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# Primary school teachers' and students' views about robotic coding course

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**ABSTRACT**

Coding, which is among the 21st century skills, has been included in the curriculum of many countries in recent years from preschool to high school. Primary school teachers are very important in the teaching of coding. In this context, this study aims to reveal the coding education that primary school students receive and the contribution of this course to them from the perspective of classroom teachers and primary school students. In this study, the qualitative method and phenomenological design were used in the study. The study group consists of 8 classroom teachers and 16 primary school students in the city center of Amasya. Easily accessible sampling was used to constitute the study group. In order to obtain the data, a quasi-structured interview form consisting of six questions for teachers and one question for students was prepared. Nvivo 9 program was used to analyze the data. Content analysis has been done as previously created code and themes are used. According to the results of the research, Robotics and Coding course contributes to children's mental development and metacognitive skills such as creative and reflective thinking and improves their problem-solving skills. In addition, it was concluded that Robotics and Coding course should be given to students at an early age, so it should be included in primary school programs.

**Keywords:** Coding, teachers' opinion, classroom teacher, metacognitive skill.

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## INTRODUCTION

Considering the development of technology, it is possible to say that it is very difficult to predict that there will be such an important need for humanity. In the past technology and its opportunities offered us were not in a position that people from all walks of life could easily reach both in terms of information and cost. The developments experienced with increasing momentum in recent years have made technology a part of our lives and even proved that even the simplest work will come to a standstill if it is not in our lives. Undoubtedly, one of the groups that best adapt to the rapidly developing technology from past to present has been children (Baz, 2018; Belpaeme et al., 2013).

At present, children are opening their eyes to a world where technology is developing rapidly and they spend the rest of their lives exposed to technology and its effects. This technology, which is included in every aspect of children's lives, has also become an indispensable element in the field of education. In our country, the reflection of technology in education has been seen on a large scale with the FATIH project and it is planned to give tablet computers to every student from the fifth grade (Ekici and Yılmaz, 2013). One of the most important factors that will enable students to use these technical opportunities effectively and efficiently, at the same time contribute to their cognitive development is coding education, which is currently on the agenda of most countries.

At the primary school level, there should be some criteria such as stimulating and participatory, exciting for children, representative of the truth and supporting their learning, in children's computer environments (Akkoyunlu, 1992). The coding education given to children is one of the most important factors to provide these criteria in the computer environment in children (Sağay, 2019). Considering this definition, the idea that the majority of the occupational groups of the future will be based on coding and the fact that children are so dealt with computers has made it inevitable for them to learn the coding language.

As in every part of education, it is important to provide learning at an early age in coding education. For this reason, in most countries, coding education starts at the kindergarten level and continues at other levels of education (Di Lieto et al., 2017; Komis and Mısırlı, 2016; Mataric, 2004). Different methods are used in the teaching of an abstract and complex process like coding to preschool and primary school children who are still in the concrete operational stage. These teaching methods are in the direction of providing children's interest and attention by making them more playful than traditional methods (Sarıkaya, 2018; Ünsal, 2019).

Considering the development of primary school children, game-based educational software has been developed to make coding education more efficient and enjoyable. These softwares are known as block-based coding and enable the child to see the product of the coding activity concretely instantly (Coravu et al., 2015; Forquesato and Borin, 2018; Ünsal, 2019). In block-based coding, commands are presented to children in the form of ready-made blocks, and the desired blocks are brought to the coding area by moving them with the help of the mouse. Coding work is carried out with the blocks combined with other blocks in the coding area (Kert and Uğraş, 2009). However, before performing the coding process, students need to identify and analyze the problem and develop appropriate algorithms in their minds (Fesakis and Serafeim, 2009).

Block-based coding is an application that allows children to enjoy the activity they do while laying the foundation of programming. Sırakaya (2018) points out that block-based coding is an application that children have fun with as well as has an easy interface, using a method more suitable for children's level such as drag and drop instead of writing code, and the absence of syntax errors due to syntax. In addition to all these conveniences and benefits, coding education is also a very effective action in improving children's cognitive thinking skills (Ioannou and Makridou, 2018; Komis and Mısırlı, 2016). While coding applications such as Code.org and scratch provide children with interdisciplinary gains, for example, directions, and mathematical knowledge. They also support the development of thinking skills such as deciding what to do next and creative thinking. In addition, the game laboratory and project activities that allow freelance work will improve children's design skills and support the development of imagination (Code.org, 2022). Although robotics and coding education are thought to be a course that should be given at an early age because it provides students with positive skills such as learning technology and developing thinking skills, In the programs prepared at the primary school level by the Ministry of National Education, a course related to Robotics and Coding is not included within the scope of compulsory and elective courses (Altun, 2018; Haymana and Özalp, 2020; Negrini and Giang, 2019; Strawhacker, 2015). This course is given as an Information Technologies and Software course at the fifth-grade level, and is among the compulsory courses as a Technology and Design course at the seventh and eighth-grade levels (MEB, 2020).

In a century when technology is developing rapidly, coding education is an important step for children to keep up with the present time they live in. In primary school years, primary school teachers are the people who spend the most time with students and as a result, they are the people who best observe the development processes in terms of cognitive, affective and psychomotor skills. On the other hand, since they are directly involved in the issue, the opinions of the teachers can provide important contributions to those working in the field, people who prepare the curriculum and other stakeholders. Due to the limited number of studies on the subject, teacher opinion can make an important contribution to the literature. In this context, the study aims to determine the opinions of primary school teachers about the coding education that primary school students receive and to make some suggestions to those working in the field, program developers and other stakeholders. Also, the study aims to determine the students' perspective on the coding lesson. To determine the perspectives of the primary school teachers toward the coding lesson, answers to the following questions were sought:

- What are the teachers' views on the necessity of the Robotics and Coding course?
- What are the teachers' views about the students' reflection of what they learned in the Robotics and Coding course in other courses?
- What are the teachers' views on the contribution of the Robotics and Coding course to children's metacognitive skills?
- What are the teachers' views about the Robotics and Coding course being included in the primary school curriculum?
- What are the teachers' views on the impact of the Robotics and Coding course at the primary school level on their future lives?
- What are the teachers' views on the fact that the Robotics and Coding course at the primary school level causes behavioral problems in students due to computer addiction?

In order to determine the perspectives of the primary school students towards the coding lesson, answers to the following question was sought:

- What are the students' views on the contributions of the Robotics and Coding course to them?

## RESEARCH METHODOLOGY

In this study, phenomenology design, one of the qualitative research methods, was used in order to examine the views of primary school students and their

teachers about the coding lesson in depth. The phenomenological design is used to explain the phenomena that we are aware of, understand, and experience but does not have in-depth knowledge about (Bogdan and Biklen, 2007; Marton, 2005). The importance of the Robotic Coding course is known, but why it is important cannot be fully expressed. For this reason, the scope of this study is aimed to have in-depth information about the views on the Robotic Coding course.

## Participants

The study group of the research consists of 8 classroom teachers who were determined voluntarily among 18 classroom teachers working in a school that is the only primary school in the city center of Amasya to offer coding lessons at the primary school level and 16 primary school students receiving education from 1 to 4 grades (Table 1). Since the researcher resides in Amasya, easily accessible case sampling was used while forming the study group. At the stage of determining the school where the research will be conducted, the criterion of being a primary school that has coding education in the curriculum and offers this course to the students regularly was taken into consideration. The only school in the city center meeting this criterion was included in the study group. Participants were determined from primary school teachers and students from the 1st grade to the 4th grade, taking into account the qualitative research sample size. It was emphasized that it would be sufficient to take one or two cases (individuals or groups) as a sample since qualitative studies do not aim to generalize the results to the whole universe (Collins et al., 2006; Onwuegbuzie and Leech, 2007). The teachers in the study group have at least 15 and up to 35 years of experience.

**Table 1.** Demographic characteristics of the study group.

| Teacher | Gender | Grade | Seniority | Student | Grade |
|---|---|---|---|---|---|
| 1 | Female | 1.grade | 15 | 1, 2, 3, 4 | 1.grade |
| 2 | Female | 2.grade | 33 | 5, 6, 7, 8 | 2.grade |
| 3 | Female | 2.grade | 30 | 9, 10, 11, 12 | 3.grade |
| 4 | Male | 2.grade | 35 | 13, 14, 15 16 | 4.grade |
| 5 | Female | 3.grade | 32 | | |
| 6 | Female | 3.grade | 33 | | |
| 7 | Male | 4.grade | 35 | | |
| 8 | Female | 4.grade | 33 | | |

## Procedure

In the research, the data were collected by creating a semi-structured interview form. A literature review was made before the interview questions were prepared (Şanal and Erdem, 2017; Lye and Koh, 2014; Wing, 2006). In this context, six questions for teachers and one question for students were formed that were thought to be suitable for the research. Formed interview questions were examined by three lecturers, two of whom were in the computer field and one in the qualitative research field. The necessary arrangement was made and interview questions were optimalisation for the study. To determine the intelligibility, the questions were read to two primary school teachers and they were asked to indicate the points that were not understood. After the necessary arrangements were made, the interview questions were made ready for implementation.

## Data analysis

Before the data were collected, the research ethics committee approval dated 17.04.2020 and numbered 2020/166 was obtained by the Social and Human Sciences ethics committee of Ondokuz Mayıs University. In order to ensure that the information obtained from the interview was reported more securely, a voice recorder was used with the consent of the participants. Before the interview, a certain amount of time was spent with the participants to ensure their trust. During the interview process, answering the interview questions was done at the request of the teachers and students. The suitable time period for the participants was determined and the interviews were carried out between 12-22 October 2021. It was reminded that there was no time limit and that they could easily answer the questions without being influenced. The data obtained from the participants with the voice recorder were written down. To confirm the accuracy of the information given to the participants, they were allowed to read it again and their consent was obtained. The obtained data were analyzed with the Nvivo 12 program. To ensure participant confidentiality, the teachers were coded as T1, T2, T3…T8 and the students were coded as S1, S2, S3….S16. The data were carried out using the pre-formed code list and

analyzed by content analysis. Content analysis is to interpret verbal, written and visual communication messages in a way that the reader can understand by analyzing similar concepts and themes within certain rules (Elo and Kyngas, 2008; Yıldırım and Şimşek, 2018). In the study, codes and themes were created by determining some criteria using the literature review, The coding process was also carried out by another researcher experienced in qualitative research, and the codes and themes on which consensus couldn't build were not included in the study. The percentage of compliance of the analyzes made by the researchers was calculated using the formula (Percent of Agreement (Reliability) = Consensus / (Agreement + Disagreement) × 100) (Miles and Huberman, 1994). According to Miles and Huberman (1994), it is recommended that the reliability rate be higher than 70% or even higher than 90%. The compliance percentage of the study was found approximately 86%. To increase reliability, the data presented was supported by direct quotations from the participant's views. The formed codes and themes are presented in the findings part.

## FINDINGS

In this part of the research, the data containing the opinions of the primary school teachers about the coding education obtained within the scope of the research are presented with tables, graphics and direct quotations.

### Teachers' views on the necessity of robotic coding course

The data obtained from the teacher interviews regarding the necessity of the robotic coding course are presented in Figure 1.

In the question asked to determine whether the robotics and coding course is necessary, all teachers point out that this course is necessary. The teachers point out that the reason for the necessity of the coding course is that the course helps to be a productive society, and develops the thinking skills of the students. It is a lesson of age and a course that appeals to students and will enable them to use the computer more consciously.

Four of the teachers who said that the robotic coding course is necessary explained the reason as the course improves the thinking skills of the children. The other issue that is mentioned is that today's age is the age of technology and the robotic coding course also addresses this age. In addition, 5 of the teachers stated that they did not have much information about the content of this course. However, according to the teachers coding course is necessary because both the children participated in the lesson with pleasure and they knew that it was related to technology. The views of two teachers on the subject are as follows:

> *$T_2$: 'Most importantly, as a country, we are not a producing society. Maybe with this course, we can pave the way for a little more producing and designing minds. I think good things will happen in this respect. I also feel happy when I see young people designing robotics on social media and on the internet. Children can produce a product when given the opportunity. As long as we realize this.'*
>
> *$T_3$: 'I don't have sufficient knowledge about coding. But I like the activities of coding as I see it on teacher sites. I think it will be very helpful in concentrating children's attention and improving their thinking skills.'*

### Teachers' views about integrating the information learned by children in the robotic coding lesson into the other lessons

The teacher's views regarding the transfer of the knowledge learned by the children in the Robotic Coding Course to other courses are presented in Figure 2.

In the question in which the effect of the robotics and coding course on other courses was investigated, two themes were formed *"I have no idea"* and *"he/she has a relationship"* based on the opinions of the teachers. Teachers stated that the course contributed to learning mathematics in general, learning directions, constructing problem-solving steps, and understanding patterns easily. In addition, it was stated that this course affected the children's ability to catch different ideas, the examples they gave in the lessons and the general ability tests. The views of one of the teachers on the subject are as follows:

> *$T_6$: 'I think that the coding course contributed to the formation of the game in his mind while playing games in the classroom, and to the patterns and symmetries in the mathematics course. When you look at coding from a very broad perspective, everything goes into it.'*

On the subject of associating robotic coding with other courses, 2 of the teachers stated that they did not know the content of the course exactly and said that they had no idea. In addition, 3 teachers stated that the coding course can be associated with every field and that it is a course that covers every subject. The views of two of the teachers are as follows:

> *$T_5$: 'Since I don't know the content, I have no guesses about it. But since it is taught as a lesson in schools, it definitely has a contribution.'*
>
> *$T_1$: 'In this regard, I have seen the benefits of coding. The children had acquired very good*

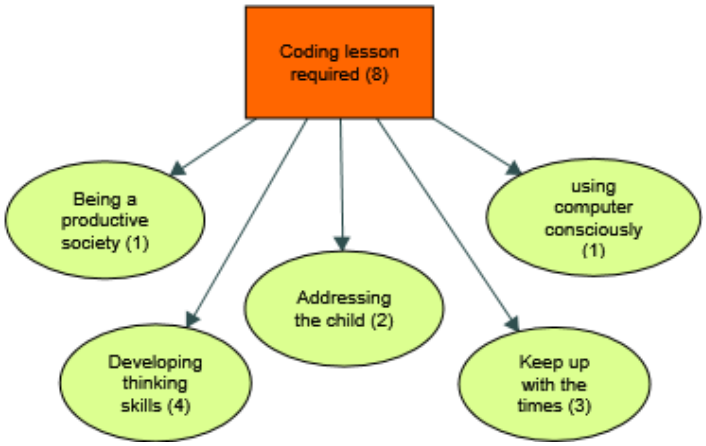


**Figure 1.** Opinions on the reasons for considering the coding lesson necessary.

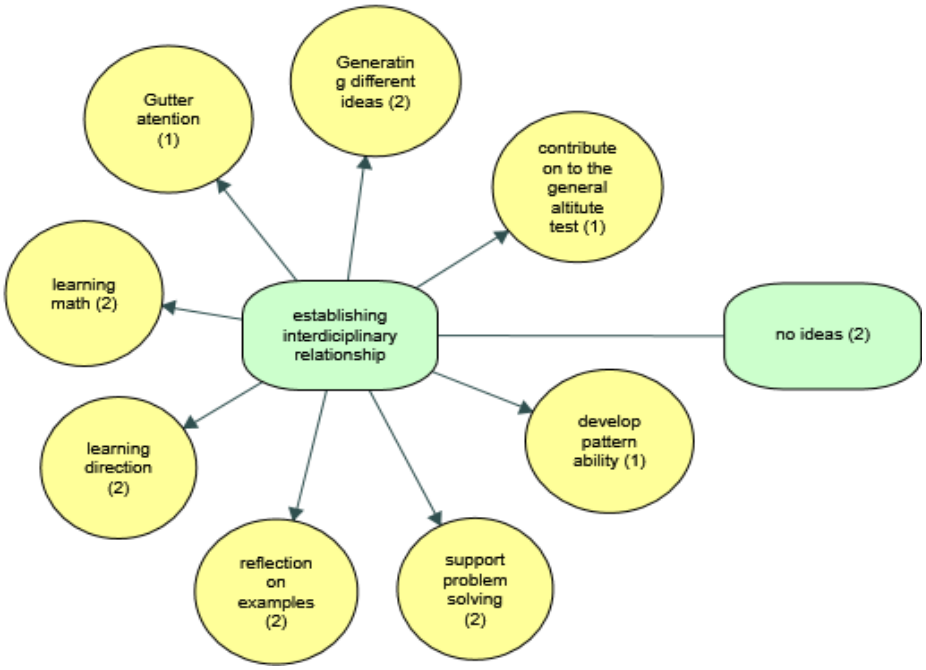


**Figure 2.** Views on the effect of coding lesson on other lessons.

*skills in coding the concepts of right and left. I don't need to teach them again. I believe it supports problem-solving skills in math. It's a complicated lesson.'*

## Teachers' views on the effect of robotics and coding lesson on children's metacognitive skills

Teachers' views on the effect of the Robotics and Coding course on children's metacognitive skills are presented in Figure 3.

In the question in which the effect of the robotics and coding course on the metacognitive skills of the students was investigated, the teachers said that this course had a positive effect on the metacognitive skills of the children and emphasized that these effects improved their sequential thinking skills, creativity, mental development and ability to look at events from a different perspective. The views of one of the teachers on the subject are as follows:

*$T_2$: 'Of course, I think. It makes the child think about the next step in the coding lesson. I think*

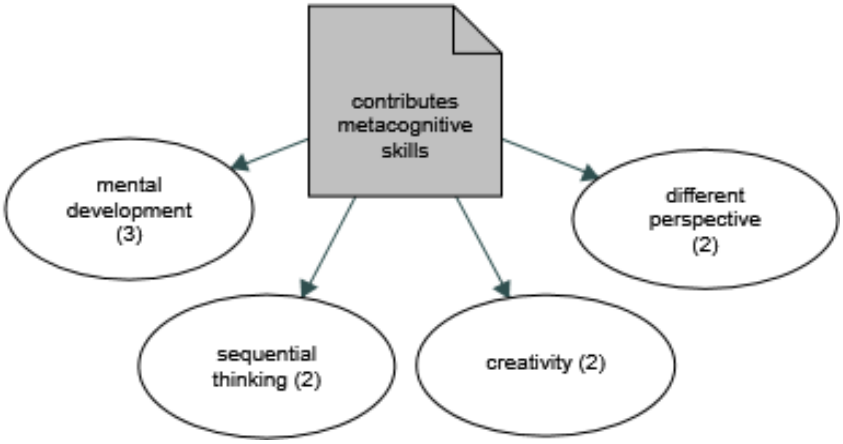


**Figure 3.** Teachers' views on the effect of coding course on metacognitive skills.

*this will also contribute to the child's thinking skills. It will contribute to planning what to do in problem-solving in mathematics.'*

Teachers expressed opinions as *"it affects"* and *"I have no idea"* about the effect of Robotics and Coding course on students' metacognitive skills. While the teachers who did not express an opinion expressed the reason for this as not knowing the content of the course, 3 of the teachers who said that it affected them stated that they improved their mental skills in general. In addition, one of the teachers stated that we can make children addicted to computers while improving their thinking skills. Another teacher stated that this course attracted more attention from boys. The views of two teachers on the subject are as follows:

*$T_6$: 'I noticed that the boy was walking according to the arrows as he walked down the aisle. This shows that he created it in his head. They use it in solving questions measuring creativity in general ability tests. But I also notice this in particular. Coding lesson attracts more attention from boys. I think this is because men are more interested in technology and think more practically.'*

*$T_7$: 'After all, they are making a design in the coding lesson. That's why I think it will also improve their creativity. But here are some questions that come to my mind: Will they be computer-dependent children in the future? Can we be raising children who are addicted to computers while raising children who think and work their minds on the one hand?'*

**Teachers' views on the place of robotics and coding in the curriculum**

Teachers' views on the place of Robotics and Coding in the curriculum are presented in Figure 4.

The views of the teachers regarding the place of Robotics and Coding in the curriculum were gathered under the heading that the curriculum is not sufficient. Teachers who do not see the curriculum point out that it creates the inequality of opportunity between schools and it should be rectified, the Robotic Coding course, which is not included in the compulsory course in primary school. It should be added to the curriculum, and this course should be given to children at an early age, and the place of the course in the curriculum should be more than one hour. They stated the reasons for not providing equality of opportunity as the insufficient number of Information Technologies teachers, the inability to use the equipment such as computers and internet in schools correctly, and insufficient equipment. The views of one of the teachers on the subject are as follows:

*$T_1$: 'I was one of the teachers who supported the establishment of computer classes the most. The computer classes in the schools I come from are either disbanded or out of order. There was a ready-made technology. If those computer classes were not closed, the robotic coding course would be able to be carried out easily in public schools now.'*

When asked about the place of robotics and coding course in the curriculum, all of the teachers said that coding should be added to the primary school curriculum. 5 of the teachers stated that it would be more appropriate to have more than one hour of coding class, and 3 teachers stated that this course should be given to children at an early age. The views of two teachers on the subject are as follows:

*$T_2$: 'It is a lesson that should be in the curriculum. It should be processed gradually from easy to difficult according to the age group of the children, the earlier the child gets*

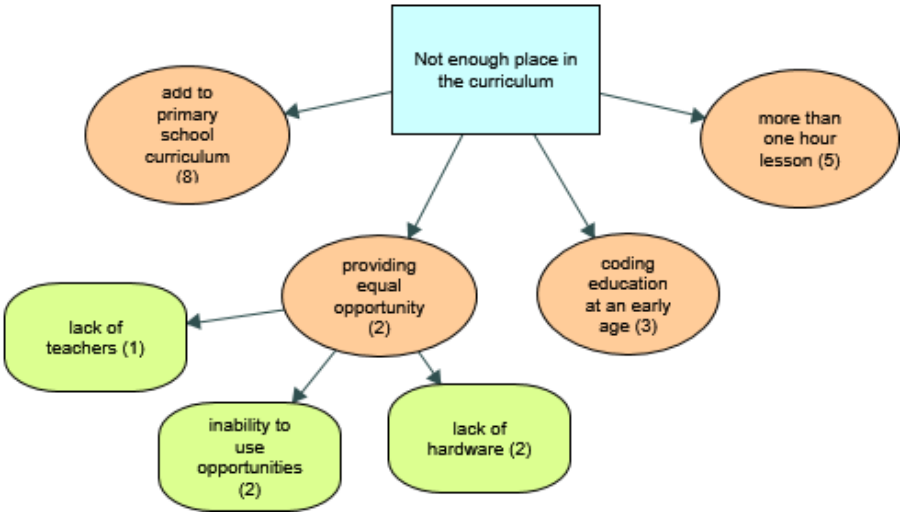


**Figure 4.** Teachers' views on the place of the coding lesson in the curriculum.

*acquainted with it, the more he gains the ability to think, solve problems, produce and design different things. This gives positive results for us. We are not a producing society. That's why the sooner our children get acquainted with this lesson, the better it will be…'*
*'…It is one of the courses where equality of opportunity cannot be achieved in education. Some schools have it, some schools don't. But all students should receive this lesson course. Information laboratories were established in schools. However, they were not used enough. I think every child should be given this opportunity.'*

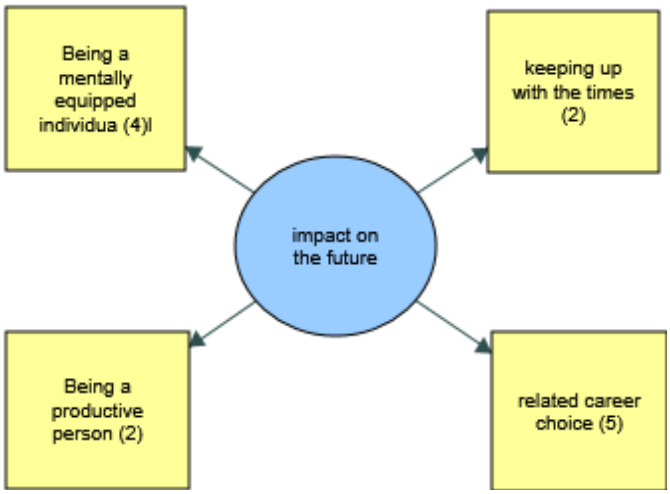


**Figure 5.** Teachers' views of coding on children's future lives.

## Teachers' views on the effect of robotics and coding lesson on children's future lives

Teachers' views on the effect of the Robotics and Coding course on children's future lives are presented in Figure 5.

To the question asked to determine the teachers' views on the effects of the Robotics and Coding course on the future lives of the students, the teachers answered as being a mentally equipped individual, being a productive individual, and keeping up with the times. In addition, the teachers stated that many professions will be related to artificial intelligence and coding in the future, so this course will contribute to students' awareness of their abilities, and accordingly, it will be useful in choosing a profession. The views of one of the teachers on the subject are as follows:

*$T_6$: "I believe that robotics and coding will be a turning point in the future lives of children. Let me explain this with an example from Teknofest.*

*Two children from Hakkari, whose father was a shepherd, were receiving education in high school, I think. They made drones as an amateur. They ask the children in the interview. You are in Hakkari and on the plateau. How did you achieve this?'. They say, 'My father used to make cars for us out of plastic bottles. He put caps on his wheels. My father used to create different models of cars with those plastic bottles." The imagination of these children comes from the robotic activities that their father had unwittingly done."*

To the question asked about the effect of the Robotics and Coding course on the future of children, 4 of the teachers expressed their opinion on choosing a profession related to this course. 4 teachers, on the other

hand, said that children will be intellectually equipped individuals with the ability to design and creativity. In addition, one of the teachers ($T_3$) exemplified how important it is to give coding at an early age to keep up with the times in the future, and stated that if such courses are taken at an early age, they will not have such a hard time in distance education. The views of some teachers on the subject are as follows:

*$T_3$: 'I think that most professions in the future will be on artificial intelligence and computers. Coding will definitely impress as it is also their foundation. If such training were given in our time, we would not have such a hard time adapting to the distance education process. So I think it will definitely affect it.'*
*$T_4$: 'Coding will be very beneficial for these children in the future as it helps to clear their minds and focus on the lesson. It's time to get this kind of stuff in schools. It will be useful for children to make sense of it. They will raise awareness and they will be able to adapt to the world of the future more easily. In addition, it will be useful for them to take this course in advance to get to know themselves. In the future, they can choose a profession that fits their skills.'*

**Teachers' views on the fact that the Robotics and Coding course at the primary school level causes behavioral problems in students due to computer addiction**

Teachers' views on the fact that the Robotics and Coding course at the primary school level causes behavioral problems in students due to computer addiction are presented in Figure 6.

Two of the teachers did not express an opinion on whether the Robotic Coding course would cause computer addiction in students, since they did not know the content of the course, and six teachers stated that the course would not cause computer addiction. The teachers, who think that it will not cause computer addiction, explained that the reason for this is that the course is taught in schools, this course is applied for one hour a week and that it does not cause addiction since it has useful content. In addition, other educational platforms are now used over computers; they stated that if there is a computer addiction, it cannot be connected only to the robotic coding course. One of the teachers, on the other hand, stated that even if the course has such an effect, she prefers the generation to interact with technology on a subject where they will provide significant gains, rather than an addiction by playing any game at least.

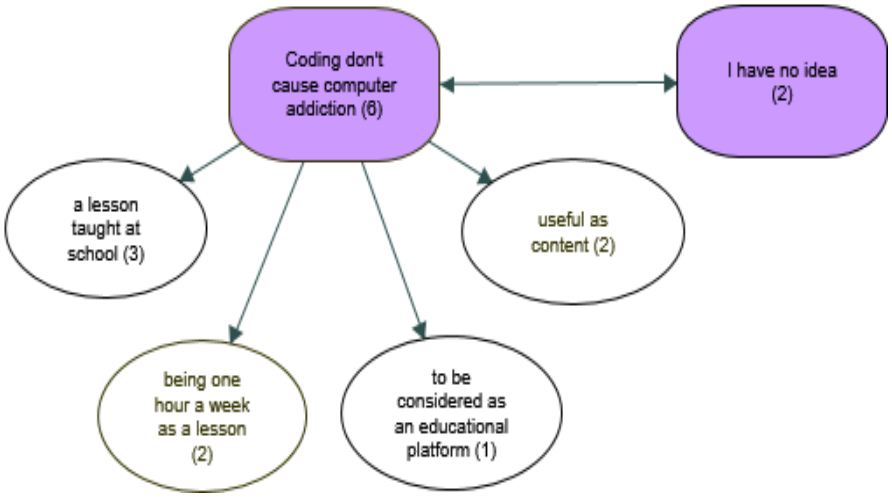


**Figure 6.** Teacher view on whether coding course causes computer addiction or not.

*$T_1$: 'I do not think that the course has an addictive effect on students. Even if it does, I prefer students to spend more time in front of the screen producing something rather than gaining an addiction by playing unnecessary games. Because no matter what we do, the new generation has been exposed to a lot of technology with the effect of the environment and the reality of the pandemic we are in.'*

**Students' views on robotics and coding course**

The opinions of the students on the necessity of the robotic coding course are presented in Figure 7.

To the question about the necessity of the robotic coding course, all of the students stated that the course was necessary and contributed to them. The students expressed their views on the contributions of the course as learning to use computers (4), designing games (3)

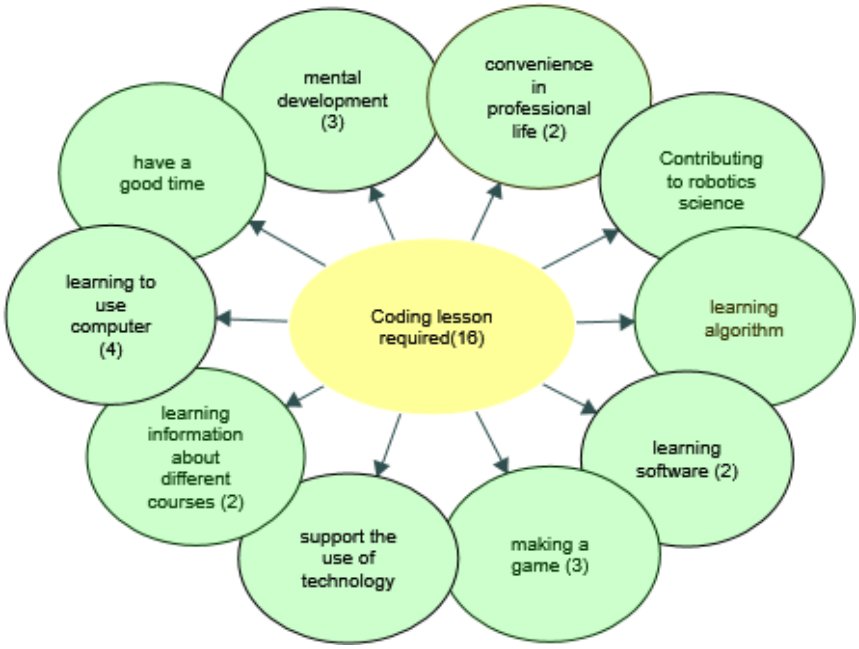


**Figure 7.** Students' views on robotics and coding course.

and providing mental development (3). Apart from these, 2 students emphasized that they will be able to use coding in the profession they will choose in the future, so learning to code already can be beneficial for their future. The students' views on the necessity of the course are as follows:

> *$S_7$: 'I think that the Robotics and Coding course is necessary and contributes to us. This course not only enables us to develop mentally, but also can help us choose a career in the future.'*
> *$S_{11}$: 'We can design games using this lesson. This course teaches us programming.'*

## DISCUSSION AND CONCLUSION

With the introduction of computers into our lives, the common language created between the computer and the user to enable effective use is called coding, in other words programming. To make the programming involved in human life with the numbers 0 and 1 more understandable for child computer users in the young age group, blocks that allow for creating a meaningful sequence with the drag and drop method are used (Coravu et al., 2015; Forquesato and Borin, 2018). Robotics and Coding, which has taken its place among the 21st century skills, the importance of which is not fully understood today, has started to take place in the curriculum at the secondary school level in some private schools in our country as well as in some countries (Başaran, 2017; Yecan et al., 2017). Robotics and Coding, which started to be taught as a course in schools, opens the door to a different world that allows students to use other courses in the computer environment and contributes to the knowledge and awareness of teachers and parents in this context.

In the interviews, all of the teachers answered the question about the necessity of the coding course, which was asked of the teachers. The most emphasized views as justifications were stated as developing students' thinking skills and being a lesson as a necessity of the age. It is stated in the literature that programming contributes to students' thinking skills such as reflective, creative thinking and problem-solving. It was also stated that the importance of learning programming increased with the advancement of technology arttığı (Akpınar and Altun, 2014; Papavlasopoulou et al., 2017; Popat and Starkey, 2019; Yükseltürk and Altıok, 2016). In this context, teacher views show parallelism with the literature. In addition, although teachers stated that they did not know much about the content. They thought that coding was necessary, which makes us think. They expressed their opinions based on the use of computers in the course of the lesson and the content they saw on the websites.

In the question asked to the teachers about the students' reflection on what they learned in Robotics and Coding course in other courses, two of the teachers could not comment because they did not have any knowledge about the content of the course. The fact that the teachers said that the Robotic Coding course was associated with other courses and that they established this relationship in the problem-solving stages and on the

pattern suggests that the algorithmic logic in the Robotic Coding course could be taught to the students. Considering that algorithms are a structure consisting of sequential steps used to complete a finite task (Gökoğlu, 2017), it can be said that the Robotic Coding course can contribute to the problem solving and pattern issues stated by the teachers (Calao et al., 2015; Vorderman, 2019; Zhu et al., 2016).

The fact that the teachers said that the Robotic Coding course is very useful in teaching the aspects of the students can be associated with the Life Studies course and their daily lives. The fact that they said that they gained Mathematics skills revealed that the teacher's views were appropriate considering that they frequently used calculations and geometric shapes in the content of the coding course. In addition, Taylor et al. (2010) stated that programming applications such as scratch not only improve children's creativity and systematic skills but also contribute to mathematics and calculation skills, confirming the views of teachers. In addition, when we think that the basis of all lessons is based on cognitive performance, it can be said that the views of the teachers who say that the coding lesson that supports this performance can be associated with every field.

Except for one, the teachers expressed a positive view about the effects of the Robotic Coding course on the metacognitive skills of the students. The teacher who did not express her/his opinion stated that he/she could not make any comments because she did not know the content of this course. Teachers generally said that they contributed to the students cognitively; They emphasized that the Robotics and Coding course is beneficial for sequential thinking, creativity, and gaining a different perspective. In coding activities, students' finding a solution to a problem in sequential stages, designing their activity, collaborative project work and using mathematical skills can be seen as an indication that the Robotic Coding course improves students' metacognitive skills (Calao et al., 2015; Kafai and Burke, 2013; Taylor et al, 2010; Wing, 2006). Therefore, it can be said that these results support the views of teachers.

In teachers' views on the place of Robotics and Coding in the curriculum, all the teachers said that this course should be included in the primary school curriculum. The primary school teachers, whose opinions were taken, stated that this course was exactly what they wanted and that it would be good if it was included in the curriculum for more than one hour. On the other hand, it was also stated that some of the schools did not have sufficient conditions to provide this education due to reasons such as teachers, internet and equipment inadequacy. According to Engin et al. (2010), problems in the supply of technological materials such as software and hardware make it difficult to provide computer-assisted education in the education and training process. This may make it difficult to include courses such as coding, which must be carried out with technological equipment such as computers, in the school curriculum.

The teachers stated that the coding lesson should be given to children from an early age, the earlier the product is given, the sooner the product will be received. For this reason, they stated that this course should be included in the curriculum starting from primary school and even kindergarten if possible. Sayın and Seferoğlu (2016) stated that many countries have added this course to their curricula to gain coding skills and develop logical thinking and problem-solving skills, and even some countries have come a long way in this regard. In their study, Tuomi et al. (2018) emphasized that countries adopt different policies for school systems regarding the learning of computer programming and coding skills, for example, Estonia teaches programming to every student from the age of seven.

To the question asked about the effect of the Robotics and Coding course on the future lives of the students, the teachers stated that it was necessary for them to be cognitively equipped individuals, to be productive individuals, to be aware of their abilities and to choose a profession related to coding, and to keep up with the times. The fact that students make projects and designs with coding software, supports the view of teachers to be productive individuals, and the fact that our age is called the age of technology and coding has taken place in the literature as a 21st-century skill shows that this course will be useful in adapting to the age when it is given to children at an early age (Bers, 2018; Monteiro et al., 2021; Negrini and Giang, 2019). Sayın and Seferoğlu (2016) stated in their studies that coding is on the way to becoming indispensable for students and the business world, and stated that the digital economy is now at a key point in the development of countries. In addition, studies state that coding improves students' computational thinking skills and also contributes to their creativity (Papavlasopoulou, 2017; Schmidt-Crawford et al., 2018). Based on this view, it can be said that coding has and will have an important place in creating the career planning of students today and in the future.

To the question about whether the robotic coding course caused computer addiction in students, six of the teachers answered that it was not addictive. As the reason for this, they said that the weekly course hours of the robotic coding course are low (1 hour), it is useful in terms of content and can be used as an education platform. This revealed that teachers think that it is difficult to keep students away from the computer environment today and that it would be better if they spend time at the computer with at least useful content. In addition, the teachers stated that apart from robotic coding, students spend time with computers, play different games, and if there is addiction, it cannot be associated with this course alone. Palmer (2015) stated in his study that spending too much time in front of the computer at an early age will reveal negative consequences such as lack of attention, lack of language

skills, creativity and imagination. This shows that even though it has useful content, it reveals the idea that technology and internet addiction in children can create or contribute to this situation when they are not sitting in front of the computer in a timely controlled manner with applications such as Robotic Coding (Mustafaoğlu et al., 2018). On the other hand, Yücelyiğit and Aral (2018) stated that besides using only social media or video/internet games, parents' life practices such as coding and design, where technology is used beneficially, may shorten the time they spend in front of the screen.

In the answers given by the students to the question about the robotic coding course, all (16) stated that the course contributed to them. These views of the students show parallelism with the teachers' views on the necessity of robotic coding courses. Considering the answers given by the students to this question, the fact that they like games and computers as of their ages suggests that they contribute to their positive attitude towards this lesson. In addition, considering that coding in the literature contributes to the development of 21st-century skills such as creative, innovative and critical thinking skills (Kanbul and Uzunboylu, 2017; Timur et al., 2021), the answers of the students revealed that they understood why they learned this lesson. Bıkar et al. (2020) stated that students develop positive opinions about robots in their studies on the use of robotics in geography learning, and therefore they will increase their interest in a subject to be taught at school and develop a positive attitude. Similarly, Arslan and Tanel (2021), in their study on Arduino, stated that students developed a positive attitude towards the lesson by using a programming tool such as Arduino, and they supported it with student opinions.

Robotics and Coding course has taken their place in the curricula of many countries with colorful and appropriate software for primary school children (Lindberg et al., 2019; Vico et al., 2019). Countries give Robotics and Coding lessons at an early age to their students to develop their thinking skills, to raise individuals who contribute to society by producing, to provide trained personnel for robot design, which is also called artificial intelligence, and other software sectors and raise this awareness. For our country, it is of great importance that the Robotics and Coding course be included in the curriculum at the primary school level to raise productive individuals and contribute to economic development.

## SUGGESTIONS

- It may be appropriate to add Robotic Coding training to the primary school curriculum, especially considering that it will contribute to the mental skills of children.
- Conditions can be improved in regions with insufficient internet infrastructure and technical equipment to provide equal opportunity in terms of Robotic Coding courses.
- Various seminars and training can be organized to explain the importance of Robotics and Coding to parents and classroom teachers.
- Local robotics and coding software can be designed that will attract students' attention and arouse interest.

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