwide in 2013-2014, has started in Turkey in 2018 for elementary and middle school teachers through a Ministry-based standard education program provided by the General Directorate of Teacher Training and Education as in-service training. Today, while the competency levels of teachers in ICT vary, to what extent coding training, which requires a higher level of knowledge and readiness, achieves its purpose is questionable. At this point, the opinions of the instructors who provide coding training are very important. For this reason, revealing the levels of coding training, which were opened and have been offered by the ministry for several years, the difficulties encountered in teaching the courses, and to what extent these courses achieve the goals will contribute to the literature.

In this study, answers to the following questions were sought by obtaining the views of Information Technologies instructors on the level of education received by the teachers who attended the Technology Use and Coding courses offered by the Ministry of National Education.

- What are the opinions of instructors on the Technology Use and Coding Training?
- What are the opinions of instructors on the content of the Technology Use and Coding Training?

METHOD

In this qualitative study, a "case study" approach was used to reveal the status of the Technology Use and Coding course that elementary and middle school teachers attended. Case studies

are in-depth studies that are concerned with individuals, events and processes as a whole, using multiple data collection sources (interviews, observations, documents, reports) over a period of time (Creswell & Plano Clark, 2007; Yıldırım & Şimsek, 2011; Yin, 1984). In this study, the aim is not to make a generalization on the sample, but to investigate the existing situation in depth.

Participants

12 Information Technologies instructors working in different regions and schools in Turkey and teaching Technology Use and Coding courses to teachers participated in this study. A purposeful sampling method was used in the study. Purposeful sampling is a method that allows for in-depth study of situations that are thought to have rich information (Patton, 1987). By using the maximum variation method together with the purposeful sampling, the diversity of the participants in the study was maximized (Yıldırım & Şimşek, 2011). In maximizing the diversity, 12 instructors who teach Technology Use and Coding were selected from different regions and different schools of Turkey to participate in the study. The purpose here is to reveal the situations that may arise from regional and school differences. One of the teachers participating in the study works at a high school, nine work at a middle school, one in the Science and Art Center, and one works as an instructor in the Fatih Project at the Provincial Directorate of National Education. Instructors participating in the study were coded as I1, I2, I3… I12 and their demographic information is given in Figure 1.

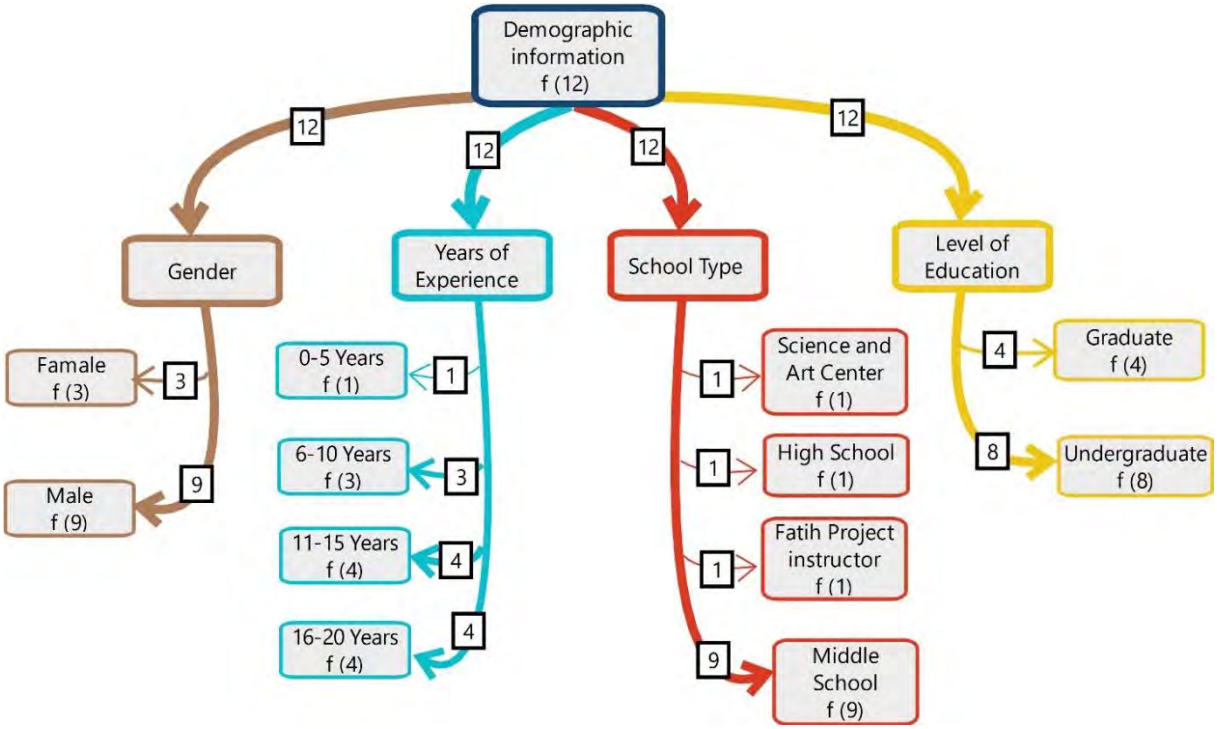

Figure 1. Demographic information of participants

As shown in Figure 1, 9 of the instructors are male and 3 are female. When their years of experience is examined, it is seen that there is one teacher with who's been a teacher for 1-5 years, 3 teachers between 6-10 years, 4 teachers between 11-15 years and 4 teachers over 16 years. In terms of the level of education, it is seen that the number of teachers with a master's degree is 4 and the number of teachers with an undergraduate degree is 8.

Data Collection Tools

The data were collected through interviews. Interview is a very powerful method in revealing individuals' opinions, experiences, and feelings, and is a method based on speech which is the most

common form of communication (Yıldırım & Şimşek, 2011). With an interview form, the researcher can make comparisons with the scope of the research by asking the questions prepared prior to the interview, by having the freedom to ask additional questions in order to get more detailed information, and by analyzing the data faster (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2012; Türnüklü, 2000; Yıldırım & Şimşek, 2011). In the study, the interview method was preferred to determine the opinions, experiences, and feelings of the instructors who teach the in-service training on robotic coding. A semi-structured interview form was prepared before the interviews were held. While preparing the interview form and the questions, alternative probe questions should be included and questions that are leading following a logical sequence should be avoided (Yıldırım & Şimşek, 2011).

During the preparation of the interview questions, the content of the course was reviewed, and the questions were prepared with an Information Technologies instructor teaching the Technology Use and Coding course. Expert opinion of an academician working in the field of educational sciences was consulted regarding the academic appropriateness of the prepared questions. The questions were re-designed in line with the expert opinion. The questions were reviewed by a Turkish Language and Literature teacher working at a high school in terms of Turkish grammar compatibility. In developing the questions, close-ended, Yes/No questions were avoided and instead open-ended questions that would reflect the honest opinions of the participants were used. In addition, as the teachers were responding to the questions, alternative questions were created in order for them to better understand the questions according to the flow of the interview, and probe questions to obtain in-depth responses were developed. With these questions, a pilot study was conducted with an Information Technologies instructor who teach the Technology Usage and Coding Course, estimated time calculations were made and a consensus was reached that the questions could be understood. The questions develpped are listed below.

1- What are the opinions of the instructors on the Technology Use and Coding Training?

a- What are the differences in attitudes towards training among the trainees (on an official assignment or voluntary basis)?

b- What do you think the reasons are for trainees to attend these courses?

c- Is the duration of the training sufficient? Why?

d- Was the planned start time for the training appropriate for you? Why?

e- What are the factors that affect the motivation of the attendees?

f- Was the learning environment and material support of the training sufficient? Why?

2- What are the opinions of instructors on the content of the Technology Use and Coding Training?

a- What are the comprehension levels of teachers attending the course in terms of the in-service training content?

b- Did they comprehend the logic of algorithm development? Can they provide training on this content in their schools? Why?

c- Did they comprehend the coding without computers education? Can they provide training on this content in their schools? Why?

d- Did they comprehend block-based coding education? Can they provide training on this content in their schools? Why?

e- Can they develop projects with coding content? Why?

f- Can they help their students to acquire problem-solving, questioning, and higher-level thinking skills? Why?

Data Collection Process

Data in the study were collected between February 24 and March 13, 2020 using a semi-structured interview form. During the data collection phase, the data were obtained by interviewing 6 teachers in their schools and by talking to the other 6 teachers on the phone. Both face-to-face and phone interviews were recorded using the recording feature of mobile phones. The shortest interview was 14.47 minute-long and the longest interview was 34.40 minutes. The average duration of the interviews was calculated as 20.93 minutes. Before the interview, the instructors were informed about the purpose of the interview and their consent were obtained. Participants were selected on a voluntary basis, and potential concerns were addressed by giving the information that their names will not be used and kept confidential, except for some demographic characteristics (such as gender, seniority). The participants were informed that the interviews will be recorded. The questions used in the study were asked separately. The participants were given as much time as needed to respond to the questions.

Data Sources and Analysis

In qualitative research, the preparation and organization of data consist of coding, developing themes by creating links between codes, interpreting, and presenting the findings as a discussion (Creswell, 2013). The codes generated from the organized data usually consist of a word or short expressions that symbolically summarize some of the language-based or visual data, that attract attention, and capture the essence (Saldana, 2016). After the theme and codes are created, the data are interpreted. In interpreting the data, direct quotations from the participants are frequently used, cause-effect relationships are established, and themes are made more meaningful (Yıldırım & Şimşek, 2011).

In the study, a descriptive analysis was completed by transforming the audio recordings of the Basic Coding and Technology Use course instructors into written texts. The data were processed according to the thematic framework and arranged in a meaningful and logical manner. The data deemed insignificant were not included in the study. In defining the data, attention has been paid to make it readable and understandable. Codes were created according to the determined themes, and interpretations were made in accordance with the purpose of the study. The data were analyzed using the MaxQDA 2020 qualitative data analysis program.

Ensuring Validity and Reliability

In research, it is very important to represent the facts correctly, to be consistent, objective, impartial, and to ensure validity and reliability (Yıldırım & Şimşek, 2011). The steps taken to ensure validity and reliability in the study are given in Table 1.

Table 1. Validity and Reliability Methods

Criterion		Methods Used
Validity	Credibility	Expert review
		Member check
	Transferability	Detailed description
		Purposeful sampling
Reliability	Consistency	Consistency review
	Confirmability	Confirmation review

As a result of the interviews conducted in the study, a framework was developed, and the decision was made on the themes. The data were coded separately by two people, one academician

and one coding instructor to determine the themes. Afterwards, the codes of consensus and the codes of disagreement were identified, and the appropriateness rate was determined. In identifying the rate, Miles&Huberman's (1994) reliability formula was used (Reliability formula: Consensus/ (Consensus+Disagreement) x 100). The result of the calculation showed a rate that is over 90%. If the rate is above 90%, it is at an acceptable level to ensure reliability (Saban, 2008). According to this result, it was seen that similar results were obtained in the analysis of the researchers, and it can be said that the study is reliable.

One of the most important criteria in research is the credibility of the study results (Başkale, 2016). For validity and credibility of the study, the complete study and the data obtained were sent to an academician working in the field of educational sciences to get an expert review. Findings in the dimension of credibility were sent to the instructors who participated in the study for member checking and confirmation was obtained on how much their responses in the interview overlapped with the findings. In order to ensure validity in the dimension of transferability, direct quotations in which participants' expressions are reflected are included in the findings section. Using purposeful sampling method in terms of transferability, teachers, who work as instructors in the Technology Use and Coding Courses, from different regions and schools in Turkey were included in the study. In qualitative studies, audio recordings to transcribe the opinions of the participants in writing increases the reliability. Use of the data source by more than one researcher in obtaining a complete and accurate recording of the data will increase the reliability of the results (Büyüköztürk et al., 2012). In the reliability dimension of the study conducted, interviews were recorded digitally. These recordings in digital environment are kept for confirmation review.

FINDINGS

In the study, the findings obtained by analyzing the opinions of the teachers who are the instructors in the Technology Usage and Coding course opened within the scope of the MEB in-service training activities are presented.

What are the opinions of instructors of the Technology Use and Coding Training?

MAX Maps codes under the In-Service Evaluation theme of information technology teachers who are instructors in the Technology Usage and Coding Course organized within the scope of MEB in-service training activities are given in Figure 2.

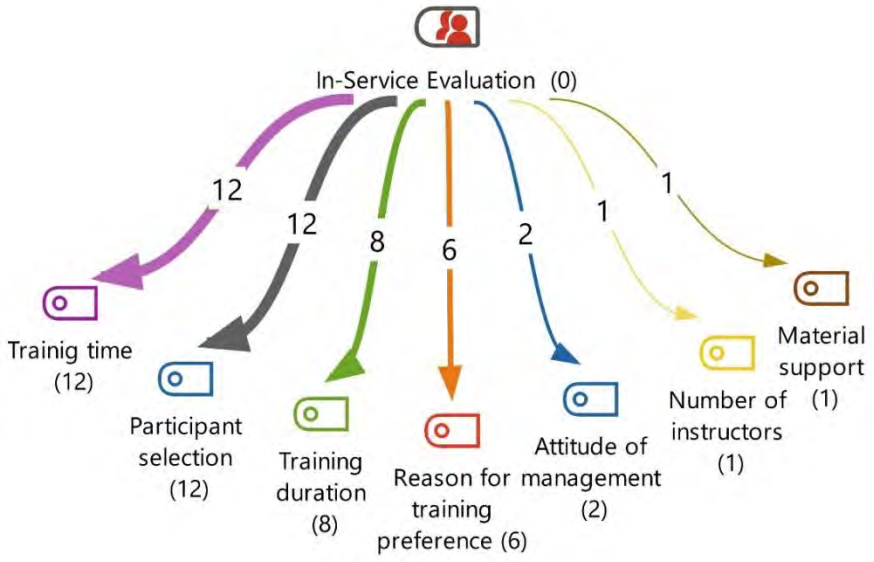

Figure 2. MAX Maps codes of the In-Service Evaluation theme

Seven codes were created under the In-Service Evaluation theme. These codes included the selection of participants, reasons for training preference, training duration, time of the training, management attitude, lack of material and number of instructors. Information on the participants from which these codes were obtained is given in Table 2.

Table 2. Codes related to the In-Service Evaluation theme

Codes	Participant Code (n=12)	f	%
Participant selection	I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	12	100,0
Reason for training preference	I1, I2, I3, I4, I7, I12	6	50,0
Training duration	I1, I3, I5, I6, I7, I8, I10, I11	8	66,6
Training time	I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	12	100,0
Attitude of management	I1, I2	2	1,6
Material support	I2, I3, I4, I5, I6, I7, I9, I11, I12	9	75,0
Number of instructors	I5	1	0,8

According to Table 2, all the instructors expressed similar opinions about the attitudes of the trainees based on the way they were enrolled in the in-service course. Attendees who were required to attend the training were unwilling to attend while those who volunteered were quite eager towards the training. Instructors shared their opinions on those who voluntarily attended the training: I4 stated "…they want to start a course in their school, that's why their attitude was good," I5 stated, "…those who attended voluntarily were curious and making efforts but those who were required to attend were not that engaged," while I9 shared, "…my lessons with the teachers who voluntarily attended were very enjoyable and productive." In terms of those who were required to attend the training, the instructors shared: I5, "…there were those who were in the mood to get it over with and sign the attendance sheet. However, after the training, there were some who changed their minds about the training. There were those who did not have this change as well." I6 shared, "…there were many who were told to attend; in general, they viewed it as something merely to endure. There were complaints such as, how will this training benefit us? I can't understand this," while I9 shared, "…It was not enjoyable, and I don't think it was beneficial either. The teachers were complaining by saying 'it's late, when will we go home?' Most of them wasted their time."

In terms of the reasons why trainees preferred the Technology Use and Coding training, the instructors shared that they preferred it out of curiosity and that it's a popular subject, and that teachers who are new in the profession were more willing compared to the senior teachers. I3 stated, "…they attend because coding is popular on social media platforms. However, when they encounter difficult subjects, they don't want to come." I12 shared, "…while some attend the training for personal development, others attend to teach their kids about coding" while I7 stated, "…young teachers are more willing to attend the courses. Teachers who are close to retiring are more reluctant."

66.66% of the instructors stated that the 30-hour course duration was sufficient for Technology Use and Coding Training. In relation to this, I8 stated "…if the training is provided thoroughly, 30 hours is sufficient," while I10 stated, "…the duration of training was appropriate. For example, if it were a 10-day training, it would be boring. The training provided by public education centers is very long, but in-service trainings are appropriate."

The instructors participating in the study stated that the Technology Use and Coding trainings were held during the week after school hours of the teacher. Almost all the instructors stated that the time of the courses were not suitable and that the trainees attended the training with a low motivation. In relation to this aspect, I2 stated that "…teachers are tired after work hours which decreases motivation," while I3 stated "…when they come to class, they are tired, and as the course is after work hours, they do not find the opportunity to practice." I4 shared, "…such courses should be offered when there's no school," I6 stated, "…when they are tired at the end of the day and their spouses and kids are waiting for them at home or when they have other daily commitments to attend to, it is difficult for them to focus on the lesson. And thus, their motivation is low, and they have difficulty in

understanding." I7 shared, "…I think the reason why teachers are not willing is that the courses are offered after work hours. If these courses are offered during seminar periods, it would be better. Teachers that are tired are unwilling to engage."

Two instructors who participated in the study stated that school administrators created problems for teachers regarding their attendance to the training. One of these instructors, I2, shared their opinion by saying, "…some of the trainees can't attend the training because their school principals cause problems. Attendance to these trainings should not be left to the initiative of the school principal."

75% of the instructors participating in the study shared their views on the learning environment of the Technology Use and Coding training and the lack of materials. In this regard, I6 said "… Necessary material support should be provided during these trainings. For example, training with Microbit is required. However, if the school or the instructor does not have the materials, then there may be a problem."

Another point emphasized in the study is that the Technology Usage and Coding Training is an applied course, that one instructor is not sufficient during the trainings, and the fact that while one instructor explains the subject and the other instructor makes the trainees practice will affect the quality of the education positively. In relation to this, I5 shared their opinion by saying, "…when there is more than one instructor in the training, it's more beneficial. Then, the trainees can receive one-on-one attention."

What are the comprehension levels of the participants in the Technology Usage and Coding Training?

The MAX Maps codes developed under the Training Content theme about the comprehension levels of teachers on the educational are provided in Figure 3.

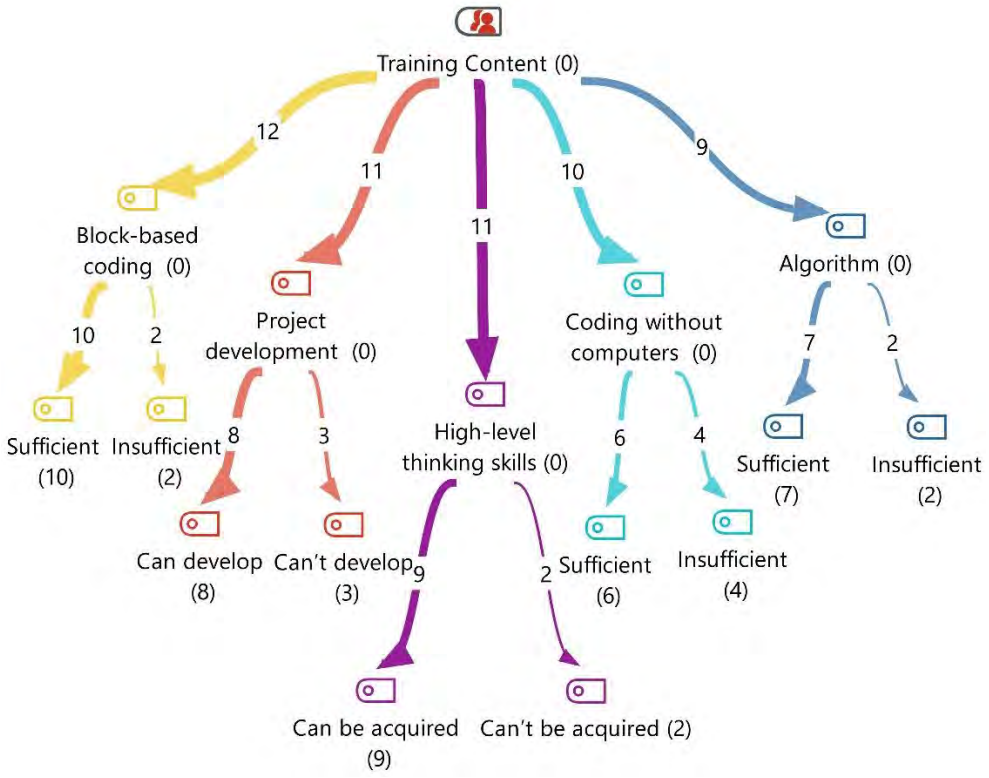

Figure 3. MAX Maps codes related to the Training Content theme

As shown in Figure 3, there are five codes under the training content theme which are algorithm, coding without computers, block-based coding, project development and high-level thinking skills. These codes are presented in Table 3 with the sub-codes of participant codes.

Table 3. Codes related to the training content theme

Codes	Participant codes (n=12)		f	%
Algorithm	Sufficient	I3, I4, I6, I5, I7, I11, I12	7	58,0
	Insufficient	I8, I9	2	16,6
Coding without computers	Sufficient	I3, I7, I8, I10, I11, I12	6	50,0
	Insufficient	I2, I3, I5, I8	4	25,0
Block-based coding	Sufficient	I1, I4, I5, I6, I7, I8, I9, I10, I11, I12	10	83,0
	Insufficient	I2, I3	2	16,0
Project development	Can develop	I1, I2, I3, I4, I5, I6, I8, I10	8	66,0
	Can't develop	I7, I9, I11	3	25,0
High-level thinking skills	Can be acquired	I1, I2, I4, I5, I7, I8, I10, I11, I12	9	74,7
	Can't be acquired	I3, I6	2	16,6

58% of the course instructors stated that the trainees have comprehended the subject of algorithm and that they are at a level to provide these trainings in their schools. One of the instructors, I4 stated, "…If the teachers attending the course can improve themselves more, it would be beneficial for them. However, if they stop using what they learn, they can't educate others. It's similar to learning a foreign language where if it is not practiced for six months, the person will forget all the information." Other instructors shared their opinions as well: I5 stated, "…they can teach because the foundation is algorithm. The foundation of their disciplines is based on algorithm as well," while I7 shared, "…algorithm is very important for the student. We are using algorithm in our daily lives, so teachers can teach it." I9 said, "…this overlaps with subjects such as problem solving, establishing logic in their fields. They can easily teach algorithm," and similarly I11 expressed their opinion: "…of course they can teach. Particularly in math and science courses there is algorithm. I saw it clearly in classroom teachers particularly. The teacher does not know what algorithm is but in training, they understand that algorithm is in every aspect in life." 16.6% of the course instructors stated that the trainees who attended the training did not grasp the algorithm content and could not provide these trainings in their schools. I8 stated, "…they get stuck in algorithm. They say they are having difficulties and they can't make the time for it," while I9 shared, "…half of the attendees were not interested and I don't think they can understand and teach algorithm."

50% of the instructors who provided in-service training stated that the teachers who attended the training grasped the subject of coding without computers, and that they could teach it in their schools. As a justification for this, I8 shared, "…they can teach it when they are provided with the logic of coding without computers and multiple practice activities," while I11 stated, "…there was an activity related to bees and honey. We developed an activity for children using colored print outs. We explained the content by having them do coding activities such as 'take the flowers numbered one and two, turn right, then turn left.'"

25% of the instructors who provided in-service training stated that the teachers who attended the course did not grasp the subject of coding without computers, and that they could not provide coding without computers training in their schools. They expanded on this by saying, "…they can't teach it because there is no such outcome in their curriculum (I2)" whole I5 stated, "… it is not possible at the secondary level education but it is possible at the elementary level education," and I12 shared, "…I don't teach these in my trainings. I don't think teachers can do it efficiently as their research and computer skills are low." Approximately 20% of the instructors stated that the coding without computers is included in the course curriculum, but they do not offer it during the training. They explained the reasons for this as "…we did not cover coding without computers; it is totally up to the teacher (I1)," or as I6 stated, "…I don't cover coding without computers in their training. I believe it is completely related to personal interest."

83% of the instructors indicated that the teachers who attended the training have grasped the block-based coding content and that they are at a level where they can teach in their schools. I4 stated, "…block-coding is easy to learn and teach," I5 shared, "…this training is easy in terms of interface and use," while I10 expressed that teachers "…like block-based coding and they are eager to learn."

66.6% of the instructors stated that teachers who attended the training could develop projects related to coding. I1 stated, "…we introduced the fundamental topics and opened the door for them. If they continue to improve themselves, they can develop new projects," while I3 shared, "…if they make the time and integrate it to the courses they teach, they can develop projects."

25% of the instructors stated that teachers who attended the course cannot produce projects with coding content. I7 expanded on it by saying, "…I don't think they can teach it at an advanced level" and I12 stated, "…I have never met a teacher who said 'I took this course for a certain period of time and I developed this.'"

74.7% of the instructors stated that the teachers who attended the course had reached a level where they could help their students gain high-level thinking skills. I1 shared, "…we don't provide training for a single field. We also provide its equivalent in life. STEM education should be integrated in this training," while I5 stated, "…these characteristics are integrated into their own courses." I6 shared, '…if they can use the coding information in their own disciplines, then they can teach high-level thinking skills," and I7 stated, "…problem solving is not only related to coding. Better examples should be found related to problem-solving phases. They can have children engage in such activities." I8 expressed that, "…regardless of the coding content, courses are taught in a way that help students gain these skills," while I11 said, "…children can find solutions to problems through high-level thinking after they learn algorithm and by doing some analysis and some synthesis."

24% of the instructors who provide in-service training stated that the trainees cannot help their students gain high-level thinking skills with the training they received. They explained the reasons by saying, "…I don't think they can teach high-level thinking skills by only using coding (I6)" and "…they can do some parts of problem-solving. However, it is difficult to grasp high-level skills (I7)."

RESULT, DISCUSSION, AND SUGGESTIONS

In the study, the opinions of the instructors of the Technology Use and Coding Training organized by the Ministry of National Education were consulted on in-service training and the content of the training. In the analysis of the data obtained, two main themes emerged: Service Evaluation and Training Content.

What are the opinions of the instructors on the Technology Usage and Coding Training?

In the analysis of the data obtained from the instructors whose opinions were consulted about the general in-service training, codes related to the selection of the participants, the reasons for attending the training, training duration, time of the training, attitudes of management, material support and the number of instructors were obtained.

In the Ministry of National Education, teachers attend in-service training by applying themselves. In some cases, teachers are required by MoNE to attend in-service training without being asked for their preference. According to the findings obtained in the study, some of the trainees in the Technology Usage and Coding training attended voluntarily while some were required to attend. It was observed that the trainees, who were required to the coding training, were generally resistant to the training, and viewed it as something merely to endure. It was observed that the trainees who attended the in the in-service training voluntarily showed a more enthusiastic, open, and positive attitude towards learning. Attitudes can cause emotions that affect behavior (Marzano et al., 1988). Sometimes, personnel for whom the training is not relevant are sent to in-service trainings which

causes significant problems in the perceptions and attitudes of the trainees about self-improvement (MEB, 2010). Professional development programs designed to provide teachers with various knowledge, skills, experiences, and thoughts are expected to positively change teachers' attitudes and beliefs (Guskey, 2002; Yaman & Tekin, 2010). If the trainees do not develop positive attitudes towards in-service training, the training will also be negatively affected (Yaman & Tekin, 2010). Teachers who attend the trainings involuntarily have an attitude that is closed to learning which negatively affects the learning environment as well as their own learning (Durmuşoğlu, 2020). For a training to be effective and successful, people who will participate in the training must develop a positive attitude towards the training (Sütay, 2019). When the trainees are included in-service training involuntarily, they may exhibit more negative attitudes and behaviors than those who attend the course voluntarily. For this reason, including voluntary people in in-service trainings as much as possible, and avoiding requirement people may contribute to the quality of in-service trainings.

The instructors stated that the reason why trainees preferred to attend the training was because of the popularity of Technology Use and Coding. In addition, young teachers with less seniority among the trainees are more eager to attend training than those with more professional seniority. Coding education, which is very popular in Turkey as well as in the entire world, has become a subject that interests not only students but also teachers. The reason why young teachers are more enthusiastic in their training may be due to their early encounters with technology.

The instructors stated that the 30-hour training period determined for the Technology Use and Coding in-service training was sufficient, and it could be boring if it was longer. Gültepe (2018) states that the duration of coding training is insufficient. Regarding the time of the in-service trainings, the instructors stated that the training are held after school hours. They stated that the trainees were unwilling and tired and their motivation was low in the training held after school hours. It can be said that teachers who attend classes at school and participate in in-service training activities with the fatigue of the day have low motivation towards learning. In terms of the negative attitudes of teachers, organizing in-service training during seminar periods or summer holiday periods may increase motivation towards learning.

As another problem experienced in Technology Use and Coding training, the instructors stated that there were school administrators who created difficulties for teachers participating in the trainings. By offering in-service training for school administrators, administrators can be informed about the content and applications of in-service trainings which may cause them to have a positive attitude (Özer, 2004). It is very important for school administrators to actively participate in trainings, to plan trainings for them and to set an example for teachers (Bümen, Alev, Çakar, Gonca, & Veli, 2012). The support, encouragement, and exemplary behaviors received from school administrators can increase the motivation and desire to learn of the teacher who will participate in in-service training. Then, the teacher, who knows that the school administrator encourages them rather than preventing from attending the training, can make an effort to contribute to the development of students, colleagues and the school with the knowledge, skills and experiences they acquire in-service training.

Instructors identified the learning environments not being suitable and the lack of materials as the problems encountered in the Technology Use and Coding training. Problems arising from lack of equipment and learning environments are experienced in in-service training organized (Gökbulut, 2006; Usta & Güntepe, 2019). Learning environments should be arranged and necessary materials should be prepared prior to the trainings. Lack of materials and equipment, especially in applied trainings, may cause inefficiency of the courses organized.

Another finding of the study is that the number of instructors in Technology Use and Coding training is insufficient. In applied trainings, while one of the instructors explains the subject, the other instructor can have trainees practice which would contribute to better comprehension of the topics. The number of instructors is determined by forming groups based on the number of students in applied workshops and vocational courses in vocational high schools. Especially in in-service trainings, which

are applied, the number of instructors can be determined according to the number of trainees and one trainer can teach the content while the other instructor has trainees engage in practice.

What are the comprehension levels of the participants in the Technology Use and Coding Training?

In the analysis of the data obtained from the instructors on whether the content of the Technology Use and Coding training was comprehended, codes related to the selection of the participants, the reasons for attending the training, training duration, time of the training, attitudes of management and material support were developed.

58% of the course instructors stated that the trainees who attended the course understood the subject of algorithm and that they could provide these trainings in their schools, while 16.6% stated that the trainees who attended the course did not understand the subject of algorithm and that they could not offer these trainings in their schools. In order for students to have a good programming logic, teachers should fully compose the algorithm logic in their students (Usta & Güntepe, 2019). The student or any individual's comprehension of the logic of the algorithm contributes to the development of problem-solving, logical thinking, viewing from different angles and questioning skills (Saygıner & Tüzün, 2017). If students cannot develop the algorithm logic, they may experience difficulties in programming education (Usta & Güntepe, 2019). Therefore, it is very important for teachers who will teach algorithm logic to students to understand algorithm logic in achieving the purpose of coding education.

50% of the instructors who provided in-service training stated that the teachers who attended the course comprehended the subject of coding without computers and could provide this training in their schools. 25% of the instructors stated that the teachers who attended the course did not understand the subject of coding without computers and that they could not teach it in their schools. Some of the instructors who stated this view have the opinion that the coding without computers training is suitable for elementary school level, while it is not appropriate for middle school level. Some instructors stated that they never explained the subject of coding without computers during the course and this is related to personal interest. Providing activities on coding without computers as an introduction causes students to increase their motivation to learn coding and contribute to their acquisition of necessary knowledge and skills (Akçay, Karahan, & Türk, 2019). Lack of sufficient content, information, and examples of coding causes students to perceive coding as just moving the game character and limits what they can do (Türker & Pala, 2018). Therefore, giving enough importance to the subject of coding without computers, which is included in the Technology Use and Coding training curriculum, is very important for students studying in schools that do not have computer laboratories and necessary equipment.

Another finding of the study is that the teachers who attended the training understood the block-based coding very easily and practiced it very fondly. Block-based coding provides great convenience especially in teaching abstract concepts (Saygıner & Tüzün, 2017). In order to make programming education common in educational institutions, programming tools that are easy to learn and have visual features should be used in learning environments (Usta & Güntepe, 2019). Block-based coding is presented step by step in visual environments and provides instant feedback (Saygıner & Tüzün, 2018). At the same time, by drawing the attention of students, and contributing to the development of skills such as concretization, algorithm logic, visual intelligence, problem solving, creative thinking, analytical thinking (Usta & Güntepe, 2019), it encourages students to become productive and creative individuals (Saygıner & Tüzün, 2017). It can be said that block-based coding causes both students and teachers to like and easily comprehend coding.

66.6% of the in-service training instructors stated that teachers who attended the training could develop projects related to coding. 25% of the instructors who provided in-service training stated that teachers who attended the training could not develop projects with coding content. Some of the basic

cognitive skills such as problem-solving and analytical thinking required for programming (Holvikivi, 2010) may be developed in some of the trainees and less developed in others. Programming is a challenging education for inexperienced learners of any age (Çınar, Doğan, & Tüzün, 2019). For this reason, while the instructors participating in the study thought that some of the trainees could develop projects related to coding, others might have thought that they would not be able to produce projects with coding content.

74.7% of the in-service training instructors stated that the teachers who attended the training had reached a level where they could help their students gain high-level thinking skills. They stated that coding trainings are not designed for a single field, they address different disciplines, and that trainings can be organized by integrating them with STEM (Science, Technology, Engineering and Math) education. It is seen that 18 countries in Europe include coding training in the primary education curriculum to "support logical thinking skills" and "to support problem solving skills" (Saygıner & Tüzün, 2018). It has been determined that these trainings also contribute to the development of metacognitive skills such as visual intelligence, problem-solving, creativity, computational and analytical thinking collaboration (Akçay, Karahan & Türk, 2019; Sayın & Seferoğlu, 2016; Usta & Güntepe, 2019; Yılmaz, 2017). With robotics and coding trainings, people practice problem solving skills, and contribute to the development of fine motor skills and hand-eye coordination (Çınar, Doğan, & Tüzün, 2019). Coding can be very effective in providing individuals with STEM education that includes interdisciplinary collaboration and 21st century skills.

This study is a qualitative study limited to the opinions of the instructors who participated in the study. Qualitative and quantitative studies can be conducted with the opinions of the trainees who are trained in this field and the students who receive coding training in schools. Many countries around the world have integrated or are working to integrate coding training into their educational curricula. Studies in which the training contents or training programs provided by countries on coding are compared can be conducted. Studies conducted show that coding training includes skills that 21st century learners should have such as visual intelligence, problem-solving, creativity, computational and analytical thinking, and collaboration. Studies can be conducted to reveal the relationships between coding training and 21st century skills.

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