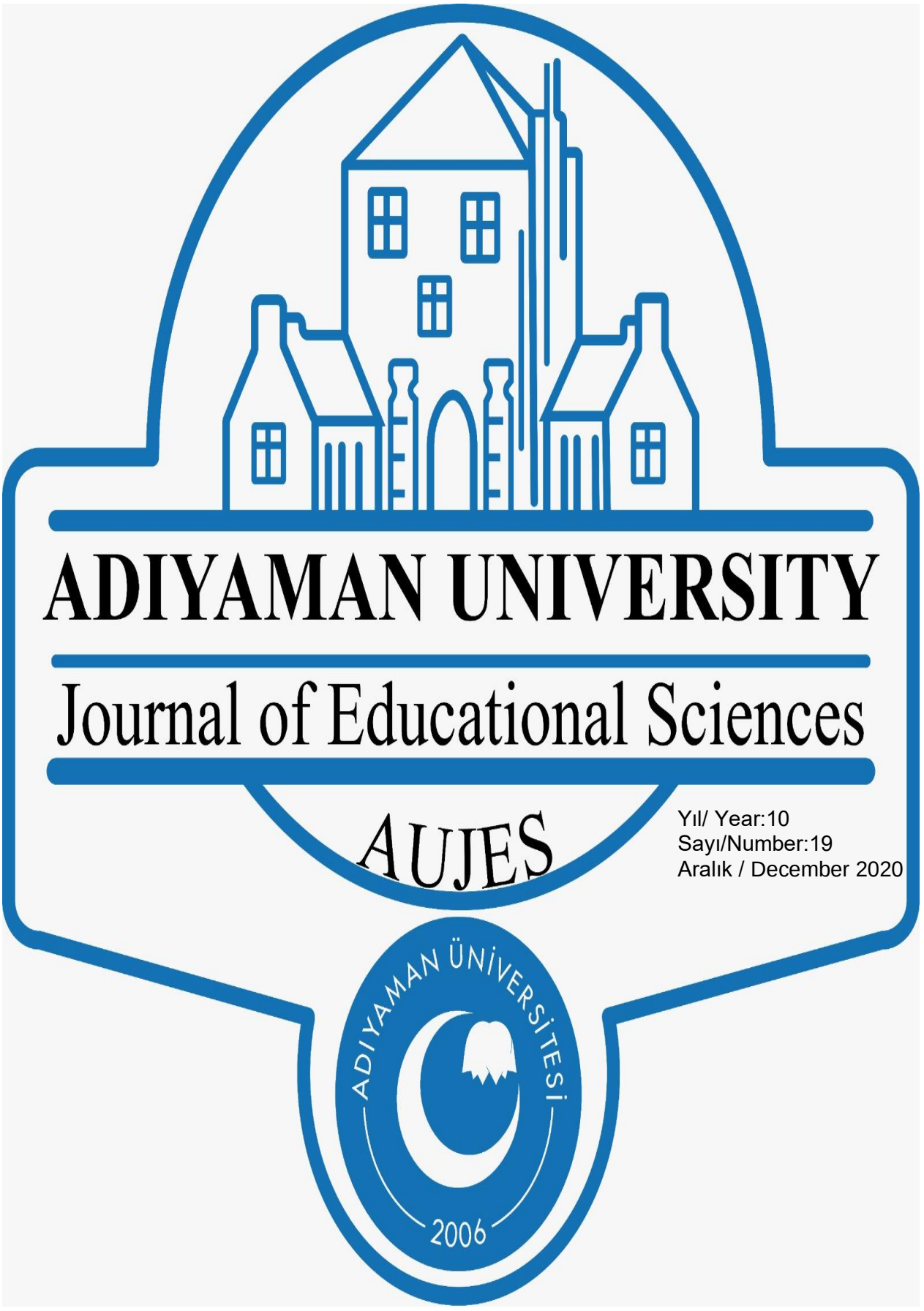


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# ADIYAMAN ÜNİVERSİTESİ EĞİTİM BİLİMLERİ DERGİSİ

**Yılda İki Kez Elektronik Olarak Yayınlanan Uluslararası Hakemli Eğitim Dergisi**
**Yıl: 2020 Sayı: 10 (2)**



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# Table of Contents

## Research Articles

## Bu Sayının Hakem Kurulu

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# Teacher Views on Programming Teaching

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# Teacher Views on Programming Teaching

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## Abstract

The aim of this study is to evaluate the processes of programming teaching in the context of Information Technologies and Software course. In the study where qualitative research method was adopted, teachers' answers to open-ended questions were subjected to content analysis and common themes were created. Within this scope, nine Information Technology Teachers graduated from different programs, working in different regions and different school types have answered open-ended questions. Teachers defined their knowledge as intermediate and above-sufficient in terms of block-based programming tools, and expressed themselves as beginner or not competent, especially for physical programming environments. There were both positive and negative responses for teaching computer science at an early age. Similarly, there are both positive and negative views on Information Network in Education Activity Books and Coding Guide. The number of students per computer is the most important problem raised regarding the instructional process. According to the opinions reported in terms of students, students are uninterested to the course and they do not have computers at home for practicing. The teachers stated that there is a need for teaching material for a more effective teaching process and laboratory conditions need to be improved.
**Key words:** Teaching programming, Opinions of teachers, Information technologies and software

## Introduction

Nowadays, digital thinking, computational thinking and coding education at K-12 level has become one of the priority issues of most countries. In many countries, computer science and programming topics are included in different levels of curriculum starting from primary education, as justified by being the requirement of current era (Balanskat, 2015; Larke, 2019; Tairab, Huang, Chang, & Zheng, 2016). In Turkey, Information Technology and Software curriculum, which is updated during the academic year 2018-2019, has become mandatory for secondary school 5th and 6th grade level, and it was determined as an elective for other levels except for high schools with preparation and science high schools. In the updated curriculum, it is seen that, "Problem Solving and Programming" issues are emphasized in parallel with the trends in the World. The inclusion of computer science topics in information technology courses in schools can be considered as an innovation. Although the benefits of making computer science concepts accessible, engaging and entertaining and understandable deeply by students has been emphasized in the computer science education started to be given in schools, there is still some uncertainties and difficulties (Sentance & Csizmadia, 2017). For instance, when viewed in terms of Turkey, the appropriateness of teacher training to the new program and the pedagogical competencies of Information Technology Teachers for both the subject and the teaching of these topics are not clearly revealed. In this study, it is aimed to reveal the teachers' knowledge and skills related to computational thinking and programming at secondary school and high school level, their experience regarding the current teaching process, the main challenges and problems they faced during the teaching, and their expectations for the teaching processes to be more efficient during the implementation process of the Information Technologies and Software course curriculum. The results of the research are expected to reveal the challenges in the teaching of computer science and programming and the experiences of teachers in this process in Turkey and thus to contribute to the field.

### Programming Education at K-12 Level

The orientation towards teaching computer science topics from an early age is based on the idea of providing individuals, who constitute the information society in the 21st century, with computational thinking skills. ISTE (2011) defines computational thinking as an approach that encompasses creative, algorithmic and critical thinking based problem solving, collaborative learning and communication skills and strengthens the combination of technology and thought. In addition, the purpose of students' gaining computational thinking in

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this definition is emphasized as not the advancement in the field of computer science, but rather that they adopt this thinking approach as a habit of practicing in different courses in their lives and educational processes.

While computational thinking is accepted as a concept put forward by Wing (2006) as using a series of thinking skills, processes and approaches in the field of computer science in solving complex problems, computer programming knowledge and computational thinking are issues that have been studied for a long time for different age levels. In the 1960s, Alan Perlis advocated that university students of all disciplines needed knowledge of programming and computation theory, while in the 1980s, Seymour Papert led the idea of children who developed procedural thinking skills through LOGO programming in K-12 classes (Buckingham, 1965; Papert 1980). In practice, computer programming is presented as a key application in supporting and developing computing thinking skills (Grover & Pea, 2013; Guzdial 2008). In this framework, the approaches that can be used for programming education at different age levels should be different than those that will be used for educating for professional programming. Countries have started to include this concept in their basic education programs, the number of tools developed has increased for programming knowledge and skills for different education levels. Lockwood and Mooney (2017) stated that there are 50 different tools being used, developed or integrated to gain computational thinking skills in their systematic literature review research. In addition, no consensus has yet been reached on how to acquire computing thinking skills in the easiest way by using tools and which methods should be used to measure these skills (Guzdial, 2008; Kale et al. 2018; Román-González, Pérez-González, & Jiménez -Fernández, 2017). Although there are various ongoing researches on these issues, the implementation of these topics differs in the curriculum of the countries.

Shailaja and Sridaran (2015) stated that students can understand what programming is by teaching with block-based tools such as Scratch for the algorithmic thinking and writing skills at the 3rd-5th grade levels, by writing simple programs at the 6th -8th grade levels, and then code-based programming environments such as Basic, Visual Basic can be introduced and finally programming languages such as Phyton and Java can be given at the 9th-12th grade levels. Hiltunen (2016), on the other hand, emphasized that programming should start first with logical “real life” games and digital game based learning environments, and that it can be continued with syntax based code based interfaces after activities with drag-and-drop interfaces. On the other hand, as a completely different approach, Mike Fellow in the 1980s defined the "unplugged" computer science approach, and it started to attract attention since 2003. In this unplugged approach; it is emphasized that mathematics and computer topics can be taught to children or adults through storytelling and drama, and primary school children can learn advanced computer science concepts with this method (Bell, Rosamond, & Casey, 2012). In Turkey, it is stated that open-source and free programming tools should be used for teaching programing concepts in the Information Technology and Software course curriculum which is mandatory for 5th and 6th grades (MEB, 2018). While studies that try to define what and how we should teach are ongoing, studies also emphasized the limitations such as lack of knowledge and experience of teachers about programming tools, infrastructure deficiencies in countries with insufficient resources, and lack of resources and tools that teachers can use in their teaching processes (Heintz, Mannila, & Färnqvist, 2016; Lockwood & Mooney, 2017).

Another prominent subject in programming education is that the levels of computer science education and pedagogical knowledge of teachers teaching in different primary and secondary schools differ from each other (Diethelm, Hubwieser, & Klaus, 2012). In Turkey, K-12 level, mostly secondary school level, computer teachers graduate from Computer Education and Instructional Technology (CEIT) Departments of Faculty of Education. With reference to the 2018-2019 curriculum, it is known that up to now, pre-service ICT teachers have not taken any courses related to programming education (such as tools and teaching approaches), although they have taken some courses related to programming. In addition, the Higher Education Council has updated CEIT curriculum which is valid since 2018-2019 academic year with adding some courses in the form of "Learning and Teaching Approaches in Informatics" and "Programming Teaching Approaches". Since the pre-service teachers who will take the specified courses will graduate approximately 3 years later, it can be said that the in-service Information Technology Teachers do not receive any training on programming teaching.

According to the research conducted by Yükseltürk and Altıok (2015, 2016) regarding the CEIT curriculum before the 2018-19 academic year; pre-service teachers believed that they did not have sufficient knowledge about visual tools and current methods related to programming, although they considered themselves sufficient to explain programming at K-12 level. Similar situations exist in other countries. In a study that investigates the successful teaching approaches and difficulties faced by 339 Computer Science Teachers who teaches programming at primary and secondary level in the UK, it is stated that some of the difficulties experienced by teachers in their teaching processes are due to their own internal and external reasons and the others is due to students (Sentance & Csizmadia, 2017). The internal difficulties are related with the lack of self-confidence of teachers on this topics and their inadequate knowledge in determining appropriate pedagogy; external difficulties are related with insufficient educational resources. In addition student-related difficulties are stated as their understanding the teaching content and problem solving. In this regard, it is stated that it is

beneficial for teachers to get more detailed education in order to improve their pedagogical skills and to produce more instructional resources (Sentance and Csizmadia, 2017).

In Turkey, the number of studies revealing the positive and negative aspects of Information Technology and Software education program from various perspectives is still limited. The study carried out by Yecan, Özçınar and Tanyeri (2017), which can be considered similar to this research, focuses on the study of only visual programming teaching. It is also seen that the study is carried out for the curriculum before the 2018-19 academic year. Similarly, there is another research conducted by Cevahir and Özdemir (2017), which is conducted before the updated curriculum and is focused only at the level of Vocational and Technical Anatolian High School. In this context, although there are studies (Göncü, Çetin, & Şendurur, 2020) are similar to the scope of this research, there is no evaluation study regarding the Information Technologies and Software education program, which is started to be implemented since 2018-2019 academic year, and focusing on and especially problem solving and programming topics that have gained importance in the program from the perspective of teachers.

One of the most important factors that determine the successful implementation of the changes made in a curriculum is the level of teachers' adoption of the program and their opinions regarding the program. Although the updated curriculum started to be implemented in all schools since the 2018-2019 academic year, it is also known that some Information Technology Teachers still carries out their educational processes in the 5th and 6th grades according to the previous curriculum. It is important to reveal the reasons for this in order to contribute to the successful and qualified implementation of the program. In this context, it can be said that here is a need to determine the level of knowledge and skills of teachers, by focusing on their content-related and pedagogical competencies especially related to programming education topics which gain more importance for the implementation of the new curriculum.

### Purpose of the Study

The aim of this research is to analyze the views of Information Technology Teachers based on their experience in programming teaching. In other words, it is the evaluation of the process of programming teaching within the scope of Information Technologies and Software course from the perspective of teachers. Knowledge and experience levels of teachers about programming environment and approaches (such as unplugged coding, text / block-based programming, physical programming and object-based programming), and their use cases in their lessons are examined. Teachers' opinions about Activity Books, Coding Guide and other teaching materials (video, animation, presentation, etc.) published in EBA for teaching the learning gains about programming, and the resources they use other than EBA were also examined. In addition, their views about programming teaching (such as, do they suggest teaching at early ages), their views on computational thinking, and interpreting the relationship between computer programming and computational thinking were analyzed.

## Method

The study was carried out within the framework of a qualitative research paradigm. One of the qualitative research approaches, the research design has been determined as a phenomenology research. It is aimed to reveal common points in the experiences of the participants with phenomenology (Johnson & Christensen, 2004, p. 365). Descriptive analysis was applied to the data collected in the research. Descriptive analysis is a qualitative analysis method in which the data collected with qualitative data collection tools are summarized and interpreted according to previously determined themes (Yıldırım & Şimşek, 2013). In this context, it has been tried to systematically describe the opinions of information technology teachers with different demographic backgrounds about programming teaching.

### Participants

The participants were selected via convenience sampling in accordance with the purpose of the study. In order to increase the diversity of the data obtained for the purpose of the research, in determining the participants, information technology teachers who teach at different school types, graduated from different degrees, and have different expertise levels tried to be determined. For example, although there were more teachers available in the province where the researchers were working, participants from different provinces were intentionally reached. The reason behind this strategy was to reduce the similarities and to increase diversity. Participant Teachers are coded with abbreviation PT.

The participants were tried to be chosen to represent the Information Technology Teachers (ITTs) at the maximum level, as can be seen from Table 1. Among ITTs, there are also graduates of Technical Education Faculty (TEF) (PT4 and PT7). Similarly, although ITTs generally work at the secondary level, there are also a small number of ITTs working at high school level (PT5). Although it is suggested to be taught as an elective course at the high school level, "Problem Solving and Programming" topics have gained importance in the

Computer Science curriculum as of 2018-2019 academic year. This was also taken into account when determining the sample and an Information Technology Teacher working in high school was also included in the participants, purposively. The participants expressed, in general, their school's academic quality around average. A teacher who worked in a district (PT2) in Muş and in the central district of Kocaeli (PT7) expressed it as "below average". The teachers' years of work experience ranged from 1 to 15 years. Six teachers had 10 years or more experience, while three teachers were in the first 3 years of their professional life (PT1, PT2, and PT3). All teachers, except two teachers (PT1 and PT3) who were working in a private school, were working in public schools

Table 1. Basic demographic information of the participants

| Code | Graduated from | City | School | Type | Location | School Quality | Experience |
|---|---|---|---|---|---|---|---|
| PT1 | CEIT | İstanbul | Secondary School | Private | Central District | Average | 1 year |
| PT2 | CEIT | Muş | Secondary School | Public | District | Below Average | 2 years |
| PT3 | CEIT | Kocaeli | Secondary School | Private | Central District | Above Average | 3 years |
| PT4 | TEF | Kocaeli | Secondary School | Public | Central District | Below Average | 12 years |
| PT5 | CEIT | Samsun | High School | Public | Central District | Average | 13 years |
| PT6 | CEIT | Samsun | Secondary School | Public | Central District | Average | 13 years |
| PT7 | TEF | Kocaeli | Secondary School | Public | Rural | Below Average | 14 years |
| PT8 | CEIT | Samsun | Secondary School | Public | Central District | Average | 14 years |
| PT9 | CEIT | Kocaeli | Secondary School | Public | Central District | Above Average | 15 years |

**Data Collection and Analysis**

The questions developed by the researchers were grouped in three categories. The first category questions were related to demographic information of the teachers. The second category included questions to reveal the knowledge and experience levels of teachers about programming teaching at K-12 level. The final category focused on instructional processes of teaching programming. This category had questions to examine teachers' experiences about instructional processes of programming teaching, to reveal the problems they faced and their expectations for better instructional environment.

In order to gain comprehensive data on programming teaching at K-12 level and on the implementation of the renewed curriculum, the diversity of teachers participating in the study was tried to be achieved. For this reason, the demographic questions in the interview form included questions about graduated university, city of work, level of school, type of school (private or public), level of teaching experience, the number of laboratories and computers in his/her school, the average number of students, etc.

Following the demographic questions, the questions were asked to the teachers in order to reveal their level of experience and competencies about programming in general and in particular programming teaching at K-12 level. For example, the participants were expected to express their level of knowledge about programming with the question: "Please write the names of the programming environments or tools you have experience with?" The form included questions about how long the participants have taught programming subjects for programming teaching at the K-12 level, whether they have participated in a training program on this topic, and their level of knowledge about the programming environment and tools at the K-12 level. Another question was "Please indicate your level of experience regarding the programming environments and approaches below (options such as unplugged coding, text-based coding tools or environments, block-based programming tools or environments, physical programming or microprocessor programming)". With this question, it was tried to reveal the knowledge levels of teachers about programming environment and tools at K-12 level.

In order to analyze their competencies related to programming teaching at K-12 level, the participants were asked open-ended questions about computational thinking, teaching programming at early ages, and programming environments, methods and approaches used at K-12 level. For example, the question "What do you think about frequently used concepts such as 'computational thinking, procedural thinking' in recent years? How would you describe it?" was related with computational thinking. "Can you provide an example explaining the teaching methods, techniques and activities you use in your lectures?" was asked to reveal the methods teachers' use in programming teaching. The question "what programming environments (unplugged, block-based, code-based, physical programming) do you think would be effective for programming teaching? Can you explain why? " was asked to analyze the knowledge levels and competencies of programming teaching approaches.

In addition to above questions, to reveal the experiences of teachers in instructional process; the programming environments, teaching methods and materials, assessment approaches they used in their lessons

were asked. In order to find answers for the problems experienced by teachers in the teaching processes the questions asked were "What are the problems you faced with in your lessons in terms of instructional environment?" and "what are the difficulties you encounter in your lessons when you consider your students?" In order to reveal the teachers' expectations in terms of the efficiency of the teaching process, "what do you think you need for more efficient instructional processes? (e.g. textbook, materials, etc.)" and "If I have ...., I will teach this this course better? What do you think that you need?" questions were asked.

After developing the questionnaire based on the three categories mentioned above, an Information Technology Teacher, an expert from Computer Education and Instructional Technology, and an expert from informatics were consulted to examine the questionnaire. The questionnaire, which was finalized in line with the suggestions of the experts, was shared with the Information Technology Teachers who agreed to participate in the research. Due to teachers' presence in different provinces and their workload, the questionnaire was sent via e-mail. Questionnaires were e-mailed to teachers in the second week of April 2019, and their answers were received in the end of third week of April 2019. That is the data collection process was completed in two weeks.

During the analysis of the data, demographic data were mostly quantified. Open-ended questions were first subjected to content analysis by two researchers separately. Afterwards, the researchers' separate analyzes were combined and an agreement was tried to be reached. In this second round, a total of 29 open-ended questions were jointly analyzed. Within these 29 questions, there were 24 mismatches among the researchers' separate analysis of 81 answers of 9 questions. As a result, researchers' open-ended analysis mismatch was 29.6%. In line with the questions asked three main themes explained above, the results of the joint analysis were also brought together under these categories. In order to increase the credibility of the research due to the low number of participants and nature of qualitative research, the findings were mainly presented with direct quotations from the participants' opinions.

## Results

### Knowledge and Skill Levels of Information Technology Teachers about Programming Tools

Only one of the ITTs (PT2) participating in the study expressed his experience in the field of programming as average. All other participants stated their experience in the field of programming as above-the average. Two teachers (PT1 and PT8) were highly interested in programming, 6 teachers (PT2, PT3, PT5, PT6, PT7, and PT9) were moderately and 1 teacher (PT4) was very low. Knowledge and skill levels expressed by ITTs regarding their K-12 level programming tools are presented in Table 2.

As can be seen from Table 2, ITTs defined their knowledge and skills on block-based programming tools as intermediate and above, while expressing their knowledge and skills on physical programming environments as either beginner or not competent. Regarding unplugged coding, most teachers describe themselves as having a medium and higher level of knowledge and skills, while in text-based coding tools, the majority expressed themselves as beginner or not competent. Based on these findings, it can be stated that Information Technology Teachers participated in this research thought that they had competencies related to block-based tools and environments, but they were not competent in text-based environments and physical programming.

The teachers expressed the programming environments they had experience with as Scratch, VB / C #, Arduino, Mblock, Code.org, Blockly and ThinkerCad. As it can be seen from Figure 1 that 8 teachers indicated that they had experience with Scratch. Six teachers indicated that they had experience with Arduino, four with Mblock, four with Code.org, three with Blockly and 2 teachers had experience with ThinkerCad.

Table 2. ITTs' views on their knowledge and skill levels for programming tools

| Code | Professional Experience | Unplugged Coding | Text-based coding tools | Block-based programming tools | Physical programming tools |
|---|---|---|---|---|---|
| PT1 | 1 year | Intermediate | Beginner | Advanced | Not competent |
| PT2 | 2 years | Intermediate | Beginner | Advanced | Not competent |
| PT3 | 3 years | Intermediate | Intermediate | Intermediate | Intermediate |
| PT4 | 12 years | Intermediate | Intermediate | Intermediate | Beginner |
| PT5 | 13 years | Intermediate | Intermediate | Intermediate | Not competent |
| PT6 | 13 years | Intermediate | Beginner | Intermediate | Beginner |
| PT7 | 14 years | Beginner | Intermediate | Intermediate | Intermediate |
| PT8 | 14 years | Not competent | Not competent | Advanced | Not competent |
| PT9 | 15 years | Above intermediate | Beginner | Advanced | Beginner |

Considering these statements, it is noteworthy that the teachers mostly emphasized block-based tools as programming environments. The fact that they have expressed VB and C# as text-based programming environments may be because they had used these environments as programming tools during their teacher training programs. On the other hand, teachers stated that they also had experience with physical programming environments, but as it can be seen in Table 2, that they didn't see themselves competent for these environments.

As it can be seen in Figure 1, the number of teachers expressing their experience with Blockly was only 3 (PT1, PT4, and PT15). However, the source book of the Ministry of National Education, 5th grade Information Technologies and Software course have learning gains that include the use of the Blockly programming environment. The related learning gains are included in "5.2.12. Programming is a kids game", "5.2.13 Lost in the labyrinth", "5.2.14 I'm flying like a bird", "5.2.15 I'm as fast as a turtle","5.2.16 Problems we can solve with Blockly "and "5.2.17 I'm making a movie" topics.

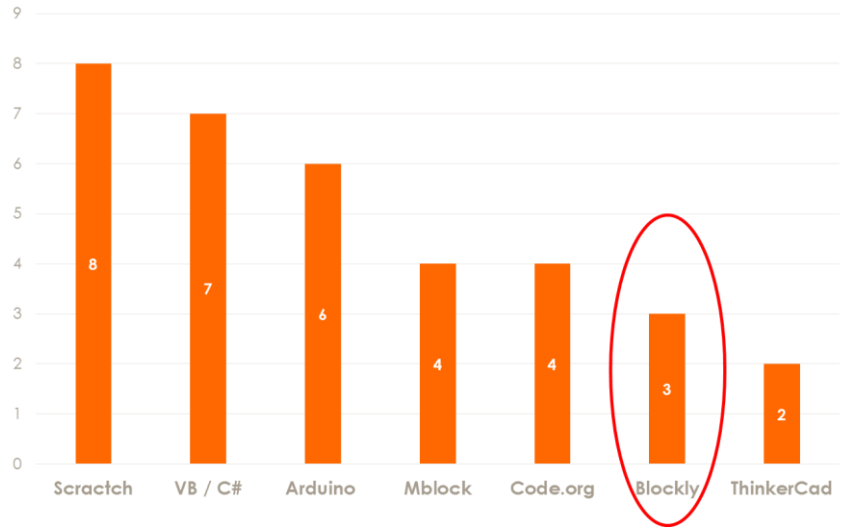


Figure 1. Tools experienced by Information Technology Teachers

**Views of Information Technology Teachers on Teaching "Computer Science" Subjects at K-12 Level**

Teachers' perceptions about a topic may affect how they value the topic and care about teaching process. In this study, Information Technology Teachers were asked about their opinions on teaching of computer science. The results about their opinions on teaching of computer science at an early age and whether other branch teachers can teach computer science or not are presented below.

The ITTs participated in this study had both positive and negative responses about teaching of computer science at an early age. Teachers who responded positively said; "*It should be definitely provided as it will improve analytical thinking*" (PT4 ), "*It should be continuously provided starting from the elementary school just as English classes*" (PT7), "*It will be useful, it will contribute to students' problem-solving skills*" (PT5); whereas the teachers with negative responses claimed "*There is no need in primary school. It can be introduced with other courses from secondary school*" (PT6), "*It may be provided at an early age but the application must be done very carefully in order not to cause any kind of addiction since the game, social media, computer and technology etc. addictions are becoming more and more common nowadays*" (PT9) and "*These systems force children physiologically, psychologically and ergonomically to become addicted to the screen causing excessive attention loss and eye problems at a very young age*" (PT3). One of the participants (PT1) stated that the concepts focused on the process of teaching computer science were wrong, saying "*We are so obsessed with teaching tools and language while our aim should be gaining numerical thinking skills. Parents think no coding is possible without a computer. Ethics and Security issues are ignored (Digital Citizenship)*".

In addition, the level of knowledge and opinions of participants on computational thinking were investigated by asking "What do you think about frequently used concepts such as 'computational thinking, procedural thinking' in recent years? How would you describe it?" The ITTs defined computational thinking with some short conceptual expressions such as "problem solving, critical thinking, algorithmic thinking, coding, artificial intelligence interaction, producing different solutions, the process of solving problems with the help of a computer, thinking like a computer". It was observed that they could not deepen their definitions on

the concept. For this reason, it was concluded that the teachers participated in this research did not have an idea that they could justify and express clearly on computer science teaching at K-12 level.

In the study, the opinions of the participants on whether other branch teachers can teach computational-thinking related subjects at K-12 level were also asked. As stated in Directorate of Basic Education official letter dated 25.09.2018, Information Technologies and Software Curriculum (Grades 1-4) prepared to be implemented in primary schools. The course was planned to be taught during free activities or extracurricular times on a voluntary basis. It was also stated in the same article that the curriculum would be taught by the primary school teachers and support from the ITTs could be asked if needed.

Primary school teachers do not get any training for programming teaching and specifically for algorithms during their undergraduate education. However, STEM (Science-Technology-Engineering and Mathematics) and STEAM with art added, have been frequently mentioned in recent years along with computer science teaching at K-12 level. It is pointed out that various branch teachers should include computational thinking approach and programming/algorithm skills in their courses. In this context, the views of ITTs on whether other branch teachers (especially primary school teachers) can teach programming related topics are examined in this research. While two of the participants (PT2 and PT4) sharply stated that "*they definitely cannot teach*", one participant (PT3) claimed "*No, they cannot teach, but different branch teachers (e.g. science teachers) are forced to teach*." Another participant (PT5) said "*They should not get involved in teaching programming. I see this something for visibility*" Other teachers, on the other hand, said that they can "*teach*"; "*They can teach if they get education (with the necessary education, if they receive very good education, if they receive in-depth education)"* (PT1, PT6, and PT8), "*They can teach on primary level and at no-computer activities*" (PT7 and PT9). It can be said that the majority of ITTs participated in this research believe that programming can be taught by other branch teachers at a very limited level "*only if they get the necessary education*". In addition, one teacher who worked in the private school and had a professional experience for one year (PT1), gave a positive response about this issue but also claimed that they could not perform it well enough. PT1 stated his views as follows:

> "*I gave coding training to kindergarten and primary school teachers during the seminar period. But the most important thing I noticed during the training was that the teachers did not own this course. In other words, someone who has never done code-based programming in their life should not teach coding lessons. Arduino, which is just a tool for us, is a goal for them*."

It is a fact that regardless of the level of education, tool-based, popular practices that do not really support students/children's computational thinking skills are not useful when learning gains are taken away from the focus. The teacher's experience on the subject also constitutes the idea that there may be a compulsory orientation to teachers in different fields, especially in private schools. PT3, who teaches at a private school, also said that different branch teachers are forced to do so.

The teachers participated in this research thought that "problem solving and programming" topics in the Information Technologies and Software Course curriculum will be beneficial to the students. However, all of the participants emphasized that the compulsory courses in the 5th and 6th grades of secondary school are not sufficient for teaching these subjects. The teacher who teaches at a private school (PT1) stated that these courses started in kindergartens in private schools and they should also start at an earlier age in public schools; while all other participants said that the compulsory education given in the 5th and 6th grades within the scope of the Information Technologies and Software courses should be continued at the latter grades.

Teachers thought positively about programming issues gaining weight in the curriculum. However they stated that the current teaching process is inefficient. For example, a participant who teaches at a private school and has 3 years of experience (PT3) stated; "*It seems emphasized but we can't go beyond a robot following a black line. We cannot switch to algorithmic thinking*", and added:

> "*These attempts at public schools remain very superficial and the process does not operate efficiently since it is not based on any infrastructure. ... The field of information technologies seems more prominent in private schools, but only robotic coding is provided as an advertising campaign without considering its instructional efficiency*."

Similarly, a teacher who worked in a public school (PT5) said; "*More emphasis should be placed on algorithmic thinking, but we don't go beyond simple robotic applications*." PT7 and PT9, who had more experience than the other participants and worked at public schools at the western part of the country, emphasized the inadequacy of computer labs and stated that the time reserved for courses are not enough. PT8, who was also a public school teacher, underlined that "When it comes to the implementation of the curriculum teachers are left alone, and there is a lack of material for teachers and schools in all conditions."

Based on these statements, it can be summarized that the general views of the participants on Problem solving and programming gains given more weight in the curriculum were positive and they also agreed on introducing these subjects at an earlier age and to be continued later on. However, it was also derived that they emphasized the insufficiency of duration of lessons for the process of programming teaching, and that the current practices do not actually serve the knowledge and skills that are intended to be taught.

**Information Technology Teachers' Views on Information Network in Education (EBA) Portal**

Informatics Network in Education (known as EBA) Portal is defined as "an entertaining portal established to communicate between teachers and students and to provide materials they can use throughout their educational lives" (EBA, 2019). In this context, it is the primary reference source especially for course content and teaching materials for teachers in Turkey including ITTs. In this research, the questions were asked to the teachers to get their opinions about the Activity Books, Coding Guide and other instructional materials in EBA which they utilize in teaching process of problem solving and programming and if exists any other reference sources other than EBA.

Both positive and negative opinions were expressed about EBA Activity Books and Coding Guide. The teachers expressing positive opinions generally made superficial statements such as: ""*sufficient*" (PT2), "*good for the beginning*" (PT6), "*better than past*" (PT9), "*there are good examples*" (PT2). It can be said that negative expressions are also expressed as general terms. For example, they expressed their negative opinions as "*not enough*" (PT7, PT8), "*must be enriched by exemplary practices*" (PT4), "*there isn't any activity book at high school level*" (PT5).

The participant teachers were also asked about their opinions regarding the Coding Guide in the EBA. Although teachers were not entirely negative, it has been observed that they offered suggestions on how to improve this resource. There were three teachers who stated briefly and very positively about the Coding Guide. One of them made the statements as "*successful*" (PT2), the other as "*sufficient*" (PT6) and the last one as "*beginner*" (PT9). Other teachers expressed their views about the Coding Guide as follows: "*It could be a guide that could be explained by simplifying it more to student level* "(PT8),"*there are good examples but they are very inadequate*"(PT7) and "*must be enriched with sample applications with digital contents*"(PT4).

Apart from the Coding Guide presented on the EBA portal, the teachers' views on other teaching materials related to problem solving and programming were also found to be negative. In the opinions regarding the teaching materials in the EBA portal; it was seen that only two teachers stated positive opinions with the expressions of "*successful and functional*" (PT6) and "*there are good instructional videos and lesson content*" (PT2). On the other hand, 6 teachers stated negative opinions. These teachers expressed their opinions as "*amateur and inadequate*", "*there are few materials and they are inadequate*", "*although there are very good examples but still very inadequate*", "*inadequate*" and "*contents are below average*". One of the teachers teaching in private school (PT1) stated that he did not browsed the resources in EBA.

Based on the teachers' views about EBA, it can be concluded that the participant teachers place more emphasis on activity-based content than just content presentation. Considering the fact that the teachers presented their views about the teaching materials in EBA in the form of suggestions, it can be said that their need for instructional materials (video, audio, poster, infographic, etc.) they can use during the lesson process are quite high.

**Instructional Processes of Information Technology Teachers**

In order to examine the experiences of ITTs in the process of teaching problem solving and programming; the questions about programming environments, teaching methods, instructional materials, assessment approaches they used, problems they experienced, and their suggestions for possible solutions were asked.

When the responses of the teachers to the questions regarding the teaching methods and techniques used in their lessons were analyzed, it was revealed that they mostly (8 teachers) teach with demonstration. The teachers explained the teaching methods and techniques used in their lessons. They stated that they use demonstration method (9), problem-based scenarios (7), expository teaching (2) and flipped classroom strategies (1). Teachers stated that they use Youtube (5), Udemy (5), Scratch (1), Pinterest (1) and corporate resources (1) other than EBA while preparing their lessons. The teachers indicated that they mostly have their students watching videos presenting recorded screen (6) during the teaching process in their classrooms. Other main strategies the teachers utilized during teaching have emerged as PowerPoint presentation (5), worksheet (4), textbook and step-by-step instruction (1), and presenting problem-based scenarios (1). Eight teachers stated that they their learning environment was student-centered, while one teacher (PT9) stated that he teaches more teacher-centered.

The "How much time do you spend on introducing the interface of the programming tool you use in your lessons?" question was directed to the teachers. The teachers stated that they spent an average of 30% of their lesson time. According to the analysis of the answers to the questions about the activities and measurement and evaluation approaches used in their lessons; two teachers (PT7 and PT9) stated that they prepared the instructional activities themselves. It was revealed that the other six teachers stated that they adapt the examples from the Internet and EBA. However, a teacher (PT3) stated that he had to use corporate resources.

According to the analysis of the questions related to the measurement and evaluation approaches used, the teachers stated that they preferred to prepare two written exams for official grading. The Ministry of National Education requires teachers to enter two exam scores to their online system. In addition to this, 7 teachers (PT1, PT3, PT4, PT5, PT7, PT8, PT9) stated that they use project, 2 teachers (PT5 and PT6) stated that they prepared an exam to be held at computer, 2 teachers (PT4 and PT1) were using Kahoot activities and 4 teachers (PT3, PT6, PT8, PT9) were using rubrics for measurement-evaluation purposes.

According to the findings, although the majority of the participant teachers stated that they used student-centered methods in their lessons, it can be said that they use the student-centered learning approach to a limited extent when their expressions regarding the teaching methods and techniques they use are taken into consideration. However, it is also noteworthy that only two of the teachers stated that they develop the teaching materials. When the findings were evaluated in terms of measurement and assessment approaches, the majority of the participant teachers (7 teachers) stated that they design and implement a project study, but only four teachers stated that they used rubrics during the evaluation process. It was observed that they did not specify any measurement and evaluation activity other than Kahoot and computer-based examination for testing students' skill to accomplish a given task. According to this; it can be concluded that the assessment and evaluation methods used by teachers are not sufficient in terms of student-centered learning approach.

**Basic Challenges and Problems Faced During Teaching Processes**

The main challenges and problems faced by ITTs regarding the teaching of problem solving and algorithm were analyzed under two main categories, which were in terms of classroom environment and students. In terms of classroom environment, 5 teachers (PT1, PT4, PT6, PT7, and PT9) expressed that the number of students in their classes was more than they should have been. The teachers generally expressed their class sizes in 20-25 range. At this point, from the answers analyzed in detail; it was understood that they actually emphasize the number of students per computer. Based on the information provided by the teachers, the average number of students per computer in their classrooms was around 1.5. There were 4 teachers (PT4, PT5, PT6, and PT9) who stated that the computers in their computer laboratories were inadequate (old). In addition, one teacher (PT8) stated that he did not even have a computer laboratory that he taught his lessons on the interactive board. Only one of the teachers participating in the research stated that he had no problems with the hardware / physical environment during teaching (PT3), but it should be underlined that this teacher works in a corporate private school.

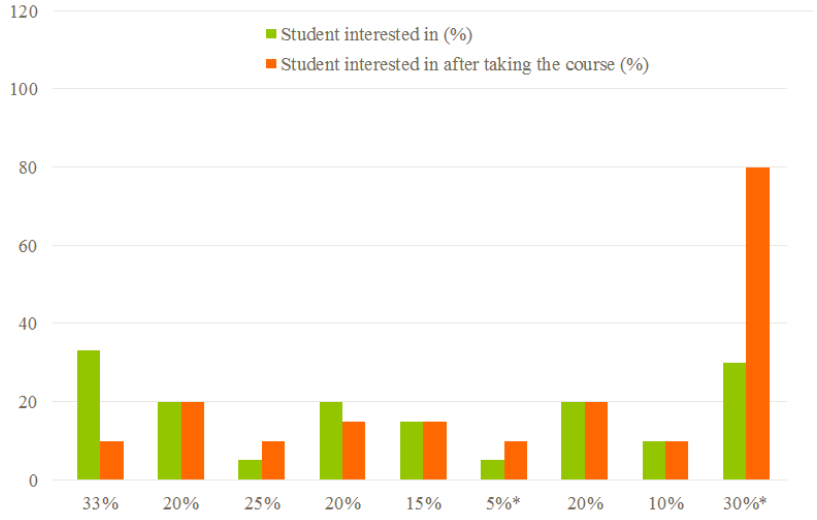


Figure 2. Students' interest in information technologies and software course

The problems expressed by the teachers in terms of students were that students were not interested in the lesson content and most students do not have computers at home. Five teachers (PT1, PT3, PT4, PT7, and PT9) stated that one of most important problems was that their students were not interested in the Information

Technologies and Software course. In order to deepen the answers, teachers were asked "How would you express the ratio of your students who are especially interested in computer programming in your lessons to the class size?" and "Do you have any students interested in computer programming after taking your course? If yes, how would you express the ratio of this situation to class size?" Based on the data graphed in Figure 2, it is seen that the highest interest expressed by the Information Technology Teachers is 33%. The Information Technology Teacher (PT8), who stated that the interest of his students in the course was 5%, was a teacher who worked in a school without a computer laboratory. When the opinions of the teachers are evaluated in general, the interest of their students in the course was determined as 19.8%.

In Figure 2, the percentage of students whose interest increased after the course was asked to determine the percentage of students whose interest increased after the students' participation in the course. Except for the teacher (PT2) working in Muş (he stated that the interest of his students increased by 80%), other teachers stated that their students' interest in problem solving and programming didn't increase after participating to the course.

Based on these findings, it can be emphasized that the Information Technology Teachers who participated in the research had problems related to the hardware and physical environment for teaching problem solving and programming issues. The teachers thought that their students' interest in the course was insufficient than they expected.

**Information Technology Teachers' Expectations in Terms of Efficiency of Teaching Process**

In order to reveal the expectations and opinions of ITTs especially for teaching computer science subjects at the K-12 level, which gained weight with the updated program, "what do you think you need for more efficient instructional processes? (e.g. textbook, materials, etc.)" and "if I have ...., I will teach this this course better? What do you think that you need?" questions were asked. As can be seen in Figure 3, the expectations of the teachers participating in the study were gathered under 5 themes: teaching materials (6), learning environment conditions (6), interested student (2), time (2) and parent support (2). In their responses to above question, 5 of the 9 teachers emphasized the need for teaching materials for their course processes. For example, the teacher (PT1), who had 1 year of professional experience, underlined the need for instructional materials by stating "*I am having trouble finding materials. There are a lot of examples on the internet, but there are no materials to be shared with students*". The other teachers who also emphasized the need for material expressed their views as "*we need course materials*" (PT5), "*textbook and material*" (PT4), "*textbook, lack of resources*" (PT2), "*activities appropriate for the age group*" (PT3), "*course book with rich digital content*" (PT8).

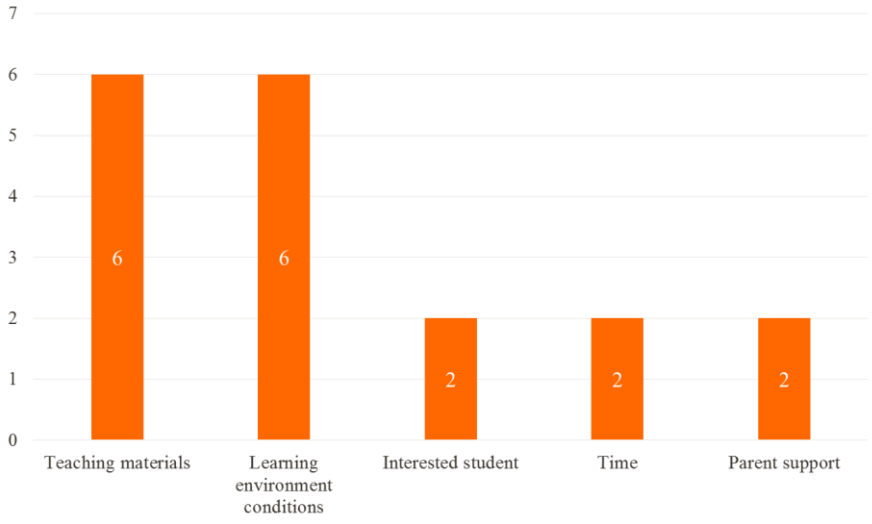


Figure 3. Teachers' expectations for their lessons to be more effective and efficient

The most coded second theme was "learning environment conditions" under the expectations of the participant teachers, can be seen in Figure 3. Under this theme, four teachers (PT4, PT6, PT7, PT9) expressed the need for improvement of their laboratory conditions. Another teacher (PT8) stated that there was no computer laboratory in his school and emphasized the need for financial resources for laboratory equipment. One teacher (PT3) suggested that class sizes should be reduced under the same theme, for reducing the number of students per computer. Some of the opinions of the participant teachers coded under the theme of learning environment conditions were "*the PCs are insufficient and the materials to be taught are not as many as the number of students*" (PT4), "*the class sizes should be less*" (PT6) and "*the number of computers is not adequate and there should be one computer for each student.*" (PT9)

Other themes created under the expectations of teachers were interested student, time and parent support. The teacher who emphasized the importance of the interest of students to the course was teaching in a school in a central district in the west (PT7) and stated his opinion as "*students are naughty and not want to learn. If they would eager...*" Another teacher (PT9), who worked in the secondary school of the city center of the same province said "we cannot cope with students' perception of computer equals games and social media. We try to convince students who are afraid to touch the keyboard; I wish they were curious lambs with shining eyes." The teachers emphasizing student interest also emphasized parent support. They expressed their opinions as "*parents should not be the only ones who hand over the students to the teacher. They need to support the student's learning process*" (PT7), and "parents should be as eager and concerned as a student" (PT9). Teachers whose opinions were coded under the theme of time stated their opinions as "*a wide time period, sufficient time should be given for efficient teaching*" (PT3) and "*we need more hours of teaching*" (PT6).

Based on these findings, the expectations of the teachers participating in this research regarding their courses, especially for teaching of problem solving and programming subjects were the need for instructional materials, hardware equipment and laboratory conditions and class sizes. In addition, it can be said that for effective and successful teaching processes teachers emphasized the need for interested students in the course subjects, increasing lecture hours, and student-parent participation.

## Discussion

The aim of the research is to analyze the opinions of Information Technology Teachers based on their experience in programming teaching. In other words, it is the evaluation of the process of programming teaching within the scope of Information Technologies and Software course from the perspective of teachers. The knowledge and skill levels of the teachers regarding the subjects gaining weight in the program were examined. Their experiences about programming teaching and problems regarding their teaching-learning processes were revealed. Teachers' expectations were examined for a better teaching process.

It was seen that ITTs participating in the study considered their knowledge and skills levels for block-based programming environments intermediate and above, but their knowledge and skills levels for text-based and physical programming environments were not sufficient. Göncü, Çetin, and Şendurur (2020) also reported in their studies that teachers also lack of knowledge in terms of technological, pedagogical and content area knowledge regarding coding education. The current Information Technologies and Software course curriculum, which is taught as a compulsory subject in the 5th and 6th grades of secondary school, is on block-based tools. In addition, block-based programming environments have a simplified structure in terms of teaching programming (Dağ, 2019). For these reasons, teachers are thought to develop themselves on block-based tools. The teachers' emphasis on Scratch among other block-based programming environments may also be due to the fact that Scracth is one of the most preferred block-based environments (Hsu, Chang, and Hung, 2018), which is also included in the current curriculum.

On the other hand, it is important to emphasize and discuss that the level of knowledge and skills of the participating teachers in other programming environments is limited, except for block-based environments. Similarly, Göncü, Çetin, and Şendurur (2020), in their work with 22 Information Technology Teachers, stated that teachers do not have sufficient knowledge of other programming environments. Considering the secondary and high school education programs starting from 2018-2019 academic year, it is seen that Small Basic is used as a text-based programming environment in the teaching of programming concepts at the secondary school level, and Phyton language is the focused programing language in the high school textbook. However, the teachers participated in this research never mentioned about these programming environments when they expressed their knowledge and experiences. In recent years, interest in physical programming (national / international robot competitions activities, private schools extra courses and etc.) has increased. In addition, as mentioned above, there are learning gains that include text-based and physical programming in both secondary and high school level computer science teaching programs. Considering all these, it can be stated that it is necessary to provide professional development in text based programming environments and physical programming that can be used especially for K-12 level.

In this study, knowledge levels of Information Technology Teachers related to computer science teaching at K-12 level were also examined. Considering the findings of the research, although the perspectives of Information Technology Teachers towards teaching computer science from a young age were positive, it was seen that their knowledge level was not sufficient in terms of computational thinking as a concept that reflects their professional competencies regarding this perspective. In addition, it has been noticed in the in-depth analysis that teachers have limited knowledge about the methods and approaches used in developing computational thinking. Computational thinking is expressed as a form of literacy, but it is also a multidimensional and complex concept (Barr & Stephenson, 2011; Bundy, 2007; Selby, Dorling, & Woollard, 2014). In Turkey and many more countries, new studies related to computational thinking has been carried out.

On the other hand, there is a need for qualified evidence for students' learning. Similarly, there is a need for studies on how teacher education should be carried out. There is also a need for evidence to help decide on the effectiveness of all these initiatives for information technologies (Snow et al., 2019).

Although computational thinking and programming issues are expressed as learning gains in curriculums, different approaches are required in teaching these gains. Because training a computer programming and teaching computational thinking are different. There is no complete consensus worldwide about which programming environments and methods should be used in order to teach computing thinking skills in the easiest way and how to evaluate it (Guzdial, 2008; Kale et al., 2018; Román-González, Pérez-González, & Jiménez-Fernández, 2017).

To help teachers develop a clearer, theoretical and practical understanding of computational thinking skills, in addition to the computational thinking skills in the curriculum, issues such as determining the effective methods and techniques that teachers can use for the development of computational thinking at different levels of education, and how to evaluate the development of computational thinking are still being explored (Ching, Hsu, & Baldwin, 2018; Grover & Pea, 2013). In this framework, as it is aimed in this research, there is a need for analyzing the situation of teachers in terms of programming teaching at K-12 level and determining their needs. It can be said that findings such studies will be useful in planning the activities for professional development of teachers.

The teachers participating in this research; in fact, stated that they are qualified for teaching unplugged coding, an approach to teaching computer science. Unplugged coding is an approach that allows students to focus on variety of problems for problem solving skills (Bell, Alexander, Freeman, & Grimley, 2009). This approach is an activity-based approach in which students can participate actively through individual or group work, and it is an approach that should be taken into account in terms of its contribution to the development of computational thinking as it is based on activities that can be applied in class or outside the classroom (Bell et al., 2009; Lamagna, 2015).

In the current curriculum and various sources, mostly maze-type unplugged activities for teaching the logic of the algorithm are included and these activities are used by the teachers. Accordingly, it can be thought that the teachers participating in this study interpret their competencies in unplugged coding mostly within the framework of maze-type activities. While expressing opinions about the possible competencies of different field teachers in programming teaching, participants' (PT7 and PT9) statements that "other fields teachers can teach with unplugged activities" might be presented as an evidence to support the idea of maze-type activities. At this point, it can be said that ITTs who participated in this research did not think deeply about unplugged computer science. Computational thinking, which forms the basis of the emphasis on computer science at the K-12 level in the world, is not necessarily a thinking approach used to solve problems related to a computer, but a thought approach used to solve problems in the real world. In particular, considering the expectations of teachers for efficient teaching processes as need for material, laboratory / learning environment, student participation, it can be predicted that unplugged computer science can be direct or indirect effective approach in meeting these expectations of teachers. For example, for schools without a computer laboratory, including more unplugged computer science practices may be an approach that eliminates the physical impossibilities of schools. Accordingly, as an approach that can be a more rational solution to teachers' expectations such as student participation and financial opportunities, and taking into account its contribution to the development of computational thinking skills, more emphasis can be placed on teaching materials compatible with the curriculum within the framework of unplugged computer science. For this, it can be said that activities aiming professional development of ITTs will be useful both in order to produce their own unplugged materials and gain more in-depth knowledge and experience about the application of this approach. However, it should also be noted that further research is needed on unplugged computer science, both conceptually and in its application in schools, and evidence supporting these views is needed.

According to the research findings, it can be concluded that teachers' knowledge and skills on computer science and programming teaching at the K-12 level are superficial. Content knowledge covering a teaching discipline is very important for a teacher (Mishra & Koehler, 2006). It can be stated that there is a need to develop teachers' knowledge and skills about unplugged activities for the development of computational thinking, plugged activities for block-based programming. It is necessary to state that teachers' knowledge and skills need to be developed especially for text-based and physical programming environments.

In this context, as suggested in similar studies (Göncü, Çetin, & Şendurur, 2020), in-service trainings that contribute to improving the content knowledge of ITTs in the field of computer science at K-12 level should be planned. Along with the curriculum updated by the Higher Education Council as of the 2018-19 academic year, some courses related to the developments in the field of teaching computer science in K-12 level have been added in the Computer Education and Instructional Technology curriculum. Two examples of these

changes are programming and teaching approaches and physical programming courses which were added to the teacher training curriculum. On the other hand, in-service teachers like the one participated in this study and pre-service teachers who will graduate from undergraduate programs until 2023 have not taken the courses mentioned above. For this reason, in-service training programs for Information Technology Teachers should focus on professional development related to the unplugged approach, block-based, text-based, visual programming environments and physical programming, which of these have already found place in MEB learning gains. Considering the fact that the level of knowledge of the teachers participating in this research about computational thinking is limited, the in-service trainings recommended for Information Technology Teachers should not be focused solely on the teaching of tools and environments, rather should focus on teaching of computer science education with recent approaches.

According to the research findings, ITTs have the belief that different branch teachers (primary school teachers) can teach programming at a very limited level. In addition, it was revealed that different branch teachers do not adopt programming issues (e.g. the opinion of PT1). It has been stated that the teachers who teach programming have given such trainings because the administration made it compulsory (e.g. the opinion of PT3).

Dağ (2019) stated that the perceptions and academic achievements of pre-service ITTs for a course they take in programming teaching are not affected by previous knowledge and perception levels of programming. Primary school teachers who have limited experience in the field of computer science participated in a training program to integrate computational thinking into their lessons. At the end of this four-month training period, teachers made significant progress in terms of both their attitudes towards computer science and the products they produced (Israel, Pearson, Tapia, Wherfel, & Reese, 2015). In this study, it was concluded that for teaching of computer science subjects at the K-12 level, ITTs did not have a clear positive view, although they had opinions about that different field teachers can teach these subjects. It should be taken into consideration that computer science education is a separate discipline and the opinions of Information Technologies Teachers about why different branch teachers can teach the contents of their own subject area should be analyzed in depth. For this reason, it is thought that there is a need to investigate the perspectives of Information Technology Teachers on programming teaching and to reveal more clear findings about this subject that will examine the collaborations they have experienced with different branch teachers on these issues.

In this research, the experiences of ITTs in teaching processes on problem solving and programming were also examined. The participants' opinions on EBA portal about programming could not be determined at a level that would significantly contribute to the literature. Information Technology Teachers participating in the research stated both positive and negative opinions about EBA, but used superficial expressions in their explanations. In the literature, no research has been found that examines the opinions of ITTs regarding the teaching materials in EBA within the framework of computer science subjects, especially at K-12 level. For this reason, it is thought that the opinions of ITTs regarding the teaching materials in EBA need to be examined in depth. In this context, it can be said that it would be useful to carry out an in-depth needs analysis on which sections of EBA teachers find useful and what they need for their teaching processes. In addition, examining the views on educational content such as textbooks, activity books and many others in EBA will also contribute.

According to the findings of this research, the teaching materials on EBA received more negative opinions compared to the activity books. The reason why teachers' opinions about teaching materials other than Activity Books and Coding Guide is more negative is that the Activity Books have been prepared by the relevant commissions of the Board of Education, within the framework of the learning gains in the curriculum. On the other hand, other materials are published by teachers who are EBA users and these materials do not go through such an examination process. For this reason, it is thought that teaching materials should be presented by matching them with the course outcomes. Thus, teachers can be able to directly and practically access the necessary teaching materials for the units and learning gains they need. In addition, a search feature similar to the filter performed on the basis of branches in content search pages in EBA can be used to search by filtering according to the publisher of the teaching materials (EBA or other users). In this way, it can be easier for teachers to access approved and appropriate learning outcomes.

In this study, it was determined that ITTs generally use demonstration techniques in the teaching process, and they mainly teach with PowerPoint and worksheets. Another finding of the research that emerged about the teaching processes and considered important is that teachers focus on tool-based teaching. Teachers stated that they spend an average of 30% of their time to teach the interfaces of the programming tools they use in their lesson processes. They stated that they generally utilize activities for the teaching process by adapting ready-made activities. Apart from the exams required by the Ministry of National Education, the project was used as the most frequently used assessment method. In order to increase the interaction and communication in the classroom, it was observed that Kahoot and similar applications were preferred in classroom activities. In the evaluation of student products, only four of the nine teachers who participated in the research stated that they

used rubrics. Based on these findings, it was concluded that although the teachers who participated in the research stated that they used student-centered methods when asked, in fact, when they were analyzed in depth, they carried out the teaching process mostly with traditional approaches, and mostly maintained a teacher-centered and tool-oriented approach. Therefore, the need for training programs for the development of pedagogical content knowledge of ITTs can be emphasized once again.

In this study, the findings that reveal the expectations of teachers towards making the teaching process efficient are as follows; teaching material, classroom environment and increasing student interest. In this context, the teachers who participated in the research emphasized their need for teaching materials especially in teaching problem solving and programming issues. In recent years, a separate pool of materials with the name "EBA Coding" has been created in EBA and various resources including algorithm and block-based coding examples with the name of coding guide and student workbooks prepared according to the updated program have been offered to teachers in EBA. Despite the fact that the number of materials published in the problem solving and algorithm issues in EBA have increased significantly, the teachers emphasize the insufficiency of the materials they reach from the EBA and other sources (internet, etc.). In this context, it is considered that what kind of teaching materials do teachers need and in what extent the existing teaching materials published in EBA respond to the needs of teachers should be examined in depth. To achieve this, studies can be carried out with the ITTs perhaps throughout the country, in order to reveal which teaching materials (video, worksheets, etc.) are needed for which learning gains.

The main problems that negatively affect the teaching processes are reported in two categories: physical environment and student-related issues. Accordingly, in terms of classroom environment, the participants stressed the need for improving laboratory facilities. Even, a teacher (PT8) stated that because of the lack of a computer laboratory in his school, he had to teach his lessons in the classroom environment and mostly using the interactive board as a demonstrator tool. Although this is not a direct finding of this research, it is thought that the number of teachers faced with the situation of teaching information technology lessons in schools that do not have a computer laboratory or that are inadequate in terms of computer laboratories is much higher than expected. In this context, as stated earlier, studies on unplugged computer science can be a solution for schools with physical impossibilities. In addition, it can be said that there is a need to increase digital teaching materials compatible with the learning gains that teachers can use in programming teaching in EBA.

In line with the findings regarding the teaching process, it was found out that Information Technology Teachers thought that students' interest was low in the Information Technology and Software course. It is a remarkable finding that teachers stated that their students' interest level is low for their own lessons. In this regard, it should be taken into consideration that the perception of teachers may differ from the perception of students. On the contrary, in his study with secondary school students, Sırakaya (2018) stated that students are pleased to receive coding education and define education as fun. Course content mainly include programming and algorithm topics and therefore this might not be matching student expectations. In the teaching process, mostly teacher-centered teaching approaches are used and this situation is insufficient in increasing the students' interest in the course. Other reasons might be that the course does not have official grade and national exams do not include questions within the scope of the course. However, it is not possible to develop a solution proposal for this finding of the research, since it is not within the scope of this research to examine the factors affecting the students' interest in the course apart from the opinions expressed by the teachers about their students during the teaching process. The success rate of a course that cannot meet the expectations of teachers, students and curriculum at a common point will be less than expected. It can be said that research is needed to reveal students' level of interest and the reasons for their disinterest, if any.

## Conclusion

As a result of this research conducted for the preliminary analysis of the current situation of programming teaching at secondary school and high school level, there are two main outcomes based on the opinions of the teachers about the application of the Information Technologies and Software Teaching curriculum, which was updated and implemented as of 2018-2019 academic year.

First of these two outcomes is that the knowledge and skills of Information Technology Teachers on programming teaching at secondary school and high school level, which has gained importance within the framework of computational thinking along with the renewed curriculum, are limited. Besides, the results obtained by investigating the experiences of teachers participated in the research about the teaching process support this outcome. Teachers focus on tool-oriented and teacher-centered approaches in teaching programming topics. It can be emphasized that there is a need for the development of content knowledge and pedagogical content knowledge of ITTs' in terms of teaching of problem solving and programming. Consequently, it is recommended to focus on the studies about the development of pedagogical content

knowledge of ITTs at secondary school and high school level in the field of computer science, especially within the light of current developments.

In informatics education, pedagogical content knowledge is an undiscovered area (Saeli, Perrenet, Jochems, and Zwaneveld, 2011). Although the number of researches on programming education at K-12 level has been increasing in recent years, the questions like what kind of teaching methods and techniques should be used especially in teaching processes, what kind of learning activities contribute positively to the learning and participation of students, and what kind of programming environment and tools in computer science will contribute positively to the teaching processes at which levels of age still remain unanswered. For this reason, there is a need for further researches on the in-depth analysis of programming teaching processes at K-12 level with the dimensions of teachers, students and environments.

The second main outcome is that although they try to carry on with their current knowledge and skills, ITTs experience problems with the teaching processes related to programming. In this research, these problems are were found as lack of teaching materials, insufficient lab facilities, and low level of interest of students in the course. The teachers participated in this study emphasized that they did not have any difficulties in finding sample materials for programming teaching, but they had difficulty in finding "teaching materials" and "teaching activities suitable for the student's level". Therefore, it can be underlined that there is a need to increase the number of teaching materials which focus on learning outcomes for teaching problem solving and programming. In addition, it can be emphasized that resources are needed to improve and create physical environments and more in-depth research is needed to both reduce the impact of physical impossibilities and increase student interest.

Within the framework of the outcomes of this research, it is recommended to evaluate the application dimension of the curriculum with a wider number of participant teachers. It is concluded that the research focusing on the different dimensions of the application process, such as the problems experienced by the teachers during the application process (e.g. physical environment, students, etc.), the teaching materials they need, the in-service trainings they need, will contribute to the literature.

One of the important limitations of this research is that, although it was conducted with Information Technology Teachers who have different qualifications in terms of professional experience, graduation area, the type of school they work, the type of institution they work, and the type of task; the research was carried out with a small number of easily accessible participants. Accordingly, it was preferred to collect data from the participants through a semi-structured interview form in order to enable teachers to answer openly and comfortably. However, this situation limited the ability to make in-depth analyzes on some results of the research. For this reason, for further researches, it is suggested to include various data collection methods such as focus group discussion, observation, etc. to the research process.

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# Academic Turkish Learning Objectives and Usage Proficiency of Syrian Students Learning Turkish as a Foreign Language

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# Academic Turkish Learning Objectives and Usage Proficiency of Syrian Students Learning Turkish as a Foreign Language

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## Abstract

The number of Syrians migrating to our country as a result of the civil war started in Syria in 2011 is 3 million 632 thousand 622 as of 17 January 2019. Kilis is the province that has the highest population rate of Syrians (84.48%), compared to the local population. Although the reasons of Syrian students' learning Turkish vary, their willing to continue academic education in undergraduate and graduate institutions in Turkey comes forward. The Turkish lessons taken by the students are mainly general Turkish and aimed at fulfilling their daily needs. The aim of the study is to determine the academic purposes and usageproficiency of Syrian students who continue their undergraduate and graduate education at Kilis 7 Aralık University. In the study which was carried out by using qualitative research method, phenomenology design was used. In the study, the data were obtained through interviews with Syrian students who continue their academic education and their lecturers, and the data obtained were analyzed using content analysis technique. Based on the views of Syrian students, it has been determined that very few Syrian students take academic Turkish lessons and need academic Turkish lessons. According to the opinions of the faculty members, most of the Syrian students do not have C1 level language proficiency, changes should be made in the certification exams, and the academic Turkish skills of the students are insufficient.

**Key words:** Academic Turkish, Teaching Turkish as a foreign language, learning and using language, Syrian students

## Introduction

People's reasons for learning another language can be influenced by social, political, military and international conditions. According to Ungan (2006), the increasing international relations around the world made it inadequate for nations to communicate using their own mother tongue and this situation brought the obligation for the nations to learn each other's languages. The geographical location of Turkey, the rise of Turkey in its region with national and international developments increase willingness of the foreigners to learn Turkish. As a result of the increasing interest in Turkish, Turkish education as a foreign language has gained importance. During the periods when Turks and Turkish states were politically and economically powerful, there was also an increase in efforts towards Turkish teaching and learning (Biçer, 2017, p.216). Increasing interest in Turkish and Turkish culture in all countries on the historical Silk Road,its taking the 5th place among the most widely used languages in the world, attracted all the attention to Turkish and the Turkish language gained international importance (Demirel, 2015, p.6).Today teaching Turkish as a foreign language in Turkey, compared to a quarter century ago, is widely held by different organizations and centers (Timberlake, 2018, p. 173). Institute of Yunus Emre carries out important studies in introducing and teaching Turkish by opening Turkish language courses in many countries. T.R. Presidency of Turks Abroad and Related Communities also provides scholarships to foreign students from different countries. In addition, the students successfully completed the Turkish education in TOMER (Turkish and Foreign Languages Research and Application Center) which operate under different universities in Turkey and got certificate the students are included in the academic process in the universities the following year. In 2010, the Foreign Student Exam (YOS) applied by the Council of Higher Education (YOK) was abolished, universities accepted students on their own terms and established TOMERs within their own bodies (Durmuş, 2013, p. 110). Foreign students who start higher education use reading, writing, speaking and listening / watching skills. By listening to / watching the topics taught by the instructors in the lessons and by reading the books, articles, thesis, papers etc. they participate in the process of understanding by reading. Moreover, they express their feelings, thoughts and ideas in various ways by using their speaking and writing skills. The Turkish used in undergraduate and graduate

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education shows different characteristics from the Turkish used in daily life. This makes it important for students to learn academic Turkish. If the student learns the language for a specific purpose and if he or she will gain material or spiritual gain as a result of learning that language, the desire to learn that language increases (Özden Ekmekçi, 1983, p. 107). According to Tok (2013), different studies should be carried out for students who learn languages for academic purposes and who will use writing as a tool in communication of thoughts and ideas. Academic language and daily language needs, usage characteristics show different characteristics. Academic language includes concepts and terms specific to a particular field. Academic language is objective, often contains passive sentences. It is avoided from precision, used cautious expressions. It contains articles based on quotations from other authors, general terms are used. Robust sentences that summarize the subject strongly are included. Context words are definitely used to establish meaning relevance in paragraphs (Yahşi Cevher & Güngör, 2015, p. 2268). Friedberg, Mitchell, and Brooke (2017) defined academic language as the language used by students in the school environment, including academic texts and dialogues, the rules and structures. Foreign language learning purposes can be one or more of daily needs, communication, tourism, education or commercial activities. Teaching / learning methods can also change according to the purpose of learning a foreign language. Choosing the appropriate methods can vary according to students' language learning goals and needs. Learning the language only within the framework of grammar rules is not considered sufficient. In foreign language teaching, the development of oral and written communicative competence, rather than just the acquisition of structures, constitutes an important place in language teaching (Akcan, 2014, p.209). The reasons for learning Turkish may be to continue daily life, to use to communicate, to participate actively in social life, to continue education, to acquire a profession, which may affect the aims and methods of learning Turkish. This situation puts forwrd the necessity of learning academic Turkish, in other words, professional Turkish.

**Theoretical Framework**

Dolmacı (2015) stated in his compilation study on academic Turkish vocabulary that the general Turkish word list covers approximately half of the corpus and the academic Turkish word list constitutes approximately one third of the academic corpus. Demir (2017), in his study to determine the academic Turkish needs of international students, found that international students had the most difficulty in using writing skills among four language skills. In addition, students have difficulties in understanding the terms related to their departments in academic reading, writing using academic language in academic writing, speaking without making pronunciation mistakes in academic speech, and understanding speech with accents other than standard Turkish in academic listening. Yılmaz and Konyar (2017) found in their study that foreign students needed academic Turkish lessons, that students only learned daily and basic Turkish, did not learn academic Turkish specific to their departments, and therefore some students dropped out of their university education. Tüfekçioğlu (2018) created a list of academic Turkish words for educational purposes, consisting of common words in 18 subfields in social sciences, words with a frequency of more than 100, uses for general scientific Turkish, verbs, prepositions and conjunctions. In his study on academic writing skills, Azizoğlu (2019) revealed that students learning Turkish as a foreign language encountereddifferent problems, and that these problems were caused by the textbook and the material and the measurement and evaluation system. Biçer and Alan (2017), in their studies to determine the needs of Syrian students for learning Turkish as a foreign language, showed that Syrian students greatly needed to learn Turkish and wanted to improve speaking among their language skills, that students had the opportunity to improve their speaking skills in the Turkish course, that establishing connections was important and they needed to learn with technological materials. Kaya (2019), in his study, where he determined the language problems Syrians experience while learning Turkish, it is stated that students mostly have difficulties in pronouncing and spelling vowels such as ö-ü-e-i, and also make mistakes while writing and saying consonants such as bp, vf, ç ş, gcj, ğ and that they wrote incorrectly for each other or made mistake in pronunciation in the same way. When the studies conducted are examined, it is seen that the studies on academic Turkish in teaching Turkish as a foreign language are limited, and there is no study specific to the academic Turkish expectations and usage competencies of Syrian students learning Turkish as a foreign language. The number of Syrians migrating to our country as a result of the civil war started in Syria in 2011 is 3 million 632 thousand 622 as of 17 January 2019. Kilis is the province that has the highest population rate of Syrians (84.48%) compared to the local population. Various organizations, national and international associations are working to ensure that the young population within the mentioned population continue their education and that they are integrated in the Turkish education system.

## Method

In this study the phenomenology approach ,one of the qualitative research methods, was used. A phenomenological study defines the common meaning of a few people's **lived experiences** with a phenomenon

or concept (Creswell, 2016, p.77). Phenomenology, which focuses on events that we are aware of but do not have an in-depth and detailed understanding, provides a suitable research ground to investigate phenomena that are not completely unfamiliar to us, but also cannot be fully understood (Yıldırım & Şimşek, 2018, p.) In the study, a phenomenological design was chosen in order to deeply analyze and reveal the academic Turkish learning purposes and usage proficiency of Syrian students who learn Turkish as a foreign language and to examine the experiences of the lecturers by including them to the study.

**Study Group**

Criterion sampling, one of the purposeful sample types, was used in the study. The reason for choosing criterion sampling that is one of the purposeful sampling types, which is one of the most appropriate sampling methods for qualitative research, is to study all cases that meet a predetermined set of criteria (Yıldırım & Şimşek, 2018, p. 22). In this study, the criteria that the interviewed student group's continuing their higher education at Kilis 7 Aralık University in the 2018-2019 academic year and the students' voluntary participation in the study were based on. Table 1 shows the information about the students in the study group..

**Table 1.** Information about the students in the study group

| Student | Age | Gender | The residence time (years) in Turkey |
|---|---|---|---|
| S1 | 19 | Female | 6 |
| S2 | 20 | Female | 6 |
| S3 | 20 | Male | 5 |
| S4 | 20 | Female | 6 |
| S5 | 19 | Female | 5 |
| S6 | 25 | Male | 4 |
| S7 | 24 | Male | 2 |
| S8 | 26 | Male | 3 |
| S9 | 22 | Male | 4 |
| S10 | 22 | Male | 6 |

The working group consists of 10 students who continue their associate and undergraduate education in different departments of Kilis 7 Aralık University. Participants have received B2 and C1 language certificates and continue their education in different faculties and Vocational Schools such as Science Teaching, Child Development, Therapy and Rehabilitation, Nursing, Food Engineering, Medical Services and Techniques Department, Turkish Education and Political Science and Public Administration Department at the relevant university. Four of the ten participants whose age range from nineteen to twenty-five, were girls and six of them were boys. The criteria for the lecturers, who were consulted for the study, to attend the classes of Syrian students who continue their higher education and to be selected from different branches were determinant.

**Table 2.** Information about the lecturers in the study group

| Lecturer | Gender | Professional experience (years) |
|---|---|---|
| L1 | Male | 16 |
| L2 | Female | 5 |
| L3 | Male | 9 |
| L4 | Male | 8 |
| L5 | Male | 6 |
| L6 | Male | 8 |
| L7 | Male | 4 |
| L8 | Male | 5 |

| | | |
|---|---|---|
| L9 | Male | 2 |
| L10 | Male | 18 |

The lecturers in the study group work in different faculties of Kilis 7 Aralık University. The experiences of the lecturers who teach Syrian students in their departments range from 2 to 18 years.

**Data Collection Tools**

Data of the study was collected from university students and faculty members who continue their education at Kilis 7 Aralık University in the 2018-2019 academic year.

**Interview**

In the study interview method was preferred as the data collection tool . Interview method is one of the types of verbal communication used to understand what people think about a situation, the subject, and the reasons for their thoughts. The interview, which provides access to information that cannot be directly observed, can also provide an internal perspective to external actions (Anagün, 2008, p.90). Through interviews, unobservable situations such as experiences, attitudes, thoughts, intentions and interpretations, mental perceptions and reactions are tried to be understood (Yıldırım & Şimşek, 2018, p.130). In the study, Syrian students' and lecturers' opinions were taken with a semi-structured interview form regarding Syrian students' academic purposes of learning Turkish and their ability to use Turkish. In this context, qualitative data in the study were obtained with a voice recorder using the interview technique based on the interview form data. In the semi-structured form, the researcher can prepare his questions within the framework of the research subject, change his questions according to the course of the interview even if he has prepared a certain plan, ask open-ended questions to the participants, and renew the interview questions and even the research according to the answers from the interviewees (Güler, Halıcıoğlu and Taşkın, 2013). The interview form prepared by the researchers was composed of questions whose content validity was revised by three lecturers.

While preparing the semi-structured interview forms,firstly the relevant literature was scanned , and open-ended semi-structured interview questions were prepared by the researcher for the interview form in the light of the research questions and literature. The opinions of a field expert , about the form, were taken and items showing similar characteristics with another item were removed. After this process, a pilot study was conducted on 3 students and 2 lecturers with similar characteristics to the sample group to test whether the questions could be understood by students and instructors clearly. The data obtained after the implementation formed an idea that 3 items should be revised, and the interview forms were finalized with 3 corrected items.

**Data Analysis**

In the analysis of the data, the results obtained as a result of the interviews with the participants were written down. Written texts were read at different times in order to be able to specialize the obtained data, and in the following process, themes, categories and codes were made in parallel with the interview questions of the research. Content analysis was preferred in the analysis of the data, as the obtained raw data were analyzed without dividing them into titles and new titles could be created. First of all, during the interviews with the students, the themes such as language skills that the students have difficulty in, the status of taking academic Turkish lessons, the effect of academic Turkish on academic achievement, the time when academic Turkish lessons should be given, were determined. Within the framework of the determined themes and categories, the categories such as speaking, speaking and listening, listening, grammar, before university education, during university education, before and during university education were determined. For example, one of the students was asked “Which language skill / skills were the most difficult when you started learning Turkish as a foreign language? What could be the reason for this difficulty? " and the answer “When I started learning Turkish, I had the most difficulty with vowels. The letters I and ö, because there are no such letters in my mother tongue. In addition, I had problems with speaking since I cannot speak Turkish because I live in the camp. " was given by the student. Based on this answer, the "Speaking" code was created. New codes were added in line with the answers given by the participants. The following coding and description technique was used in the analysis of data:

**(R1,R2)… :** The researcher's questions,

**(S1,S2)… :** Students whose opinions were consulted,

**(L1,L2)… :** Lecturers whose opinions were consulte

**[1], [2]… :** Some answers selected from the opinions expressed by the source people. Some speech mistakes made by the students in the results section were taken as they were and the correct form was written next to them.

**Validity and Reliability**

In order to ensure the reliability and validity of the study, after the interview form was prepared by the researcher the opinions of a field expert were consulted. The interview form, which was prepared in line with the expert's recommendations, was read by three students and a pilot application was made, and opinions were taken from the students about the readability and understandability of the questions. As a result of the interviews with the students, the students were asked to confirm their answers , and the misunderstood parts of were corrected. Before the interviews, some explanations were made to the students in order to create an atmosphere of mutual trust, and interviews were made in a quiet and natural environment for them to feel comfortable. The interviews lasted 30 minutes, and some information taken from the students was directly presented in the results section. In order to ensure external validity, the research model, study group, data collection tools, data collection and analysis were explained in the method section. Since the study group consisted of students from different departments who continued their higher education, it was regarded to consist of suitable participants. The fact that the study was limited to 10 participants can also be considered as a factor limiting the external validity. The data obtained from the participants were written directly and it was aimed to prevent data loss. By doing this, the internal reliability of the study was tried to be ensured. Reading the data by two researchers at different times, creating appropriate common codes and reaching consensus were among the other methods used in order to increase reliability.

## Results

**Reults Obtained According to Student Opinions**

**Table 3**.Syrian students' opinions about the time they started learning Turkish, the institution and the reasons for learning Turkish.

Opinions about the reasons for learning Turkish

| **R1:** When and where did you start learning Turkish? What were the reasons for learning Turkish? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **S1:** I joined Kilis TÖMER one year ago in 2017. I reached the B2 level, I could not pass C1. The reason I learn Turkish is to attend university, continue my education, and speak with Turks. **[1]** | *Teaching*<br>*Interactive classroom environment* | *Communicative Skills* |

| | | |
|---|---|---|
| **S3, 4, 5, 8:** I started learning Turkish in 2016. I learned Turkish first in private courses and then in Kilis TOMER. The main reason I learn Turkish is to enter university and study pharmacy. I also learn Turkish both to communicate with Turks and to make friends. **[2]** | | |
| **S2, 6, 7:** In order to study the department I want in Kilis TOMER in 2017, then to complete my education. I have to learn Turkish in order to communicate with Turks, to understand them and to express ourselves. **[3]** | *University education* | |
| | *Interaction and sharing* | *Educational functions* |
| **S9, S10:** In 2016, I started learning in TOMER at Kilis 7 December University. Because I live in Turkey and I will continue training, to avoid misunderstandings, I have to learn Turkish and to talk with neighbors. **[4]** | *Real life skills* | |

Table 3 includes the views of Syrian students when they start learning Turkish, the institution and the reasons for learning Turkish. All of the students started to learn Turkish through an official institution between 2016 and 2017. The institution where students learn Turkish is Kilis TOMER, affiliated to Kilis 7 Aralık University. The main reason for students to learn Turkish is education. Students want to continue their education in Syria or to start higher education in Turkey. Other reasons for learning Turkish are to adapt to the geography they live in, to establish social relations with Turkish friends and neighbors, to Express their troubles and wishes, and not to be misunderstood by the Turks.

**Table 4**.The opinions of Syrian students regarding the language skill / skills they had the most difficulty in while learning Turkish

**R2:** What was the most difficult language skill / skills when you started learning Turkish? In your opinion, what could be the reasons for this difficulty?

| Place: Kilis 7 Aralık University | Theme by Coding | |
|---|---|---|
| Date: December 2018-February 2019 | Codes | Themes |
| **S5, 7, 8 9, 10**, : The language skill that I had the most difficulty when I started learning Turkish is to speak (speaking). While speaking, I couldn't think of both the words and the necessary rules at the same time.For this reason I was shy while speaking Turkish. The reason for this is to encounter and talk less with Turks, and to speak always Arabic with my family at home..**[1]** | *Speaking* | *Readiness* |
| | *Applying the rules* | |
| | *Not practicing enough* | |
| **S1, 2, 3:** The language skills I find difficult are listening and speaking. Because I couldn't separate words from each other. **[2]** | *Listening* | *Stress(Anxiety)* |
| **S4**: When I started learning Turkish, I had the most difficulty with vowels. Letters I and Ö. Because there are no such letters in my mother tongue. I also had a problem with speaking. Since I lived in the camp and I did not talk with Turks, I could not practice **[3]** | *Pronunciation* | |
| | *Alphabet difference* | *Student's perception* |
| | *Lack of practice* | |
| **S6:** The language skill I had the most difficulty with was grammar. In my opinion, the reason for this difficulty is that Turkish people (Turks) speak | *Ungrammatical Uses of Turks* | *Grammar* |

differently from the book. **[4]**

The basic language skills that the participants had difficulty when they started to learn Turkish and their views on the reasons are indicated in Table 4. The majority of the students stated that they had difficulties in speaking while learning Turkish. Among the reasons for difficulty in speaking skills are the inability to remember the rules, not practicing enough, fear of incorrect speech, pronunciation, and alphabet difference. In the interviews, a student thought of grammar as a separate skill, and the reason was that he took this lesson as a separate lesson in the courses. The same student thought that Turks used the language different from the grammatical rules in books, which negatively influenced grammar learning. Readiness, stress (anxiety), student perception and grammar are among the situations that cause Syrian students to have difficulties in some basic language skills.

**Table 5**.Syrian students' status of taking academic Turkish and their opinions about academic Turkish lessons

| **R3:** Did you take academic Turkish lessons? If you did, how long did the academic Turkish lessons last? What are your opinions about the duration? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **S4, 7:** I took academic Turkish lessons. We took 120 hours of lessons in 1 month, this time was not enough. When we go to university, we need to be ready because there are too many academic words that we have not seen in the lessons. **[1]** | *Insufficient education* | *Duration of the education* |
| **S9:** I took 120 hours of academic Turkish lessons. I think this time is enough because one should improve his Turkish through self-education or personal effort. Language is not only learned from courses, it is important to study one's own. **[2]** | *Sufficient education* | |
| **S1, 2, 3, 5, 6, 8, 10:** I did not take academic Turkish lessons. **[3]** | | |

Information about Syrian students' taking academic Turkish lessons and their opinions about the course in question are given in Table 5. Three participants took 120 hours of academic Turkish lessons, and two of the three participants stated that 120 hours was insufficient for this course and the duration should be increased. The other participant who takes the Academic Turkish course believes that this period is sufficient and the reason is that the language cannot be learned only from the courses, it requires individual effort. The majority of the participants stated that they did not take academic Turkish lessons.

**Table 6**.Syrian students' opinions about the time of academic Turkish lessons

| **R4:** In which period of your education life do you think academic Turkish lessons should be given? Can you explain the reason? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |

| | | |
|---|---|---|
| **S2, 3, 4, 6, 7, 8, 9, 10:** Academic Turkish lessons should be given before the university because we enter the university without preparation and we start the lessons immediately, so we have difficulty in understanding the lessons . [1] | *Difficulty in understanding academic expressions* | |
| We need to be ready before starting university, for this reason academic Turkish lessons should be given before university. It will be difficult if it is in university because the classes at the university are very intense. **[2]** | *Preparation for higher education* | *Before higher education* |
| | *Difficulty of higher education courses* | |
| **S1:** Academic Turkish must during the university. Because the lessons we take at the university are more planned, regular, wider and more effective. **[3]** | *Systematic and planned education* | *Parallel to higher education* |
| **S5:** I think that academic Turkish lessons should be given both before and during university. Before entering the university, we must have knowledge about the basic concepts of our department. As we come across new concepts in this department, we need to ask a lecturer. For this, academic Turkish lessons should be given both before and during university. **[4]** | *Preparation and support for higher education* | *Before and during higher education* |

Students were asked at which period of their education life academic Turkish lessons should be given and the reason of this. The data consisting of these opinions are given in Table 6. Most of the students think that academic Turkish lessons should be given before starting higher education. Students think that they have difficulties in understanding academic expressions in their departments and that higher education courses are difficult. The student, who thinks that these courses should be given at the same time with the higher education courses, attributes the education to be more systematic and planned during this period. According to another student who has expressed his opinion on this issue, academic Turkish courses should start before higher education, supporting courses should continue during university education or in cases where students have difficulty.

**Table 7**.Syrian students' opinions about their understanding of academic expressions in their departments

| **R5:** How is your understanding of the academic expressions specific to the department you are studying? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **S1, 4, 5, 6, 8, 9, 10:** I sometimes have problems with understanding academic words in my department. I lose a lot of time to understand the meaning of words because sometimes I can't do it with translation, so I don't understand. Sometimes I get it wrong and then I get the lesson wrong. **[1]** | *Inability to get use of the time* | |
| In my lessons, I always come across new words that I have never heard. I have less problems with these troubles in numerical lessons. **[2]** | *Readiness* | *Difficulty in understanding* |
| Sometimes I have difficulty in understanding. So, it surely influences my success. I fall behind when | *Falling behind Turkish students* | |

| | | |
|---|---|---|
| compared to my friends, whether in studying or doing homework. Because I have not lived in this culture since I was born, I have to learn everything I come across and this takes time. **[3]** | *Different cultural life* | |
| **S2:** I'm studying in the child development department. It is easy for me to understand my courses in my department because the words of my courses in the department are not foreign. **[4]** | *Department of education* | *Individual difference* |
| Since I have taken academic Turkish lessons before, I easily understand the words and the meaning of the terms. **[5]** | *Readiness* | *Self-efficacy* |

Table 7 contains the views of Syrian students regarding their understanding of the terms and academic expressions of the departments they study. Most of the students who expressed their opinions in the study stated that they had difficulty in understanding academic expressions specific to their departments. Although the students use the dictionary to translate the expressions they have not encountered before, they cannot understand these expressions, and they think this is as a waste of time. Students with poor readiness levels think that they fall behind their Turkish peers in lessons, and they attribute this to their birth and growth in a different cultural environment. A student who does not have difficulty in understanding academic expressions attributes this situation to the lack of academic terms in his department, while another student attributes it to taking academic Turkish lessons and regarding himself as competent in this matter.

**Table 8**.Syrian students' opinions about their lecturers who attend their lessons

**R6:** What do you think about the lectures of the lecturers who attend your classes at the university?

| Place: Kilis 7 Aralık University | Theme by Coding | |
|---|---|---|
| Date:December 2018-February 2019 | Codes | Themes |
| **S1, 2, 3, 8, 9:** The lectures of our teachers are quite fine. They work hard to teach the students. They always ask us after class, are there any questions? **[1]** | *Efficient communication* | |
| We can easily understand them in lessons. Their presentations are very good. Sometimes our lessons go on in a fun way. **[2]** | *Conformity to student level* | *Class environment* |
| | *Effective lesson presentation* | |
| **S4, 5, 6, 7, 10:** Our lecturers who come to our lessons teach well. But they lecture normally. They don't care if there are strangers or not. **[3]** | *Neglect of learner differences* | |
| Presentations of the lecturers are generally good. However, some teachers ignore foreigners, if there is an important note (information, subject) they pass it. Just because the Turks took them in high school, they don't tell. **[4]** Some of our lecturers present the lesson clearly and understandably, some of them teach quickly. We do not understand the lecturers who teach fast, so we pass the class with low marks **[5]** | *Superficial and fast presentation* | *Teaching Method* |

The lecturing status of the lecturers who teach students for university education was asked to the students and Table 8 was created based on the answers they gave. Half of the students who gave their opinions stated that the lecturers were particularly interested in them and communicated effectively, they gave the appropriate lectures according to the student level, and they presented the lessons efficiently. On the other hand, some students, expressed that the lecturers did not care about the differences in the classroom, did not take into account the presence of foreign students in the classroom, presented the lessons superficially and spoke quickly. During the interviews, it was observed that Syrian students had concerns that the lecturers could see these interview reports, which caused the students to be anxious while expressing their opinions on the issue. Three student sentences expressing negative opinions about the lecturers completed their opinions with saying; 'Our lecturers do this for our benefit, we should work harder.'

**Table 9.** Syrian students' opinions about their expectations from their lecturers

| **R7:** What are your expectations from the lecturers at the university? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **S4:** Our expectations from faculty members are that they always support us, listen to us when we tell about our problems, and show us the right path. **[1]** | *Consulting and support* | |
| **S5:** I want my lecturers to get us love Turkish, to support and trust us. **[2]** | *Love of language* | *Guidance* |
| | *Trust* | |
| **S9:** Instead of lecturing from the slide, the book, I want them to teach us from their own experiences. I want them to train us in the right way, because we will continue the path of our lecturers. | *Personal and efficient presentation* | *Education method* |
| **S6:** I want them to talk more slowly with foreign students when they teach. **[3]** | | |
| **S10:** I think ourlecturers who come to our lessons have nothing to do with foreign students' communication problems. This is student's problem and he should try to improve his language. **[4]** | *Learner-centered* | *Individual effort* |

In Table 9, data are given based on the answers given by the students to the question of 'What are your expectations from the lecturers who attend your courses at the university?'. The students ask the lecturers to provide counseling, give a love of language, present their lessons with their individual experiences instead of direct instructions on the slideshows, use a slow and understandable language in lessons in the subjects of guidance and education method., and encourage them to have self confidence. A student expressed his opinion on this subject as "*Learning a foreign language and communicating with a foreign language is entirely up to the student, there is no other thing that lecturers can do on this subject''.*

**Results Obtained According to the Views of the Lecturers**

**Table 10.** Lecturers' opinions about the main problems of Syrian students

| **R1:** In your opinion, what are the main problems of your Syrian students who continue their university |
|---|

| education? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **L9, 2, 5, 8:** The most important problem of Syrian students is undoubtedly the language problem. Since their Turkish proficiency is low, it is difficult for students to reach the desired level in terms of cultural and social adaptation as well as their academic success. These students should be more willing to learn Turkish. **[1]** | *Language learning* | *Language* |
| | *Orientation* | *Adaptation to the environment* |
| **L3, 10:** I can list psychological and material problems, language, cultural and social adaptation problems. The attitudes of the academic, administrative staff, Turkish students and the public towards them (such as they are freely educated) are more important than the problems I mentioned. Other problems can be somehow solved, but it is difficult to overcome them. **[2]** | *Negative attitude* | *Exclusion* |
| | *Psychological problems* | |
| **L6, 7:** In my opinion, the main problem of our Syrian students is the adaptation problem. In addition, students staying in the camps are influenced negatively by transportation and bad living conditions, which causes them to be unable to focus on lessons and their success levels are negatively affected. **[3]** | *Economical and physical insufficiencies* | *Socio-economic* |
| **L1:** The difficulties Syrian students experience are a reality. However, in most of them there is an unnecessary demand for tolerance for the abuse of these troubles. Namely, they do not want them to be evaluated with the same conditions and criteria as other students. **[4]** | *Unnecessary expectation* | *Exploitation* |
| **L4:** The main problem of Syrian students is the lack of communication. They always prefer to hang out with their Syrian friends and not talk to Turks. Even though they meet up, I observe that they come together arpun Arabic speakers. In group assignments and collaborative work, they prefer the guest role rather than being a group member. They need to be assertive and selfless**. [5]** | *Inability to integrate with (Turkish) peers* | *Communication* |

The lecturers were asked about the basic problems of Syrian students and the results are given in Table 10. Based on the responses received from the lecturers, language is the primary problem of Syrian students, followed by the inability to communicate with their peers and to adapt to the social environment. It is also seen as a problem by the participants that Syrian students resort to unnecessary expectations from their lecturers by using their negative situation as an excuse. In addition, living in tent cities, container cities and physically unsuitable environments, being socioeconomically poor negatively affect the quality of life of students and thus their success of education. In the opinion of the lecturer, the inability of Syrian students to adapt to the environment and the school environment is due to the prejudice of the public, some academic and administrative staff, Turkish students towards Syrian students.

**Table 11.** Results regarding the academic Turkish needs of Syrian students according to the views of the lecturers

| **R2:** What do you think about the academic Turkish usage of your Syrian students? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |

**L1, 2, 10:** Most of them need academic Turkish lessons. Due to the measurement and evaluation problems of the B2 or C1 level certificates obtained from TOMER, their Turkish proficiency is not sufficient for university education. C1 is a certificate issued for academic level language proficiency. However, our students have problems even in reading and writing**. [1]**

**L5:** In fact, Syrian students do not have enough knowledge of daily Turkish. In this respect, it is inevitable for a student who does not know Turkish properly to not be able to master academic Turkish and to understand what is taught. It is obvious that they should undergo serious education. Turkish should be taught well through TÖMER or other language courses before vocational education at the university. Those who are not proficient enough should not be taken into vocational training. Continuous education in the process of developing Turkish language skills will increase academic skills in using Turkish. **[2]**

**L4:** I observe that they do not understand everything they hear in class. They keep staring at me blankly. They express themselves better if there is daily conversation, but when the subject is the lesson, they stumble if given the opportunity to speak. When I look carefully, I see that they try to get support from their friends and sometimes they try to cheat. In fact, the inability to express oneself is a problem for both Syrian and Turkish students. However, I think Syrian students' Academic Turkish is insufficient due to their lack of self-confidence **[3]**

**L6, 8, 9:** I think that Syrian students' academic Turkish is quite insufficient.They have great problems in expressing themselves, communicating and reading what is written. Of course, there could be many reasons for this. I think they should take supplementary Turkish lessons during their university education. Over the course of four years, different courses should be held with lecturers from different fields. Therefore, if necessary, a supplementary Turkish teaching support can be provided with special words and sentences specific to the field. **[4]**

**L3:** Syrian students are trying to rebuild their lives in our country. It is really difficult to study in a new country with a different language and culture. They are also traumatized because they experienced the war and witnessed many bad events. As far as I have observed, I see many of them try to learn Turkish. In my opinion, our students need more in speaking skills. Since our Turkish students also have problems in matters such as academic writing, I do not think they are so different in this regard. I think it would be beneficial for them to take supportive Turkish lessons during their university education.. **[5]**

**L7**: Some of them are pretty good. We have Syrian students who speak fluently and efficiently. Some of them need a supportive course. **[6]**

*Measurement and evaluation*

*The need to learn Academic Turkish*

*Lack of readiness*

*Field-based academic Turkish*

*Trauma*

*Supportive education*

*Stress (Anxiety)*

*Adaptation*

*Individual Differences*

Table 11 shows the opinions of lecturers about Syrian students' academic use of Turkish and their need. It is seen that the majority of lecturers agree that Syrian students have insufficient academic Turkish knowledge

and that they should take academic Turkish lessons. Some lecturers think that students come from courses where they received language certificates without sufficient education and that the exams held there do not measure the Turkish proficiency level of the students correctly. The instructors who think in this way suggest that it would be more beneficial to start the students to higher and vocational education by organizing C1 + or C2 level courses. According to the instructors who think that students' academic Turkish is quite insufficient, Syrian students experience problems in the daily use of Turkish, communication, following and understanding the lessons. In addition, their lack of self-confidence, their tendency to constantly seek help from their friends, and their tendency to cheat, and their low level of readiness reveal that their academic Turkish is insufficient and that academic Turkish lessons are necessary. One of the lecturers stated that academic Turkish lessons, specific terms, words and sentences should be taught to students during their higher education. According to one of the lecturers, Syrian students experience various problems due to the war, and despite their hard situation, trying to learn a language and continuing their university education is seen as a positive attitude and a situation should be supported.

**Table 12.** Lecturers' opinions about the expectations of lecturers from institutions providing Turkish education for foreigners

| **R3:** What are your expectations from the official / private institutions that provide Turkish education for foreigners? | | |
|---|---|---|
| Place: Kilis 7 Aralık University | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **L4, 6, 7:** Practical Turkish should be taught to students and activities that will contribute to their socialization should be organized. A guidance should also be made to us, lecturers who do not have enough knowledge about teaching Turkish to foreigners. Strategic and functional plans should be determined and explained to us instead of just giving additional time in the exam and showing understanding. **[1]** | *Field knowledge* | *In-service training* |
| **L1, 3:** Official institutions urgently need to finalize the curriculum-program work and put into effect a binding guide. Then, qualified trainers should be trained. Current certification activities are temporary / palliative solutions. First of all, graduate studies should be diversified and academicians should be trained in this field. Then, undergraduate programs should be opened as a sub-branch of Turkish education. Private institutions should be involved after these conditions are met. **[2]** | *Permanent solutions* | *Curriculum* |
| **L9, 10:** Teaching Turkish to foreigners should not be short-term education. It can be enriched with different activities and practices, not just through direct presentation. In addition to language skills, studies should be done on cultural adaptation. **[3]** | *Duration of the education* | *Duration* |
| | *Education method and applications* | *Method and technique* |
| **L5, 2, 8:** I only expect that students have not been given a certificate for that level which they really do not deserve. When the certificate level and the student's level of Turkish use and knowledge are not equal, students and academicians have to experience many difficulties both in their daily lives and academically. **[4]** | *Certificate exams* | *Measurement and evaluation* |

According to Table 12, which includes the opinions of the lecturers about the expectations from the institutions that provide Turkish education for foreigners, it is necessary to inform and plan the academicians about Teaching Turkish to Foreigners (TTF). Some instructors made self-criticism and stated that they did not

have enough knowledge about the field. They stated that they did not make a different activity for foreign students in the courses, they did not know whether they should do it or not, therefore, they should be informed by experts about TTF. Institutions that teach Turkish to foreigners should replace the certificate program, which brings temporary solutions, with the curriculum that brings permanent solutions, it is thought that the duration of the course allocated for Turkish education is insufficient, therefore it is recommended to increase the duration of Turkish lessons. One of the expectations of most lecturers is that the certificate degree should be parallel to the level of the student. According to them, the B2 or C1 level language certificates that the students received do not reflect their real level, and they think that the students are lower than the level of the certificate. According to some participants, institutions that teach Turkish need to apply different methods and techniques, more functional methods that can be used in daily life and education should be used instead of the usual memorization methods in language teaching, if necessary, social clubs and social activities can be organized with cooperation between different faculties.

**Table 13.** Lecturers' opinions about language skills with which Syrian students' have difficulties

| **R4:** Which of the basic language skills do you think Syrian students attending your classes have difficulty with? | | |
|---|---|---|
| Place: Kilis 7 Aralık Üniversity | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **L5, 2, 3, 4, 7:** They have problems with pronouncing the words correctly. They have problems with writing. They cannot write sentences properly. I often find it difficult to read and understand what they write. For this reason, they often cannot complete the exam questions. I notice speaking problems in lectures or presentations. **[1]** | *Pronunciation*<br>*Ungrammatical use* | *Speaking and Writing* |
| **L8:** They mostly have problems with writing. In exams, they often rewrite the question and try to make the paper full and get extra marks. When I ask an exam question similar to a question I replied in the lesson before, they try to write the answer to the question directly from their notebook. **[2]** | *Memorization* | *Writing* |
| **L9**: I think that the students who attend my lesson mostly have insufficient speaking skills and therefore have difficulties. When I ask students to answer a question, it is understood from the expressions that the student has an idea about the subject, but the student cannot express his knowledge properly and meaningfully. **[3]** | *Inability to express oneself* | *Speaking* |
| **L1:** Students have the most difficulty in listening / watching and writing. They have difficulties due to the lack of practice in listening activities and not using Turkish as the language of communication in the classroom (by Syrian students). Writing, on the other hand, is problematic due to the difference in alphabet, the perception of capital and small letters and the incomprehension of the articulated structure of Turkish words. **[4]** | *Practice and repetition*<br>*Alphabetical differences* | |
| **L6, 10:** I don't think there is a problem with listening / watching. However, listening is also a job of understanding, creating and synthesizing. That's why they seem to be listening to what they watch. However, they are quite insufficient in reading and writing. They cannot express themselves, they do not read. There are errors in the words they write. **[5]** | *Listening method*<br>*Writing mistakes* | *Listening and writing* |

Table 13 contains results regarding the basic language skills that Syrian students have difficulty with, according to the views of the lecturers. Based on the participant opinions, students have the most difficulty in speaking and writing skills, followed by listening / watching and reading skills. Difficulties related to speaking skills emerge in the education process in the form of pronunciation errors, inability to make sentences, and inability to express themselves and what they know. It is seenthat students have difficulty in writing skills due to the alphabetical differences between the source language and the target language. It is stated by the lecturers that the students pretend to be listening to the lesson, that they remain passive in the lessons and they cannot answer the questions.

**Table 14.** Lecturers' opinions about the exam performance of Syrian students

| **R5:** What is the output of what you try to teach your Syrian students in your classes in the process or in exams such as visa / final? | | |
|---|---|---|
| Place: Kilis 7 Aralık Üniversityi | Theme by Coding | |
| Date: December 2018-February 2019 | Codes | Themes |
| **L6, 10:** I am sorry to state that Syrian students are unsuccessful in the exams. During the lessons, they do not participate in the activities willingly. Frankly, we do not have any special effort for Syrian students. Because what we can do is limited. In fact, we do not know what to do. We can say read more books, watch Turkish movies, listen to music and write. We cannot direct it as accurately as a Turkish educator. Therefore, perhaps other educators can be given a training on how to better guide Syrian students.. **[1]** | *Lack of satisfaction*<br>*Teaching Turkish to Foreigners field knowledge* | *Self criticism* |
| **L8, 1, 2, 4, 5** If I asked the same question I asked in the exam, they memorize it and do it. Unfortunately, this is an indication that Syrian students cannot learn more in classes. However, this situation is quite normal. Because they do not understand, they cannot do the exams**. [2]**<br>**L9:** Students do what they read and memorize rather than what is told. If students have read about the questions used in any measurement situation before, they try to answer them in line with these readings. However, if they have not read or memorized any of the questions used, they usually cannot answer. **[3]** | *Rote learning* | *Learning method* |
| **L7, 3:** I get very good results from some students. For example, one of my Syrian students give me an exam paper better than even the students living in Turkey for many years, which makes me happy. And by sharing his paper with our other students, I want to express that this may be the result of determination and studying hard. However, I am sorry that this situation is limited to only one or two students. **[4]** | *Individual differences* | |

Instructors were asked what was the output of the education given to Syrian students during and at the end of the process, and the results from the answers to the question are shown in Table 14. Except from two participants who gave their opinions, all lecturers stated that students generally failed in the evaluation exams, both during the process and at the end of the term. Syrian students' preference of memorization rather than understanding, processing information,association, having difficulty in expressing themselves or not wanting to express themselves, inability to use language adequately are indicated as the reasons for students' failure in exams. Two of the participants stated that the situation depends on the students, even that some Syrian students are more successful than Turkish students. One of the lecturers makes a self-criticism and states that he has no experience in directing and guiding, and that the necessary education should be given to the lecturers by the experts of the field.

**Conclusion, Discussion and Suggestions**

In the study, the opinions of Syrian students, who learn Turkish as a foreign language, about the academic purposes of Turkish learning and theproficiency level of use were tried to be determined. The results obtained based on the analysis of the data obtained from the study are given below. Educational activities are the primary goal of all Syrian students to learn Turkish. In addition to continuing their education life, students try to learn Turkish in order to adapt to the country they live in and communicate with their neighbors and those around them. Among the basic language skills, Syrian students have the most difficulty in speaking skills, followed by listening skills.Derman (2010),who in his study states that foreign students regard themselves insufficient with the pronunciation while speaking Turkish, reaches the similar results.

Few of the students participating in the interview took 120 hours of academic Turkish lessons, expressed that they reaped the benefits of what they learned in these courses during their higher education, and some students stated that 120 hours of education was not sufficient. According to the majority of students, academic Turkish courses should be given before university education begins, almost all students have difficulties in understanding academic expressions and terms specific to their departments.

While half of the students participating in the study were satisfied with the teaching methods , interest in them, and the lecture presentations of the lecturers ; half of them complained about being neglected and treated as if they were absent, quick and fast talking and presntation of the lecturers. Syrian students expect lecturers to support them, to provide effective guidance, to give the love of Turkish and confidence. They also demand that they speak a little slower and more clearly in the lessons, and convey their own experiences instead of just showing and reading the slides from the powerpoint presentation on the smart board. According to Göçer (2009), in order for students to learn the target language better, as well as being active in the classroom environment, they should be provided learning environments where they can participate in activities in different social environments, use the language efficiently, make presentations and read books other than lesson books etc.

According to the lecturers, the language certificates of Syrian students for starting university education do not match their actual level. According to them, most Syrian students have poor academic Turkish proficiency due to the assessment activities in certification exams, their lack of self-confidence, psychological disorders caused by trauma, etc. Language nonproficiency is the major problem of Syrian students and there are other problems arising from this. As well as the problems such as adaptation to the culture they live in, psychological problems, financial difficulties, inability to communicate with their Turkish peers, being excluded by some academic staff and students at the university,Syrian students demand some privilege by using their negative situation as an excuse.

According to lecturers, Syrian students' academic level of Turkish use is quite insufficient. Students' inability to express themselves, anxiety about making mistakes, practices and methods during Turkish learning are among the main reasons for their nonproficiency.

Lecturers expect language certificates to be given according to the level of the student, and C1 language certificate not to be given to those who do not deserve it. Other expectations include generating permanent solutions instead of temporary solutions, changing the curriculum, increasing the duration of the courses, using different methods and techniques in Turkish teaching, and having more practicing lessons and activities. Biçer, Çoban, and Bakır (2014) stated in their study that there are some problems in teaching Turkish to foreigners, that Turkish teaching centers have a lot of work to solve these problems, instead of providing theoretical information in the lessons, it is necessary to teach the students the ability to use Turkish in daily life, and to have practices in which students take an active role in the process. This result of the study is similar to the previous study.

It is observed that Syrian students have difficulties in basic language skills in general and speaking and writing skills in particular. They also experience the problems such as pronunciation mistakes, inability to form sentences, inability to express what they know, and inability to articulate some certain sounds. Syrian students' not practicing Turkish, using Turkish only at university in daily life are among the reasons for their poor speaking skill levels. While Syrian students state that they do not have difficulties in reading and writing skills, which are among their basic language skills, instructors think that students have difficulties in reading and writing. It is possible to say that Syrian students either consider themselves competent in these skills or are not aware of their deficiencies. This result of the study shows different features with student views. In their study, Biçer et al. (2014) found that among the problems encountered in the basic language skills of foreign students' learning Turkish, the most problem was seen in writing, in accordance with the students' opinions. In their study, Maden, Dincel, and Maden (2015) named the problems faced by students learning Turkish as a foreign language as the difficulties arising from alphabetical differences, application and adaptation, comprehension, reading, speaking and writing skills of foreign students due to different variables etc. In this respect, the result of the study shows similar characteristics with some results of the previous study. In his study, Tiryaki (2017) found that foreign students' writing success at the word level was higher than their writing success at the

sentence and paragraph level, and according to this result, students were more successful in writing sentences with relevant words. In this respect, it is possible to say that this result of the study shows different characteristics with the results of the previous study.

Lecturers cannot reap what they teach to Syrian students, and students fail in measurement and evaluation activities such as visa and final. The fact that Syrian students prefer the memorization method is reason for this failure. Some of the faculty members expressed their self-criticism that they did not make any special effort for Syrian students in the process because they did not have any knowledge on this subject. Syrian students also stated that some lecturers ignored foreign students and pretended that they were not in the classroom. According to this result of the study, the views of the students are parallel to the views of the lecturers. Göçer (2007) emphasized that measurement and evaluation studies at every stage of the learning-teaching process should be carried out dynamically from the first day of the semester or courses to the last day. This situation arising from the measurement and evaluation system indicates that process evaluation is necessary as well as result evaluation.

As a result, Syrian students learn Turkish for education and communication, and have difficulties in speaking and listening / watching and writing skills. According to the lecturers, the certificates that Syrian students need to get to enter university do not reflect the actual profiency level of the students, and students are seen as nonproficient in using academic Turkish.

**Suggestions**

- Units and social clubs should be established to deal with foreign students, and cooperation should be provided between faculties and institutions that have foreign students.
- Lecturers should be informed about teaching Turkish to foreigners by experts.
- Organizations that provide Turkish education for foreigners should focus on practical methods and revise their measurement and evaluation activities accordingly.
- Syrian students should be integrated with academic, administrative staff and their Turkish friends, and negative prejudices against Syrians should be tried to be broken.
- It should be recognized that Syrian students have disadvantages, but they should be prevented from make use of this situation and graduating without deserving effort.

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# Elementary Freshmen's Mathematical Attitudes in Teaching Incorporating Free Problem Posing Activities

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## Abstract

This study aims to investigate the impact that teaching incorporating free problem posing activities has on elementary freshmen's attitudes toward mathematics. As such, this study employs an embedded mixed methods design which includes quasi-experimental design. The participants of this study consisted of 33 elementary freshmen at a university in the Marmara region of Turkey during the fall semester of the 2017-2018 school year. The participants were selected using convenience sampling. The study's data were collected using two instruments: the mathematical problem posing performance file and the mathematics attitudes scale. Quantitative data of the study were analyzed using descriptive and inferential statistic while qualitative data were analyzed using content analysis. Quantitative findings revealed there to be a statistically significant difference between the pretest and the posttest scores for the entire mathematics attitudes scale and for the interest-love sub factor. The qualitative findings, however, indicated that freshmen's opinions could be grouped into two main categories: the affective dimension and the cognitive dimension.

**Key words:** Embedded mixed method, free problem posing activities, mathematics attitudes, elementary school freshmen.

## Introduction

In the 21st century, where global competition is intense, the importance of mathematics is emphasized more. In line with the scores obtained from international exams, countries can prove to what extent they have a voice this century. Accordingly, other countries follow the mathematics education programs of successful countries closely and make updates in their national education programs. Turkey step by step in the math curriculum for trying to improve the math achievement in international exam updates are go (Baş, 2017). In 2005, the education, which took the place of traditional education as the center of the constructivist approach, was adopted and it was last updated in 2018 with 1-8. Mathematics curriculum for the classes started to be implemented. In this program, 1-4. classes are elementary school levels and there are 229 attainments in total, which students are expected to gain. 9.2% of these attainments are based on mathematical problems (the number of gains determined as "…pose…" for the determination of these attainments) and 13% are related to mathematical problem solving skills (while determining these attainments, the words "… solve problems" are counted) (see Ministry of National Education [in Turkish: MEB], MEB, 2018). Therefore, the ability to solve mathematical problems and to pose mathematical problems has a rate higher than one-fifth of the attainments. In this context, the study aimed to determine whether elementary freshmen's attitudes towards mathematics course have changed due to problem posing and to examine their thoughts about problem posing skills. Therefore, both quantitative and qualitative data were collected and analyzed in the study.

### Mathematical Problems

A problem can be defined as a difficulty that one wants to overcome but whose solution is not clearly seen (see Hoosain, 2004; Kilpatrick, 1985). A similar definition can also be made for the problems encountered in math classes. Schoenfeld (1992) stated that straightforward and simple techniques cannot be used to solve math problems. In fact, even understanding those upon initial encounter can be difficult. Math problems can be classified as being either routine or non-routine. While routine problems can be close-ended questions with a single correct answer, non-routine problems can be open-ended with more than one correct answer (Filiz & Abay, 2017). Therefore, non-routine problems are a type to which students are generally unaccustomed. However, students' habitual solving of close-ended problems with a single correct answer may prevent them from acquiring sufficient information about their own thought processes. Therefore, students should also be

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given the opportunity to define and solve non-routine problems (Işık & Kar, 2011; Türnüklü & Yeşildere, 2014). One example of a non-routine problem is: "How many different ways can 16 apples be placed in four baskets, each with a different number?" (Altun et al., 2007).

**Mathematical Problem Solving**

In order to overcome a challenge, individuals make plans, determine strategies, and then seek to implement them. If one is still unable to solve the problem following these steps, s/he has not completely understood the challenge and is required to address it using completely different methods. This type of procedure resulting in reaching a solution constitutes problem solving. Similarly, students studying mathematics may develop a sense of curiosity upon encountering a challenge needing to be solved. If students are able to solve different types of problems, they get experience and learn how and where to begin working even if they have not previously encountered a similar problem (Altun, 2015). In this process, students share their attempted solutions with their peers and teachers in class and discuss the strong and weak points of their attempts. Accordingly, problem solving is an indispensable part of teaching mathematics as it allows students to establish relationships between concepts and operations while seeking solutions to problems (National Council of Teachers of Mathematics [NCTM], 2000). However, acquiring problem solving skills may not be easy for students, who often experience difficulties in the face of mathematical problems. Aside from being able to solve math problems, students must also be allowed to learn how to act systematically while solving problems. Polya (1957) standardized the problem solving process. Although there are different types of problems, these steps are: (i) gaining a general understanding of the problem, (ii) planning, determining, (iii) applying a strategy, and (iv) checking one's solution. According to these steps, problem posing activities are also stated to be instrumental in aiding individuals develop problem solving skills (see Abu-Elwan, 2002).

**Relationship between Problem Posing and Problem Solving**

Despite the importance of problem solving mentioned above, having only problem solving skills may not always be sufficient for students. Consequently, mathematical problem posing activities have begun to be included alongside mathematical problem solving activities since the 1990s (see Dede & Yaman, 2005; Gonzales, 1994; Silver, 1995; Tuska, 2003). This is because problem posing is seen as a mirror that reflects the nature and characteristics of students' mathematical experiences (see Van den Brink, 1987) and can also be used as a tool for determining how students think and understand while learning mathematics skills (Cai & Hwang, 2003; Silver, 1994). In addition, problem posing develops flexible thinking skills and creative thinking skills in students (see Kilpatrick, 1985; Silver, 1997; Yuan & Sriraman, 2010) and can also facilitate students' determining skills and assist them in eliminating prejudices and misconceptions about learning math (English, 1997). As such, teachers should emphasize changes in conditions and aspects of problems so that students may understand what to do and why to do it while solving problems and to be able to follow the process more efficiently. Additionally, aside from helping students develop problem solving skills to better deal with problems, having them construct problems themselves is stated to facilitate their mathematical development (see Dede & Yaman, 2005). Additionally, dealing with problem posing activities may also aid students in becoming increasingly familiar with open-ended situations. For this reason, the problem posing process, similar to the problem solving process, is held by researchers to be a central topic of mathematics teaching (see Silver, 1994) because it requires problem solving competences (see Grundmeier, 2003).

Addressing a problem from different angles or constructing new problems from its solution is possible. However, it not necessary to produce new problems solely from previous problems in problem posing; problems can also be produced from open- ended and close-ended situations. While posing the problem, one completes its construction by simultaneously calculating how the problem may be solved (Cai, 1998; English, 1997; Grundmeier, 2003). On the other hand, one of the most-controversial issues in the related literature is whether or not a clear connection exists between problem posing and problem solving. Even though the literature includes studies indicating no close relationship to exist between these two concepts (see Crespo, 2003; Silver et al., 1996), one encounters studies attesting the existence of a close relationship between these two concepts more frequently (see Cai & Hwang, 2002; Cankoy & Darbaz, 2010; Dickerson, 1999; Arıkan, 2014). For example, Dickerson (1999) argued that problem posing activities are an effective technique to increase students' success with solving problems. Similarly, Cankoy & Darbaz (2010) also determined at the end of one experimental study that problem solving based on problem posing positively affects students' understanding of the problem. In a related vein, Fidan (2008) stated that providing opportunities for students to form their own problems through their own expressions positively contributes to the development of students' problem solving skills.

**Types of Mathematical Problem Posing**

Silver (1994) stated that problem posing activities can be handled in three different ways together with problem solving activities: (i) pre solution posing, (i) in-solution posing, and (iii) post solution posing (Kılıç, 2015). Brown and Walter (2005) proposed the problem posing strategy as "what-if-not". According to this strategy, they stated that problems can be posed by replacing a situation, condition, or the given/desired pair. Here, Brown and Walter's (2005) what-if-not problem posing strategy can be said to show similarity in form to Silver's (1994) post solution posing strategy by changing the conditions or the data. Meanwhile, Stoyanova and Ellerton (1996) addressed problem posing strategies in three categories: (i) structured, (ii) semi- structured, and (iii) free problem posing strategies. Brief descriptions regarding these three strategies are given as follows:

*Structured problem posing strategy*. The strategy is to form new problems by using data from an existing problem. The following is an example of this strategy:

Example 1:

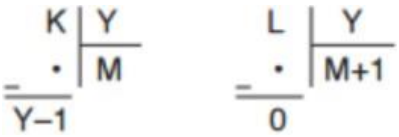



Figure 1. An example for free problem posing strategy

From the K in the figure, find the total of K + L using the adjacent division function (Turkish Student Selection Exam [ÖSS], 1991). Pose as many problems as possible using the data from this problem (Kılıç, 2013).

*Semi-structured problem posing strategy*. One clear case is the problem posing strategy aimed at exploring relationships over limitations that are made or an incomplete problem and posing new relationships. The following is an example of this strategy:

Example 2:
$8 \times 5 = 40$
$90 - 40 = 50$
Pose problems that are appropriate to the given operations (Arıkan & Ünal, 2013).

*Free problem posing strategy*. This is a flexible and creative problem posing strategy that poses as few restrictions as possible. Some examples of this strategy are:

Example 3:
Pose a problem related to real life (Işık & Kar, 2012).
Pose a problem with a challenging solution (Bayazit & Kırnap-Dönmez, 2017). Form a problem that can be segmented (Kılıç, 2013).
From the above expressions and questions, the free problem posing strategy is considered the most flexible problem posing strategy that allows students the opportunity to think using the problem posing strategies proposed by Silver and Cai (1996) and Brown and Walter (2005). Accordingly, the free problem posing strategy is the focus of the current study.

**The Relationship of Attitudes toward Mathematics and Mathematical Problem Solving and Problem Posing**

Attitude, under its simplest universally accepted definition, is a term that outlines the case of an intention being appreciated or disliked (see Hannula, 2002). However, defining attitude only as the like or dislike of any one thing can become the reason for overlooking the attitude's formation process. Therefore, the process of attitude formation should be questioned and considered accordingly over a comprehensive definition. When examining the related literature, different perspectives are seen on attitudes. For example, while İnceoğlu (2010) stated that attitude transforms into behavior through personality traits, cultural/social environment, and individual experiences, Ekici (2002) stated that attitudes do not just contain affective and behavioral characteristics but also cognitive characteristics. Similarly, Karagöz et al. (2016) has asserted that while

attitudes are composed of cognitive, affective, and behavioral elements, affective elements are more prominent in mathematics teaching.

Similarly, Hannula (2002) highlighted that when cases where positive emotions develop while progressing toward the result when solving/manufacturing a math problem and progress toward the goal are blocked, negative feelings such as fear, sadness, and anger are triggered because of mathematical attitude's having four dimensions: (i) emotions felt while doing math, (ii) giving value to math, (iii) the formation of expectations about the benefit math provides for careers and one's future, and (iv) the associations that come to mind upon math's mention. Kadijevich (2008) evaluates mathematical attitudes under three dimensions: (i) self-confidence in learning math, (ii) love of math, and (iii) the usefulness of math. Therefore, while students with positive attitudes toward math prefer math-oriented professions (Yıldız, 2006), students who generally do not consider math a worthy occupation because they have difficulty associating math with real-life applications choose professions where math is not heavily used (see Tarım & Dinç-Artut, 2016). This is because affective variables like attitude are a significant factor in the process of learning math and play a dominant role in whether students' future career goals include mathematics or not (Dede & Uysal, 2012). In this context, the current study examines mathematical attitudes as a synthesis of the views of Hannula (2002) and Kadijevich (2008) regarding mathematical attitudes in terms of enjoying math, the usefulness of math, giving value to math, and anxiety about math. The following are brief explanations related to these attitude dimensions:

*Like, interest and enjoyment to mathematics.* Including mathematics in more than a single activity indicates a predilection toward math (Aksu, 2010).

*Occupational and daily importance.* Students' attitudes toward needing to use math in daily life and in their future professions (see Dossey & McCrone, 2007; Fennema & Sherman, 1976). Believing that math is important is the case of dealing with the proofs of mathematical theorems, researching historical information about math, and being curious about the nature of math (Eccles & Wigfield (1995).

*Confidence and anxiety about math.* Negative attitudes about learning math can be handled as a combination of low self-confidence, test pressure, and fear of failure. According to this, mathematical anxiety contains affective and cognitive components (Bessant, 1995).

*Interest, like and enjoyment.* Take pleasure in dealing with a process, and that approaching it with an intrinsic motivation (Warner, 1980).

**Problem Solving, Problem Posing, and Mathematical Attitude in the Turkish Mathematics Curriculum**

When looking at the updates made in recent years to the mathematics teaching program in Turkey, properly analyzing the problem solving process, developing positive attitudes related to mathematics, and giving value to mathematics are frequently included under the program's objectives (see MEB, 2005, 2013).

Similarly, the current mathematics curriculum enacted in 2018 in Turkey (see MEB, 2018a, 2018b) aims for three things: (i) for students to be able to express their own solutions and the strategies they use in their own words in the problem solving process, (ii) for individuals to be educated in such a way that they possess the ability to determine their own deficiencies in the problem solving process, and (iii) for them to be able to examine each stage of the problem solving process. At the same time, problem solving skills are also included in the curriculum as one of the fundamental skills specific to mathematics. In this context, for example, space is included in the elementary school mathematics curriculum standards between grades 1 and 4 directed at completing problem solving and problem posing exercises. Of these standards expected to be acquired by students, 21 are associated with problem posing and 30 with problem solving (see MEB, 2018a).

The Special Aims of the Mathematics Curriculum for 1-4 graders, moreover, encourages developing positive attitudes toward math class by using students' own experiences, approaching math problems with self-confidence, and doing exercises that increase the value of mathematics in students' eyes. The expression for developing a positive attitude towards mathematics in the curriculum is exactly as follows: "*The impact on mathematical success of developing positive attitudes toward math cannot be ignored. Mathematical games should be included in sections related to units' content as deemed appropriate*" (MEB, 2018a, p. 15). In fact, studies revealing the positive impact that problem posing activities have on students' affective tendencies toward math in general and their attitudes toward math in particular are often noted in the literature (e.g., Fetterly, 2010).

**Purpose and Importance of the Research**

The liking or dislike of mathematics, the tendency to engage in or abstain from mathematical activities, the belief that someone is good or bad in mathematics, and the belief that mathematics is useful or useless summarizes one's attitude towards mathematics Neale (1969).

The current research seeks to examine the impact that instruction incorporating free problem posing activities has on freshmen's attitudes toward mathematics. In fact, teachers' attitudes and beliefs directly impact those of their students (Schoenfeld, 1992). Accordingly, a teacher with advanced problem posing skills can create problems relevant to students' current realities and can transfer their own attitudes toward math to students because s/he is familiar with their students' interests and experiences (Albayrak et al., 2006). Vionita and Purboningsih (2017) stated that students can be allowed to exhibit positive attitudes toward learning math through enjoyable, easy-to-understand, and relatable activities, emphasizing that problem posing activities need to be frequently used in learning environments. Similarly, Altun (2015) highlighted the importance of providing space for different mathematical problem posing activities suitable to students' experiences and skills in classroom environments at various grade levels. Therefore, determining and developing elementary freshmen's attitudes and skills toward problem posing activities (free problem posing activities in particular) can make significant contributions both to their students and their own future professional careers.

In particular, elementary freshmen's possessing more knowledge about and experience doing problem posing activities (especially free problem posing activities) before entering the profession is integral to improving students' cognitive levels and attitudes toward mathematics. This is because freshmen are able to develop positive attitudes toward math through problem posing activities and to transfer these positive attitudes to their students in their future teaching experiences (see Albayrak, İpek, & Işık, 2006). In this context, in the current study, it is thought that problem posing will make a significant contribution to the development of positive attitude to mathematics and the theoretical framework is built on it. In addition, if the mathematics net of the freshmen who participated in this study were examined, it was determined that they achieved success under 50% success (Council of Higher Education, 2017). In this case, this study was intended to be carried out considering that some of the freshmen had a negative attitude towards mathematics before they settled in the University. For this purpose, the contribution of problem posing to the development of positive attitude towards mathematics course was examined quantitatively by comparing the pretest posttest with the Math Attitude Scale scores.

Qualitative data were collected to support quantitative data.

The purpose of this study is to investigate the impact that teaching incorporating free problem posing activities has on elementary freshmen's attitudes toward mathematics. For this reason, we sought answers to these questions:

- Does learning environment enriched with free problem posing activities influence elementary freshmen's attitudes toward mathematics?
- What are elementary freshmen's opinions related to problem posing about their experiences before, during and after problem posing?

## Research Design

In the study, embedded mixed methods design was used. The main idea in this design is that either quantitative or qualitative data is handled in a wider design and these data sets have a supportive position over the entire methods design (Creswell, 2012). In this context, quasi-experimental design was used as the main design in the present study. In this design, measurements are made on the study group before and after the experimental design. In the experimental process, the qualitative data collected have a supportive position over the entire design (Creswell & Plano Clark, 2014).

**The Study Group**

The study group of this research consisted of 33 elementary freshmen attending a foundation university in the Marmara region during the fall semester of the 2017- 2018 school year. The convenience sampling method was used to select freshmen. The sample consists of 6 males and 27 females. The lessons included in the freshman classroom-teaching curriculum are mathematics (Basic Mathematics 1 & 2), education courses (Introduction to Educational Science and Educational Psychology), and general culture courses (Turkish Language 1 & 2, Introduction to Computers 1 & 2, English 1 & 2, and Ataturk's Principles and the History of the Turkish Revolution 1 & 2).

**Data Collection Tools**

The study uses the mathematical Problem Posing Performance File and the Mathematical Attitudes Scale. Information on these data collection tools is summarized below.

Problem Posing Performance File contains 10 different mathematics topics formed which based on the free problem posing strategies classified by Stoyanova and Ellerton (1996). The items were prepared in-line with the content of students' Basic Mathematics 1 class. The scope validity of the test appears in a U shape. Items included in the Problem Posing Test are listed below:

Pose a problem related to divisibility.

Pose a problem concerning the least common multiple (LCM) and the greatest common divisor (GCD).

- ✓ Pose a problem related to proportions and ratios.
- ✓ Pose a problem related to relations.
- ✓ Pose a problem related to functions.
- ✓ Pose a problem related to parabolas.
- ✓ Pose a problem related to operations.
- ✓ Pose a problem related to graphing data.
- ✓ Pose a problem related to measuring central tendency.
- ✓ Pose a problem related to measuring central dispersion.

*Mathematical Attitudes Scale.* This study uses the Mathematical Attitudes Scale developed by Duatepe and Çilesiz (1999) for the university level and is a Likert- type scale formed of a total of 38 items. The scale mainly reflects the affective component. The reason for this scale was chosen as both validity and reliability study of the first- year students at the university and the affective attitude towards mathematics course. The scale's items are scored from 1 = totally disagree to 5 = totally agree, and negative items are reverse scored. The Mathematical Attitudes Scale has 22 negatively scored items (Items 5, 7, 10, 12, 13, 14, 15, 16, 20, 22, 23, 26, 28, 30, 31, 32, 33, 34, 35, 36, 37, & 38) and 16 positively scored ones (Items 1, 2, 3, 4, 6, 8, 9, 10, 11, 17, 18, 19, 21, 24, 25, 27, & 29). The scale contains the following sub-factors: fear-confidence (Items 1, 18, 20, 22, 26, 27, 33, 35, & 36), interest-love (Items 2, 5, 8, 9, 10, 13, 15, 28, 30, 31, 32, 33, 34, & 38), profession and giving importance (Items 4, 7, 12, 14, 17, 21, 25, & 37), and pleasure (Items 3, 6, 11, 16, 19, 23, 24, & 29). The Cronbach's alpha of reliability for the overall scale is 0.96 and between 0.87 and 0.94 for the sub-dimensions (Duatepe & Çilesiz, 1999). The maximum score obtainable is 190 and the minimum is 38. Here, when examining the results report of the Trends in International Mathematics and Science Study (TIMSS) published in Turkish by the Ministry of National Education (MEB) in 2016, the sub-factors of the scale show general similarities with the sub-factors used to measure attitudes toward mathematics classes. This is because in 2015, the TIMSS measured the four sub-factors as: attitudinal components toward mathematics lessons, interest in math class, liking to learn math, self-confidence in math class, and giving value to math class. Example items for each sub-factor have been presented in Table 1.

Table 1. Sub-Factors and Examples from the Mathematical Attitudes Scale

| Factor | Example Items |
|---|---|
| Fear-Confidence | I am enthusiastic toward math. (27)<br>Math is one of my most feared classes. (35)<br>I feel very helpless when studying math. (36) |
| Interest-Love | I continue to strive hard until I find the answer when faced with an unusual question while studying math. (11)<br>I like to solve the problems I encounter using math. (21)<br>Math confuses my head. (33) |
| Profession and Giving Importance | I will use math in many places throughout my life (4)<br>Being successful in math class is important to me (25) |
| Pleasure | I want to study math (3)<br>It's hard to stop once I start studying math (16)<br>Dealing in class with math problems with half-finished solutions gives me pleasure. (24) |

**The Procedure**

This study is an embedded mixed-methods design that uses a quasi-experimental design (a quantitative research method). Accordingly, the single-group pretest-posttest design has been used in the quantitative part of the study. The group, comprised completely of freshmen, was subject to an experimental procedure based on problem posing activities for two hours once a week over 10 weeks within the scope of their Basic Mathematics 1 course.

During the experiment's first four weeks of implementation, the students were first introduced (It took 4 × 2 = 8 hours) to problems, math problems, problem solving in math and its strategies, and problem posing in math and its strategies. These strategies are exemplified through sample problem posing activities related to certain basic mathematical concepts. These basic topics are the rules of division, the lowest common multiple, the greatest common divisor, ratios/fractions, correlations, equivalence, the order of operations, functions, showing data on the graph, graph types, measuring central tendency, and measuring central dispersion. The fifth week includes problem posing activities aimed in particular at free problem posing strategies. At the end of the first 5-week period, at least two problem posing items for two of the above-mentioned ten basic mathematical concepts were requested each week beginning in the sixth week. This way, the number of problems to be posed at the end of the 10th week was determined to be at least 10 per person. The problems posed during the experiment's implementation were initially discussed in small groups during class and then as a large group in which the entire class participated. Additionally, the study group was subject to the above-mentioned Mathematical Attitudes Scale as a pretest prior to the experiment's execution and as a posttest afterward. Moreover, freshmen's views regarding the pre-experimental procedure (being able to make the necessary plans and arrangements, determining the study group, determining, and examining the measuring tools, and determining the details of the experimental process), the experimental process (understanding it), and the post-experimental process (explaining the results, determining the study group's responses, determining the long-term effects of the experimental process) were recorded in writing. In other words, in order to learn the attitudes of pre-service teachers about mathematics course during the problem posing activity process and at the end of the problem posing activity, "What is your expectation from teaching based on free problem posing activities? Do you think it will contribute to you?" was asked to the freshmen and freshmen's thought to be used to explain the quantitative findings.

**Data Analysis**

As stated above, this study is of an embedded mixed-methods design that incorporates a semi-experimental design. In this context, the study analyzes the quantitative and qualitative data separately (Creswell, 2012). Accordingly, the study first analyzes the quantitative data (experimental process) and discusses whether the quantitative results obtained as a result of the analysis are supported by the qualitative data.

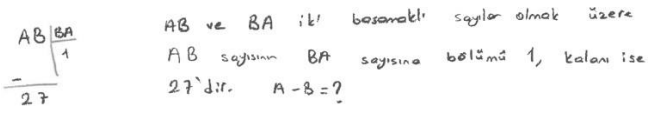
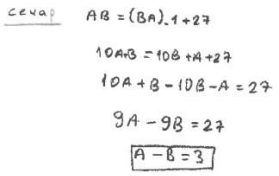
*Quantitative data analysis.* First, freshmen's answer sheets were coded as S1, S2, …, S33, and these codes were used throughout the entire study. Analyses of the scores from the Mathematical Attitudes Scale that the freshmen completed as a pre and posttest were done using a statistical package program, and both descriptive and predictive statistical analyses have been included in the data analysis. A Shapiro-Wilk test for normality was first conducted, which revealed that the scores obtained from the Mathematical Attitudes Scale had normal distribution ($p > .05$). A dependent t-test was then used to compare the mathematical attitude pre and posttest scores. Additionally, in order to study the experiment's ability to determine the statistically significant difference from the entire scale and its sub-factors, the partial effect size values ($\eta^2$) were also calculated. Meanwhile, in scoring the Problem Posing Performance File, 10 problems chosen by the freshmen from among what they had posed related to the above-mentioned basic mathematical concepts (one from each concept) were evaluated, each one worth 10 points for a total of 100 points. Here the evaluation criteria and scoring are as follows: (i) explaining the problems clearly and understandably/language usage (writing factor) = 3 points, (ii) posing mathematical logic (Fiction factor) = 3 points, (iii) posing a topic-appropriate problem (topic factor) = 2 points, and (iv) solving the problem (solving factor) = 2 points.

Table 2. Problem Posing Evaluation Criteria Table

| Writing Factor (If the problem is…) | Fiction Factor | Topic Factor | Solving Factor |
|---|---|---|---|
| Mathematical (1 point) | Having logical plot (1 point) | Posing the problem on the desired topic (1 point) | Solving the created problem completely (1 point) |
| Clear (1 point) | Mathematical fluency (1 point) | Paying attention to the attainments of the topic (1 point) | Solving the created problem partially (1 point) |
| Not only math operation (1 point) | Real life compliance as much as possible (1 point) | | |

A problem posing performance file was created for each coded freshman and these files were examined by individual researchers. Additionally, in addition to the researchers, one freshman, one math teacher, and one mathematics educator with a doctorate in problem posing each scored the test independently. A consensus between the researchers and experts was sought. Table 2 depicts the process of evaluating a problem that one freshman posed during the problem posing activity related to division and divisibility that received a score of 9.

Table 3. Evaluating the Problem Posed by Freshman S9

| | |
|---|---|
| Topic: Division-Divisibility | The problem posed by the freshman:<br>  <br> |
| Writing factor/ The problem is expressed clearly and understandably - language usage (3 points) | Operations was asked directly in the last sentence. Therefore, no points were given from this sub-factor (2 points) |
| Fiction factor/ Posing mathematical logic (3 points) | The problem contains no logical contradictions (3 points) |
| Topic factor/ The problem is appropriate to the topic (2 points) | The problem is appropriate to division-divisibility (2 points) |
| Solving factor/ Solving the problem (2 points) |  <br><br>The problem is appropriately solved (2 points) |

The scores earned on the problem depicted in Table 2 were statistically analyzed using the total score that freshmen received from the problem posing activity. The Shapiro-Wilk test for normality was conducted for freshmen's problem posing test scores, which revealed the data from the test to be normally distributed ($p > .05$).

*Qualitative data analysis.* Before, during, and after the experiment, the previously mentioned open-ended questions were asked to the freshmen to identify and understand the impact of the experiment on their mathematical attitudes and free problem posing strategy. The data collected were analyzed using content analysis.

*Validity of the Data*

Validity of the quantitative data. The study's quantitative data were obtained during the experiment. The measures taken in the study on the internal and external factors that threaten the validity of the experimental procedures have been summarized as follows:

A study group was formed in order to determine which individuals were appropriate for the study. Since the participants included in the sample at the beginning of the study remained unchanged, the number of participants in the study remained the same. Due to the 10-week period between the Mathematical Attitude Scale's pre and posttest execution, the subjects were considered to have little familiarity with the items on the scale. Moreover, a performance test was not used here. Instead, in order to determine the participants' natural reactions to the items included on the Mathematic Attitude Scale, they were informed that their answers would not be used to calculate their course grade. Performing any process that could lead to statistical manipulation of the data was not an issue because there was no control group. Additionally, because the experiment continued for 10 weeks, participants' maturation and possibility of experiencing burnout were also considered.

Furthermore, understanding the impact of the open-ended questions directed at the subjects has been attempted during the experimental process, and some corrections have also been made according to the feedback.

Validity of the qualitative data. In the qualitative data analysis, participants' answers to the open-ended questions were read several times, no changes were made regarding their statements, and the written texts were presented to participants for their approval. This was done to allow participant control over the data (Creswell, 1998). Additionally, peer assessment was also benefitted from in identifying categories (Lincoln & Guba, 1985). Additionally, broad space was given to the freshmen's statements in the study in order to provide readers with the feeling of having experienced part of the current study themselves (Creswell & Miller 2000).

## Results

The qualitative and quantitative findings obtained in the study are presented separately.

### Quantitative Findings

Here, the study's quantitative data are presented under two headings: problem posing and attitude scores.

*Problem Posing Scores*

At the start of the instruction based on free problem posing activities, freshmen were first provided with some necessary theoretical information regarding the previously mentioned application. Afterward, the topics from the Basic Mathematics 1 class were handled with an instruction incorporating free problem posing activities. Ten problems that had been posed in each of the 10 weeks, especially from the 6th week onward, chosen by the freshmen themselves were collected and each problem was scored on a basis of 10 points. This way, the highest obtainable score on the test was 100 points. When examining the scores' distribution, 9 freshmen were found to have scored 90 or higher, 14 to have scored between 80 and 90, and 10 to have scored between 70 and 79. The arithmetic means of freshmen's problem posing scores are shown in Figure 1 by topic.

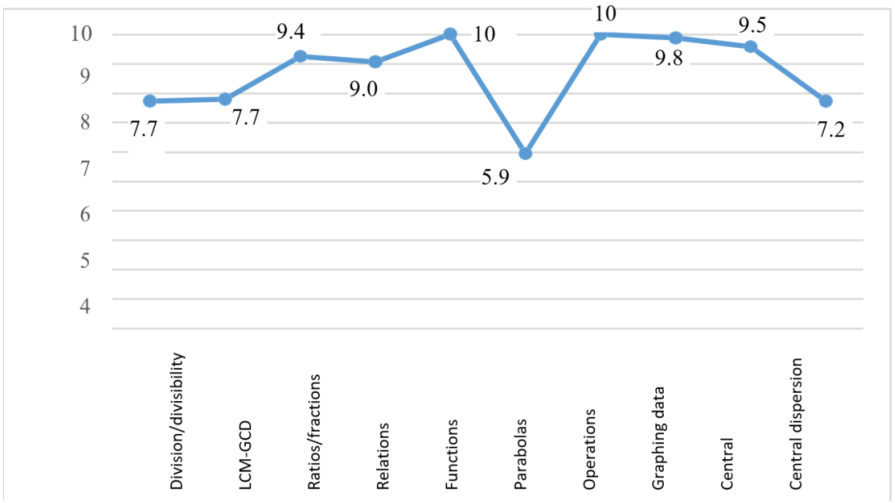



Figure 1. Arithmetic mean of problem posing scores according to topic.

As shown in Figure 1, freshmen's arithmetic means by topic (Division-divisibility to Central dispersion) are 7.72, 7.78, 9.24, 9.06, 10, 5.93, 10, 9.87, 9.57, and 7.72, respectively. Students experienced the greatest difficulty in posing proper problems related to parabolas (mean = 5.93). Meanwhile, functions (m = 10) and operations (m = 10) were determined to have the highest scores in terms of problem posing. Of course, these scores should be noted to have been given without regard to the difficulty level of the problems posed to the freshmen. Moreover, the difference in efficiency posing problems addressing such intertwined concepts as functions, polynomials, and operations constitutes another interesting, albeit separate area of study.

*Attitude scores*

The normality coefficients for the Mathematical Attitudes Scales pre and posttest were first examined and were found to have normal distribution ($\alpha 1 = 0.57$; $\alpha 2 = 0.165$). The dependent t-test results for the Mathematical Attitudes Scale pretest and posttest scores are presented in Table 4.

Table 4. Dependent t-test Results for the Factors Included in the Mathematical Attitudes Scale Mathematical Attitudes Scale pretest and posttest scores

| | *Pretest* | | | *Posttest* | | | *Comparison Statistics* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Measure | Mean | SD | n | Mean | SD | n | *df* | *t* | *p* | $\eta^2$ |
| Fear-Trust | 33.27 | 10.19 | 33 | 34.03 | 8.78 | 33 | 32 | .41 | .67 | 0.00 |
| Interest-Love | 44.27 | 11.47 | 33 | 50.48 | 13.42 | 33 | 32 | -4.06 | .00 | 0.34 |
| Profession and Importance | 32.06 | 5.18 | 33 | 33.36 | 4.64 | 33 | 32 | -1.10 | .27 | 0.03 |
| Pleasure | 28.42 | 6.97 | 33 | 27.69 | 6.57 | 33 | 32 | .70 | .48 | 0.01 |
| Overall Scale | 138.03 | 28.24 | 33 | 145.57 | 27.32 | 33 | 32 | -2.06 | .04 | 0.11 |

As seen in Table 4, the dependent samples' *t*-test results show the existence of a statistically significant difference between the pretest and posttest scores for the overall scale and the sub-factor of interest-love $t(32) = -2.06$, $p = 0.04$; $t(32) = -4.06$, $p = 0.000$). Here the effect has been determined to be at a medium level for the overall scale ($\eta^2 = 0.11$) and at a high level for the sub-factor of interest-love ($\eta^2 = 0.34$). Meanwhile, no statistically significant difference was found between the pre and posttests of the other sub-factors on the Mathematical Attitude Scale: $t(32) = -.41$, $p = 0.67$ for fear-trust, $t(32) = -1.10$, $p = 0.28$ for profession and giving importance, and $t(32) = 0.70$, $p = 0.48$ for pleasure.

**Qualitative Findings**

The freshmen's views were collected in writing during the various stages of the experimental process (before, during, and after), and some adjustments were made to the experimental process based on their views. Approximately 70% of participants' views were similar. For example, 10 freshmen stated that they wanted to know more about how problem posing would be done after receiving general information about it. Accordingly, the definition of problem posing and how it would be done were addressed in greater detail. Throughout the experiment, the freshmen's feedback focused on needing more practice with problem posing activities. At the end of the experiment, their feedback was concentrated on how to use more things in the problem posing process, such as games, materials, and creative ideas. Freshmen's statements fell under two main categories: the affective and the cognitive dimension. Explanations regarding these dimensions are as follows:

*Affective dimension.*

Before the experiment, some participants stated their inability pose problems whereas others admitted to being afraid of math class. Their views changed over the course of the experiment. By the end, they stated that their self-confidence had increased, that math class had become enjoyable, and that their belief in needing to make use of problem posing activities as a teacher had become stronger. These statements indicate that the experiment had been a positive impact on the freshmen's affective tendencies, such as self-confidence, attitude (enjoyment/taking pleasure), and being dutiful/responsible. These findings indicate that the statistically significant difference between pre and posttest scores on the attitude scale in favor of posttest scores are not random. For example, statements from freshmen S12, S15, and S30 have been summarized as follows:

Freshman S12's views:
*I do not suppose I will be able to pose problems because I am scared of math and my foundation is insufficient. I start biting my nails when I hear the word math.* (Pre-experimental process)
*I enjoy math but am unable to do it.* (During the experimental process)
*I have become more able to do mathematical problem posing*. (Post experimental process)

Freshman S15's views:
*Math classes are boring. I do not think this will change with problem posing.* (Pre-experimental process)
*I consider problem posing to be important for my profession.* (During the experimental process)
*Math classes are no longer boring.* (Post-experimental process)

Freshman S30's views:
*I was not able to do math in high school. I do not believe I will have any success. I might need to know a lot of math to be an elementary school teacher.* (Pre-experimental process)
*Problem posing will help me be a good teacher.* (During the experimental process)
*I see the value in posing proper problems. I t*hink my prejudices toward mathematics have decreased. (Post-experimental process)

*Cognitive dimension.*

Prior to the experiment, the freshmen stated that they expected to gain a more clear and concrete understanding upon completion of the problem posing activities and that math problems should be more logically consistent and mathematical operational fit into the logical framework. Additionally, some freshmen argued that math had no application in real life and that problem posing was therefore unnecessary (i.e., Freshmen S1, S4, S7, S10, S11, S12, S27, & S32) prior to the experiment. Freshman S11's statement is a salient example reflecting the general views held by freshmen.

*I do not love math, and I do not think I'll be able to do any math-related activities.* (Freshman S11, pre-experiment)

Prior to the experiment, six freshmen stated that a variety of opportunities and resources were available for professional life and that problem posing was therefore unnecessary (i.e., Freshman S16). Additionally, freshman S20 stated that problem posing contributes nothing to mental development. Short statements from freshman S16 and S20 are provided below:

*I believe problem posing is unnecessary. Many resources are already available on the market for elementary school teachers.* (Freshman S16, pre-experiment)

*I do not like math, but I must use it for my profession. I do not think problem posing will contribute to my students' mental development.* (Freshman S20, pre-experiment)

Freshmen's views were determined to have changed following the experiment's execution. During the experiment, freshmen began to be able to pose problems such that notice individual differences of their students' level, to have developed complex thinking, and to be able to notice students' mistakes (Freshman S21, freshman S22). In addition, they said that they had developed problem solving skills, were able to think analytically, had gained pre-teaching experience, learned how information depended on students' own levels, had gained greater mastery of the subjects, and had reinforced what they learned (Freshman S13, freshman S17). For example, the following statements made by freshmen S31 and S33 offer a general summary of the aggregate of participants' views:

*While posing a problem, I need to be able to solve that problem and think logically.* (Freshmen S31, during the experimental application process)

*I feel I cannot create any questions using numbers. While creating problems, the information needs to be used logically and consistently, and must be appropriate to real life.* (Freshman S33, during the experimental application process)

The freshmen stated that as a result of the experiment and problem solving activities, they had become able to associate mathematics with everyday life and had overcome their prejudices toward mathematics. In addition, they also stated that they had gained experience in their profession by using free problem posing while teaching, had learned how to identify students by the problems they themselves had posed, and were able to pose problems in-line with their interests and abilities. The views of freshmen S10, S31, and S6 summarize the above statements:

*I can pose problems by using concrete concepts appropriate to real life.* (Freshman S10, at the end of the experimental process)

*I noticed that my problem solving skills had improved, and I had a developed a positive attitude toward both math and problem posing.* (Freshman S31, at the end of the experimental process)

*I think I have gained different points of view. As such, I believe I can pose different problems that address different levels and different learning types. By identifying with my students, I can form problems aligned with their interests.* (Freshman S6, at the end of the experimental process)

Freshman S13's statements are included below to exemplify participants' cognitive experiences and development during the experimental process:

*Math courses are now more active. Thanks to problem posing, I can see the mathematical relationship between information, and I have learned new concepts.* (Pre-experimental process)

*I can pose problems by changing the numbers, but I want to find original ideas. (*During the experimental application process)

*The mathematical relationship among information needs to be established while posing problems (*Post-experimental process).

## Discussion, Conclusion, Recommendations

Problem solving and, thus, problem posing skills are among 21st-century skills (Ananiadou & Claro, 2009). Owing to their importance, these skills are therefore expected by teachers to help students learn these skills. A similar situation also naturally applies to freshmen, which requires them to acquire these skills. However, the relevant literature frequently finds that freshmen are insufficiently versed in problem solving and problem posing (Dede & Yaman, 2005; Gonzales, 1994). In order to overcome this problem, it is recommended that freshmen be trained in dynamic teaching environments that incorporate problem solving activities so as to provide them the opportunity to think flexibly instead of undergoing a textbook-based education (see Gonzales, 1994). Moreover, research in the literature (see Frey, 2010; Özgen et al., 2017) shows problem posing skills to have a positive impact on attitude.

Problem posing activities are found in the mathematics curriculum of many countries owing to its importance (Silver, 2013) and have also been included in both middle school and high school mathematics teaching curriculum (Grades 1-8 and 9-12) in Turkey (see MEB, 2005, 2013, 2018a). Accordingly, it is further recommended that problem posing studies also be included in the attainments of elementary and high school mathematics curricula in Turkey (see MEB, 2018a; 2018b). Moreover, studies have also found problem posing teaching programs to aid in the positive development of a few affective tendencies, such as attitudes toward math, self-confidence, and in decreasing mathematical anxiety. Therefore, problem posing activities have been given precedence in the current study, and the effect that their incorporation in teaching has on freshmen's attitudes and opinions toward mathematics has been researched. The reason for this MEB considers teachers' attitudes to be among the general competencies of the teaching profession in addition to teachers' professional knowledge and skills (see MEB, 2017). Moreover, considering those studies indicating that teachers' attitudes toward mathematics have an impact on students' own behaviors and attitudes (e.g., Savaş et al., 2010), it is essential that freshmen develop positive attitudes toward their own math classes so that their future students may do the same. Accordingly, the finding that a teaching environment incorporating problem posing activities leads to a statistically significant difference in freshmen's overall scores on the Attitudes Toward Math Scale and their scores on its sub-factor of interest-love in favor of the posttest is important because teachers' attitudes toward teaching math shape their approach to math and how they design their units and lessons. In turn, students' attitudes toward mathematics are influenced (Aiken, 1970).

Additionally, the current study has found there to be no difference between the pre and posttest scores of the other sub-factors on the attitude scale. For example, freshmen's average pre and posttest scores on the fear-confidence subscale were 33 and 34, respectively. The source of freshmen's anxiety toward mathematics stems from their early years as students, as identified in their written responses, and this may be the reason for the closeness between scores. This is because the freshmen sometimes experience irritation during the experiment, because they knew where and how to start the problem posing activities, establishing relationships between concepts and operations, and assessing the accuracy of all the posed problems' processes. Anxiety toward math comprises both cognitive and affective components, with individuals stating to feel helplessness, intense frustration, and mental failure (Ashcraft & Faust, 1994). Moreover, the literature also indicated that Turkish had high levels of math anxiety regardless of grade level (see Dede & Dursun, 2008; MEB, 2005). It is therefore imprudent to expect all traces of negative past cognitive and affective experiences to be eliminated after a single learning experience incorporating short-term problem posing activities.

The average pre and posttest scores from the Attitudes Toward Math's *profession and giving* importance subscale were 32 and 33, respectively. Accordingly, the present study indicates no noteworthy change in scores related to freshmen's views on the usefulness of mathematics in their daily lives and in other disciplines, on knowing math well enough to be able to contribute to one's future professional life, and on considering math to be important. One reason for this could be because participants considered it important to understand mathematics prior to the problem posing study. The average pre and posttest scores from the attitude scale's pleasure subscale were 28 and 27, respectively. Considering that the highest score that can be obtained from this sub-dimension is 40, it is seen that pre-service teachers like mathematics in general because of problem posing

activity (although the profession and materiality subscale is not at the level of pretest and posttest scores). Probably, they found the problem posing activities simple and enjoyable at the beginning of the experiment. When taking another look at the freshmen during the experiment (e.g., the 7th week), although they stated problem posing to be difficult, they also admitted that mathematics in general and problem posing in particular had become a fun endeavor.

The qualitative data corroborates this. For example, most freshmen stated problem posing to be an indispensable part of their professional lives and that problem posing helped improve their understanding of mathematics' real-life application (e.g., freshman S16). Freshmen's views in this vein are important, and freshmen holding such opinions are expected to exhibit this kind of a teaching approach in their future professional careers. This is also important for students' own development because mathematics' usefulness is not restricted to using real-life examples in math classes. Its importance extends to facilitating increased mathematical knowledge and contemplation during one's daily activities. This way, students gain the opportunity to understand and evaluate the world's economic, physical, and social dimensions (Atweh, 2007).

Lastly, the current study has determined that freshmen tended to pose problems containing superficial and simple relationships. For example, freshmen posed problems at basic levels, generally giving f(x) when f(a) is desired or giving g(x) when finding the resultant function of f(g(x)) is desired. Although this case shows that the participants implemented their problem posing requirements at the minimum level, they were expected to employ as many original ideas as possible, especially in free problem posing activities. This is because only when mathematical problem posing activities are carried out from an original point of view can they open the doors to flexibility and creativity (Arıkan, 2017). An implicit relationship was found between mathematical problem posing and creativity, and information about problem posing skills compared to creativity levels or also creativity levels compared to problem posing skills can be acquired (Krutetskii, 1969; Ellerton, 1986). Elementary freshmen wrote easily identifiable problems in any mathematics book, so they could not present original problems, and presented problems in the form of an exercise question. Bonotto (2013) reached a similar conclusion in his study in which Grade 5 students participated with a semi-structured problem posing strategy. However, considering the age of the participants and the problem posing strategy used was a little more difficult, considering the participants in our study to be teachers in the future, the problems posed in our study would be expected to be unique. On the other hand, due to the first-time participants were trained in problem posing, the dimension of originality was disabled in the evaluation of the problems in our study. The study has also determined freshmen to experience some serious problems associating quadratic equations and their graphs (parabolas) and making problems based on these. Conducting further research to identify and resolve the reasons for this and similar cases is recommended.

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# The Adaptation of Math and Science Engagement Scales in the Context of Science Course: A Validation and Reliability Study

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# The Adaptation of Math and Science Engagement Scales in the Context of Science Course: A Validation and Reliability Study*

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## Abstract

In this study, The Math and Science Engagement Scales developed by Wang et al. (2016) was adapted to Turkish in the context of science course and, the validity and reliability studies were conducted. The original version of the scale consists of 4 dimensions and 33 items. These dimensions are; cognitive engagement, behavioral engagement, emotional engagement, and social engagement. During the adaptation phase, the items were translated into Turkish by three experts. The Turkish forms were examined and the draft form of the scale was obtained by the researchers. Then, the two experts of the two languages were examined through the language equivalence expert form for word usage and cultural suitability. The participants of the study consisted of 519 students in 6., 7., and 8. grades studied at two secondary schools in a small scale city in the south east of Turkey during the 2019–2020 academic year. The convenience sampling method was used to determine the participants. Confirmatory factor analysis (CFA) was applied to the data obtained after the implementation. The fit index values obtained as a result of CFA ($\chi 2$ / df = 1.75; RMSEA = 0.038; SRMR = 0.049; RMR = 0.072; CFI = 0.98; NFI = 0.96) show that the 4-factor structure of the scale is acceptable. As a result of the reliability analysis, the Cronbach alpha reliability coefficient of the Turkish form of the scale was 0.90 and the Guttman Split-half coefficient was 0.81. Finally, it can be said that the validity and reliability of the 33-item and 4-dimensional Turkish form of the scale adapted with this study can be used to determine student engagement in science classes. Add your abstract here.

**Key words:** Science education, Student engagement, Scale adaptation, Secondary school students

## Introduction

Interdisciplinary approaches in education have recently become popular. Although disciplinary knowledge has been developed over the centuries and forms the basis for exploring field-specific knowledge, the integration of disciplines has also been discussed for over 100 years (Czerniak & Johnson, 2007). Nowadays, the term "interdisciplinary teaching" "is widely used in all fields of education due to the growing awareness of the intrinsic value and benefits of interdisciplinary teaching (You, 2017). The increasing importance of interdisciplinary approaches has led to the expansion of STEM (Science, Technology, Engineering, and Mathematics) integration in science education. Interdisciplinary science education has been identified as a factor in STEM that encourages students to be actively involved and ready for the workforce and, among other benefits, contributes to the development of holistic thinking (Kezar & Elrod, 2012). Therefore, STEM is seen as a holistic approach to curriculum and teaching (Yıldırım et al., 2018). Thus, STEM education started to take place in the science curriculum in many countries.

Turkey has also made various studies to adapt to this change and development. STEM integration has taken its place in the curriculum of science courses with the updated curriculum in 2018 (MoNe, 2018). In the majority of STEM-based education programs, including in Turkey (MoNe, 2018), with long-time involvement of students in authentic tasks that require problem solving and applications, to help them see the connections between disciplines are used in projects (Lesseig et al., 2017). These interdisciplinary projects; to solve problems based on mathematics /science concepts and procedures, combining teamwork with engineering design methodology, using appropriate technology (Shaughnessy, 2013). Student engagement is a strong predictor of academic performance and selection process (Hughes et al., 2008). Student engagement is generally defined as a function of factors such as human needs, emotion, intention, motivation, interests, identity (Azevedo et al., 2012). Therefore, student participation has an important role in the process of conducting STEM projects. Studies indicating that there is a positive relationship between student participation and student

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achievement, which is an indicator of academic performance (Baron & Corbin, 2012; Kahraman, 2014; Reeve & Tseng, 2011; Willms et al., 2009). In addition to student achievement, studies are indicating that there is a connection between student engagement and affective characteristics (Kahraman, 2014; Turner et al., 2014; Willms et al., 2009). Kahraman (2014), by addressing the multidimensional student engagement, using the TIMSS 2011 data in Turkey, students were aimed to investigate the relationship between the contributions and achievements in Grade 4 and Grade 8 science courses in his study. According to a result obtained from the study, it was observed that while affectionate science lessons had a positive effect on success in 4th-grade students, it was found that school did not have a significant effect on success. In the 8th grade, a positive effect was determined in both dimensions.

When the literature on student engagement is examined, it is seen that there is a broad consensus that it is a multidimensional structure that includes behavioral, emotional, and cognitive components (Fredricks et al., 2004; Wang et al., 2011). Active participation of students with its multidimensional structure also plays a key role in STEM careers (Wang & Degol, 2014). Therefore, to increase students' engagement in science classes and identify students at high risk of not participating in STEM practices, "student engagement" should be conceptualized and measured appropriately (Wang et al., 2016). When the literature is examined, the attitude towards STEM (Aydın et al., 2017; Ceylan et al., 2018; Damar et al., 2017) and self-efficacy (Özdemir et al., 2018; Yıldırım et al., 2018). When the literature on student participation is examined, general scales related to student participation are included (Eryılmaz, 2014; Yıldırım et al., 2017). Eryılmaz (2014), in a study aimed to develop a measurement tool to determine the engagement level of university students, examined student engagement in the dimensions of emotional engagement, cognitive engagement, and behavioral engagement. Lightning et al. (2017) adapted the Student Engagement Scale developed by Mazer (2012) into Turkish and conducted validity and reliability analyzes. This scale was developed to measure the level of participation of university students. The scale consists of 13 items and 4 dimensions (in-class silent behaviors, in-class verbal behaviors, thinking about course content and out-of-class behaviors). In Turkey, Yerdelen-Damar et al. (2020) conducted a Turkish adaptation study of "The Math and Science Engagement Scale" in the context of physics lesson. However, a scale for determining student engagement for the secondary school science course was not found. Therefore, there is a need to determine student engagement in the science class in a multidimensional way. From this point of view, The Math and Science Engagement Scales developed by Wang et al. (2016) was adapted to Turkish in the context of science course and the validity / reliability studies were conducted in this study.

## Method

### Research Design

This study includes adapting The Math and Science Engagement Scales was developed by Wang et al. (2016) to Turkish in the context of science course, and conducting the validity and reliability studies.

### Participants

The participants of the study consisted of 519 students in $6^{th}$, $7^{th}$ and $8^{th}$ grade studied at two secondary school classrooms in a small-scale city in the south east of Turkey during the 2019–2020 school year. The convenience sampling method was used to determine the participants (Fraenkel et al., 2012). The distribution of the participants by gender and grade level is as Table 1.

Table 1. The distribution of the participants

| | | **N** | **%** |
|---|---|---|---|
| **Grade level** | $6^{th}$ grade | 198 | 38.1 |
| | $7^{th}$ grade | 141 | 27.2 |
| | $8^{th}$ grade | 180 | 34.7 |
| | Total | 519 | 100 |
| **Gender** | Female | 225 | 43.4 |
| | Male | 294 | 56.6 |
| | Total | 519 | 100 |

### Research Instrument and Procedure

Within the scope of the study, the science dimension of The Math and Science Engagement Scales was translated into Turkish, and validity and reliability studies were conducted. The original version of the scale consists of 4 dimensions and 33 items. These dimensions are; cognitive engagement (8 items), behavioral engagement (8 items), emotional engagement (10 items), and social engagement (7 items). During the adaptation phase, the items were translated into Turkish by three experts. The Turkish forms were examined and

the draft form of the scale was obtained by the researchers. The draft form was reviewed by the Turkish expert for clarity and necessary corrections were made. Then, the draft scale was examined by two experts who have mastered both languages in terms of word usage and culture suitability through the language equivalence expert form. In order to determine the consistency between experts, the formula suggested by Miles and Huberman (1994) was used (reliability = consensus/consensus + dissidence). In terms of word usage, experts differed in the 3,9, 20, and 27th items. For this reason, the consistency between experts is calculated as 29/33 = 0.87 in terms of Word usage. In terms of culture suitability, the consistency between experts was calculated as 31/33 = 0.93 due to dissidence in the 1 and 24th items. Also, corrections were made in the 3, 5, 9, 21, and 27th items, which were determined to be a problem in terms of the language used in line with the opinions of the experts, and the scale was finalized.

**Data Analysis**

The data obtained as a result of the implementation of the Turkish form of the scale was converted to z-scores and outliers were checked. Z values less than -3 and + 3 were accepted as outliers (Çokluk et al., 2010). Then, skewness, kurtosis, mode, median, mean of the values, and histogram / Q-Q plot graphs were examined to determine whether the item scores in the scale showed normal distribution. According to the findings, it was determined that the data showed normal distribution. Then Mahalanobis distances were calculated for multivariate normality analysis. Mahalanobis distances should be at $p < .001$ for the determination of multivariate outliers (Tabachnick & Fidell, 2007). For this reason, the analysis was continued by deleting the data of 40 multivariate outliers which were not at $p < .001$ from the Mahalanobis distance calculated.

The multicollinearity between the variables was checked in the next step to provide the assumptions of the CFA. First, the relationships between the variables were examined. In very high correlations such as .90 and above, statistical problems arise with singularity and multicollinearity (Tabachnick & Fidell, 2012). When the correlations between variables were examined, it was determined that the highest correlation was 0.538. For this reason, it was determined that there was no problem since the correlations were less than 0.90. However, since the correlation and collinearity are not the same, even if all correlations are low, multicollinearity may be in question (Alin, 2010). Singularity and multicollinearity can be determined through perfect or very high squared multiple correlations (SMC) or very low tolerances between variables (Tabachnick & Fidell, 2012). Therefore, Tolerance, VIF (Variance Inflation Factor) and, CI (Condition Index) need to be examined. If the tolerance is too low, the variable does not go into the analysis (Tabachnick & Fidell, 2012). Therefore, multicollinearity can be mentioned if the VIF is greater than 5 to 10 and the tolerance is less than 0.1 to 0.2 (Kim, 2019). Therefore, if there is a tolerance value close to zero and the VIF value exceeds 10, the highest degree of multicollinearity can be observed (Kumari, 2008). Adeboye et al. (2014) stated that starting from VIF values above 2.50, multicollinearity can be mentioned. The tolerance values calculated in the current study ranged between 0.441 and .867 and VIF is between 1.154 and 2.369. Therefore, there is no multicollinearity problem in terms of tolerance and VIF values. Besides, CI values were examined in the study. Condition index is a measure of the dependence of a variable on other variables (Tabachnick & Fidell, 2012). CI value greater than 30 indicates a very strong multiple linear connection problem (Gujarati, 1995; Kim, 2019; Kumari, 2008). In this study, it was determined that there were two CI values greater than 30 and the highest CI value was determined as 32.298. Adeboye et all. (2014) pointed out that if CN <100, multicollinearity is not a serious problem. Therefore, it was determined that there is no multicollinearity problem in terms of CI values. Finally, the Durbin-Watson (DW) value was examined. Durbin-Watson is a measure of the autocorrelation of errors and shows that errors are not independent (Tabachnick & Fidell, 2012). Positive autocorrelation causes Type I error because the error variance estimates are too small, and negative autocorrelation causes power loss (Tabachnick & Fidell, 2012). In this study, it was determined that there was no problem since the DW value was calculated as 1.169. Therefore, based on all this assumption analyzes, it has been determined that the data are suitable for CFA application. Furthermore, the Kaiser-Meyer-Olkin (KMO) test and Bartlett test were examined to determine the suitability of the data for factor analysis. According to the results, it was concluded that the sample size was sufficient, and the confirmatory factor analysis was started.

Then, confirmatory factor analysis (CFA) was applied to the data (Çokluk et al., 2010). Lisrel 8.80 program was used in the analysis process. To test the model examined in Turkish form, the fit index values were calculated ($\chi 2$ / sd, GFI, AGFI, RFI, NFI, NNFI, IFI, CFI, RMSEA, RMR and SRMR) and the model was tested in terms of the criteria for values (Schermelleh-Engel et al., 2003). Also, standardized loadings, t values and R2 values were calculated by drawing the Path diagram. In order to determine the reliability of the Turkish version of the scale, the Cronbach's alpha internal consistency coefficient and Guttman split-half reliability were calculated.

## Results

According to the results of the confirmatory factor analysis conducted to determine the fit of the 4-factor model in the original form of the scale, the fit index values are as in Table 2.

Table 2. Fit indices of the Turkish version of the scale

| | **Good Fit Values** | **Acceptable Fit Values** | **4-dimensional model** |
|---|---|---|---|
| $x^2$/df | $0 \leq x^2/df \leq 2$ | $2 \leq x^2/df \leq 3$ | 1.75 |
| RMSEA | $0 \leq RMSEA \leq .05$ | $.05 \leq RMSEA \leq .08$ | 0.038 |
| RMR | $0 \leq RMR \leq .05$ | $.05 \leq RMR \leq .08$ | 0.072 |
| SRMR | $0 \leq SRMR \leq .05$ | $0.5 \leq SRMR \leq .10$ | 0.049 |
| NFI | $.95 \leq NFI \leq 1$ | $.90 \leq NFI \leq .95$ | 0.96 |
| NNFI | $.97 \leq NNFI \leq 1$ | $.95 \leq NNFI \leq .97$ | 0.98 |
| CFI | $.97 \leq CFI \leq 1$ | $.95 \leq CFI \leq .97$ | 0.98 |
| GFI | $.95 \leq GFI \leq 1$ | $.90 \leq GFI \leq .95$ | 0.93 |
| AGFI | $.95 \leq AGFI \leq 1$ | $.90 \leq AGFI \leq .95$ | 0.89 |

According to the confirmatory factor analysis results, the fit index values were as follows ($\chi 2$ / df = 1.75; RMSEA = 0.038; SRMR = 0.049; RMR = 0.072; CFI = 0.98; NFI = 0.96). It is seen that these values are within acceptable ranges (Schermelleh-Engel et al., 2003). The t values, standardized factor loadings and R2 values obtained from the path analysis are given in Table 3.

Table 3. Standardized factor loadings, squared standardized loadings, t values

| | | Standardized factor loadings | $R^2$ | t values |
|---|---|---|---|---|
| **Cognitive engagement** | M1 | .55 | .30 | 12.56 |
| | M2 | .54 | .29 | 12.10 |
| | M3 | .43 | .18 | 9.33 |
| | M4 | .58 | .33 | 13.19 |
| | M5 | .37 | .14 | 5.53 |
| | M6 | .19 | .04 | 3.84 |
| | M7 | .43 | .19 | 9.47 |
| | M8 | .18 | .04 | 4.01 |
| **Behavioral engagement** | M9 | .55 | .30 | 12.73 |
| | M10 | .68 | .47 | 16.36 |
| | M11 | .57 | .33 | 13.13 |
| | M12 | .55 | .30 | 12.58 |
| | M13 | .49 | .24 | 11.26 |
| | M14 | .46 | .21 | 9.90 |
| | M15 | .33 | .11 | 7.23 |
| | M16 | .44 | .20 | 10.01 |
| **Emotional engagement** | M17 | .65 | .43 | 14.82 |
| | M18 | .74 | .55 | 16.80 |
| | M19 | .60 | .36 | 13.40 |
| | M20 | .69 | .48 | 15.85 |
| | M21 | .53 | .28 | 11.61 |

| | | | | |
|---|---|---|---|---|
| | M22 | .54 | .29 | 11.88 |
| | M23 | .56 | .32 | 12.15 |
| | M24 | .48 | .23 | 10.61 |
| | M25 | .62 | .38 | 13.03 |
| | M26 | .36 | .13 | 7.70 |
| **Social engagement** | M27 | .26 | .06 | 5.24 |
| | M28 | .49 | .24 | 9.35 |
| | M29 | .54 | .29 | 8.86 |
| | M30 | .59 | .35 | 10.77 |
| | M31 | .55 | .30 | 10.42 |
| | M32 | .42 | .18 | 8.24 |
| | M33 | .41 | .17 | 8.32 |

When Table 3 is examined, it is seen that the standardized factor loadings of items 6, 8, 15, and 27 are low. It was decided that these items would remain in the test because they supported the theoretical model in the original scale and t values were significant. Besides, item-total correlations were calculated for each item in the final form of the scale and the significance of the difference between item scores of the upper 27% and lower 27% groups were determined by t-test. The values obtained are shown in Table 4.

Table 4. Item-total correlations and t-values for the difference between the upper 27% and lower 27% groups

| **Dimensions** | **Items** | **t values** | **Item-total correlations** | **Dimensions** | **Items** | **t values** | **Item-total correlations** |
|---|---|---|---|---|---|---|---|
| **Cognitive engagement** | M1 | 5.82 | .525** | **Emotional engagement** | M17 | 10.90 | .621** |
| | M2 | 4.89 | .515** | | M18 | 12.47 | .677** |
| | M3 | 6.23 | .430** | | M19 | 6.33 | .569** |
| | M4 | 6.73 | .540** | | M20 | 12.53 | .633** |
| | M5 | 5.42 | .423** | | M21 | 12.34 | .531** |
| | M6 | 3.91 | .110* | | M22 | 11.41 | .531** |
| | M7 | 6.62 | .442** | | M23 | 12.75 | .570** |
| | M8 | 5.12 | .153** | | M24 | 7.31 | .466** |
| **Behavioral engagement** | M9 | 8.20 | .524** | | M25 | 11.61 | .585** |
| | M10 | 10.20 | .616** | | M26 | 5.68 | .387** |
| | M11 | 5.23 | .533** | **Social engagement** | M28 | 3.69 | .279** |
| | M12 | 5.45 | .497** | | M30 | 5.75 | .425** |
| | | | .507** | | M31 | 7.53 | .446** |
| | M13 | 6.14 | .481** | | M32 | 8.17 | .509** |
| | M14 | 10.53 | .380** | | | | |
| | M15 | 7.08 | .459** | | | | |
| | M16 | 8.04 | .525** | | | | |

When Table 4 is examined, according to independent t-test results related to the significance of the difference between item scores of the upper 27% and lower 27% groups, t values vary between 3.69 and 12.75. Item-total correlations ranged from 0.110 to 0.676 and they were significant. The correlation values calculated between the factors of the scale are given in Table 5.

Table 5. Correlation values between factors of the scale

| | **Reliability** | **Sum** | **Cognitive** | **Beharovial** | **Emotional** | **Social** |
|---|---|---|---|---|---|---|
| **Cognitive** | 0.636 | .804** | 1 | .670** | .551** | .449** |
| **Beharovial** | 0.720 | .849** | .670** | 1 | .636** | .464** |
| **Emotional** | 0.843 | .862** | .551** | .636** | 1 | .490** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Social** | 0.664 | .719** | .449** | .467** | .490** | 1 |
| Cronbach alpha: 0.90 | | Guttman split-half coefficient: 0.81 | | | | |

When the correlation values calculated between the factors are examined, it is seen that all values are significant. As a result of the reliability analysis, the internal consistency reliability coefficient of the Turkish form of the scale was 0.90, and the Guttman split-half reliability coefficient was 0.81. Furthermore, the dimensions of the scale were divided into positive and negative categories and tested with the hypothesized model with path analysis. The path diagram obtained as a result of testing the model with path analysis is as in Figure 1.

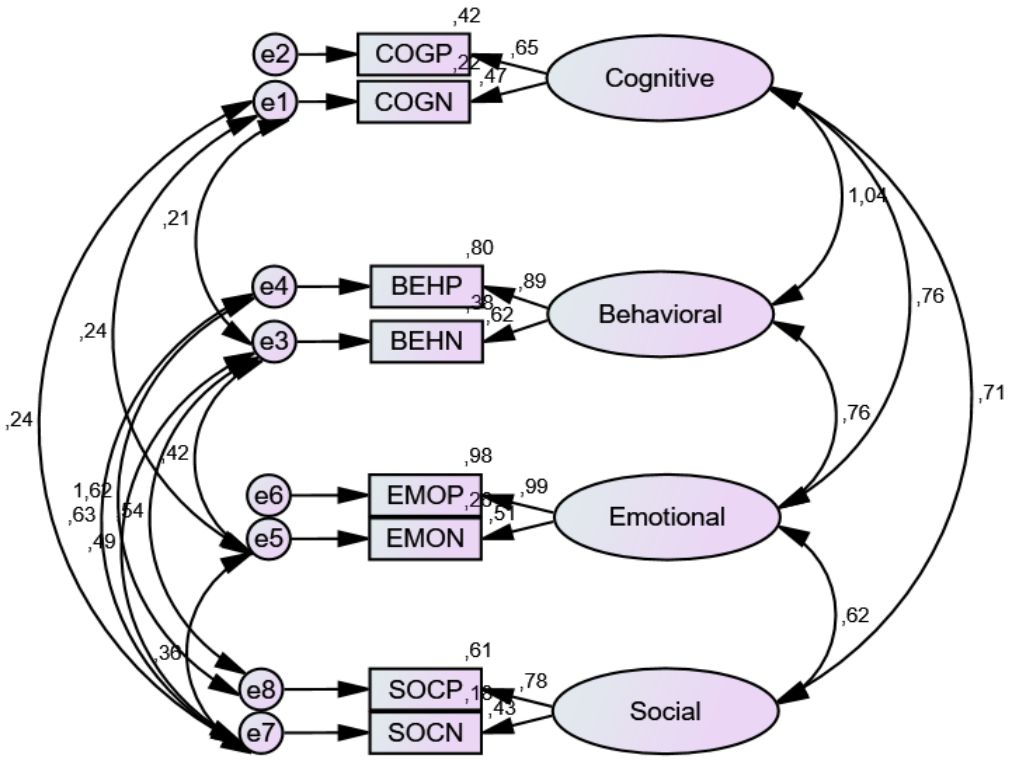


Figure 1. Path diagram of the model

The values related to the standardized regression coefficients and the significance of the regression coefficients are given in Table 6.

Table 6. Reliability coefficients of the variables and standardized factor loadings

| **Relationships between variables** | | | **B** | **β** | **S.E.** | **C.R.** | **p** |
|---|---|---|---|---|---|---|---|
| COGN | <--- | Cognitive | .47 | .42 | | | |
| COGP | <--- | Cognitive | .65 | .22 | .140 | 9.825 | *** |
| BEHN | <--- | Behavioral | .62 | .38 | | | |
| BEHP | <--- | Behavioral | .89 | .80 | .102 | 13.937 | *** |
| EMON | <--- | Emotional | .51 | .20 | | | |
| EMOP | <--- | Emotional | .99 | .98 | .226 | 9.678 | *** |
| SOCN | <--- | Social | .43 | .18 | | | |
| SOCP | <--- | Social | .78 | .61 | .270 | 6.499 | *** |

The findings of the analysis showed that negative and positive engagement categories appeared to be positively associated with engagement in all factors. According to the results of the path analysis conducted to determine the fit of the hypothesized model in the original form of the scale, the fit index values are as in Table 7.

Table 7. Fit indices of the hypothesized model

| | **Good Fit Values** | **Acceptable Fit Values** | **Hypothesized model** |
|---|---|---|---|
| $x^2$/df | $0 \leq x^2/df \leq 2$ | $2 \leq x^2/df \leq 3$ | 1.76 |
| RMSEA | $0 \leq RMSEA \leq .05$ | $.05 \leq RMSEA \leq .08$ | 0.038 |
| RMR | $0 \leq RMR \leq .05$ | $.05 \leq RMR \leq .08$ | 0.010 |
| SRMR | $0 \leq SRMR \leq .05$ | $0.5 \leq SRMR \leq .10$ | 0.049 |
| NFI | $.95 \leq NFI \leq 1$ | $.90 \leq NFI \leq .95$ | 0.99 |
| RFI | $.97 \leq NNFI \leq 1$ | $.95 \leq NNFI \leq .97$ | 0.97 |
| CFI | $.97 \leq CFI \leq 1$ | $.95 \leq CFI \leq .97$ | 0.99 |
| GFI | $.95 \leq GFI \leq 1$ | $.90 \leq GFI \leq .95$ | 0.99 |
| AGFI | $.95 \leq GFI \leq 1$ | $.90 \leq GFI \leq .95$ | 0.97 |

When Table 7 is examined, the model is accepted as the fit indices of the model are within the range of "good fit values" (Schermelleh-Engel et al., 2003).

## Discussion, Conclusions and Recommendations

Student engagement is important for the effective implementation of the STEM integration which is very popular today in science education. Therefore, the determination of student engagement is considered important. In this study, The Math and Science Engagement Scale developed by Wang et al. (2006) was adapted to Turkish in the context of science course, and validity and reliability studies were conducted for secondary school students. The original 4-dimensional structure of the scale was tested by confirmatory factor analysis. The goodness of fit index values obtained as a result of CFA ($\chi 2$ / df = 1.75; RMSEA = 0.038; SRMR = 0.049; RMR = 0.072; CFI = 0.98; NFI = 0.96) indicate that the 4-factor structure of the scale is acceptable (Hu & Bentler, 1999; Kline Schermelleh-Engel et al., 2003; Tabachnick & Fidell, 2012). But standardized factor loadings of items 6,8, 15 and 27 are low (Çokluk et al., 2010; Suhr, 2006)). It was decided that these items would remain in the test because they supported the theoretical model in the original scale and t values were significant. Kline (2010) stated that t values greater than 1.96 were significant at p = 0.05 level. He also stated that low correlation amounts should increase the likelihood of a meaningful increase as the sample increases (Kline, 2010). Therefore, it was decided not to discard these items.

According to the CFA results applied to the 4-factor structure of the model, $\chi 2$ / df = 1.75 was calculated. The Chi-square test shows the amount of difference between expected and observed covariance matrices (Suhr, 2006). The smaller the chi-square value, the better the model (Hinkin, 1995) and that there is little difference between the covariance matrices expected and observed to approach zero. Therefore, this ratio is an indicator that the model may be suitable for the data (Tabachnick & Fidell, 2012). In this study, $\chi 2$ / df value less than 2 is an indicator of the perfect fit of the model to the data (Çokluk et al., 2010; Schermelleh-Engel et al., 2003).

As a result of the analysis, the RMSEA value of the model was calculated as 0.038. Suhr (2006) stated that the RMSEA value between 0 and 1 showed better model fit; Arbuckle (2005) suggested that the RMSEA value of 0.05 or less fits well into the model concerning degrees of freedom. Therefore, it can be said that the RMSEA value obtained in this study shows good agreement (Arbuckle, 2005; Çokluk et al., 2010; Hu and Bentler, 1999; Schermelleh-Engel et al., 2003; Suhr, 2006; Tabachnick & Fidell, 2012). When the other values were examined, it was determined that the fit indices were RMR = 0.072, SRMR = 0.049 NFI = 0.96 NNFI = 0.98 CFI= 0.98 GFI= 0.93. According to these values, it is determined that the 4-dimensional structure of the model fits well (Çokluk et al., 2010; Hooper et al., 2008; Hu & Bentler, 1999; Kline, 2010; Schermelleh-Engel et al., 2003; Suhr, 2006; Tabachnick & Fidell, 2012). Hu and Bentler (1999), close to 0.95 CFI and SRMR value close to 0.08 showed a good agreement between the observed data and hypothesized model and reduced Type II error rate, he said. Kline (2010) stated that the combination thresholds to achieve “acceptable fit” are CFI ≥ .95 and SRMR ≤ .08. Therefore, the CFI and RMSEA values obtained in this study show a good fit. However, it is seen that the calculated GFI value is not among the acceptable values (Schermelleh-Engel et al.). Kline (2010) states that one limitation of the GFI value is that it varies with the sample size. Therefore, in the present study, the GFI value was within the acceptable range affected by the sample size (Hooper et al., 2008; Kline, 2010),

and the sample size (n = 519) was more than 300 participants recommended as the ideal sample size for DFA (Hair et al., 2006).

Also, item-total correlations were calculated for each item and the significance of the difference between item scores of the upper 27% and lower 27% groups were determined by t-test. As a result of the reliability analysis, the internal consistency reliability coefficient of the Turkish form of the scale was 0.90, while the Guttman split-half reliability coefficient was 0.81. Besides, as a result of the path analysis established with the paths drawn between the dimensions, it was found that the positive and negative sub-dimensions in the scale predicted the factors positively. When the fit index values of this model were examined, it was determined that the bifactor model showed a good fit. As a result, it can be said that the validity and reliability of the 33-item and 4-dimensional Turkish form of the scale adapted with this study can be used to determine students' science engagement. Thus, a multidimensional perspective on student participation and the results to be achieved in the studies to be conducted will provide richer information about how students behave, feel, think and socialize in science classes rather than considering each dimension separately (Wang et al., 2011). Therefore, it will be possible to measure multidimensional student engagement in science courses with the scale adopted in this study. Also, it may be suggested that the role of students' engagement in their STEM achievements can be determined by using the adapted scale in this study.

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**Attachment. *Science Engagement Scale***

**Bilişsel Katılım**

1. Fen dersi için çalışırım ve bunun doğru olduğundan eminim.
2. Bir problemi çözmek için farklı çözüm yolları düşünürüm.
3. Yeni öğrendiğim şeylerle daha önce öğrendiklerimi ilişkilendirmeye çalışırım.
4. Bir şeyi yanlış yaptığımda hatalarımı anlamaya çalışırım.
5. Bir problemi çözmek yerine direkt cevabın söylenmesini tercih ederim.
6. Ders çalışmanın zor olduğunu düşünmem.
7. Çalışacağım konu zor olduğunda konunun sadece kolay kısımlarına çalışırım.
8. Dersi geçecek kadar çalışırım.

**Davranışsal Katılım**

9. Fen dersine konsantre olurum.
10. Fen dersini öğrenmek için çaba harcarım.
11. Bir şey zor olsa bile denemeye devam ederim.
12. Ödevlerimi zamanında tamamlarım.
13. Sınıf dışında da fen dersi hakkında konuşurum.
14. Fen dersine katılmam.
15. Dikkatimi toplamam gerektiğinde başka şeyler yaparım.
16. Anlamazsam hemen pes ederim.

**Duyuşsal Katılım**

17. Fen dersini dört gözle beklerim.
18. Fen hakkında yeni şeyler öğrenmekten zevk alırım.
19. Fen dersinde neyin öğretildiğini anlamak isterim.
20. Fen dersindeyken kendimi iyi hissederim.
21. Fen dersinde kendimi sık sık usanmış hissederim.
22. Fen dersinin sıkıcı olduğunu düşünürüm.
23. Fen dersinde olmak istemem.
24. Fen öğrenmeyi umursamam.
25. Fen dersindeyken kendimi sık sık keyifsiz hissederim.
26. Fen ile ilgili yeni şeyler öğrendiğimde endişelenirim.

**Sosyal Katılım**

27. Kendi fikirlerimi, başkalarının fikirleri ile yapılandırırım.
28. Fen dersinde başkalarının fikirlerini anlamaya çalışırım.
29. Fen bana yardımcı olabilecek kişilerle çalışmayı tercih ederim.
30. Fen dersinde zorlanan kişilere yardım etmeye çalışırım.

**31.** Başkalarının fikirlerini umursamam.
**32.** Başkalarıyla çalışırken, fikirlerimi paylaşmam.
**33.** Sınıf arkadaşlarımla çalışmayı sevmem.

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# The A Method Against "Linguistic Imperialism": CLIL

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# The A Method Against "Linguistic Imperialism": CLIL

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## Abstract

English Language Teaching (ELT) contains many social, economic, educational or political factors. This article will focus on the political effects of ELT. In this context, the concept of "linguistic imperialism" of R. Phillipson will be detected. It preaches that ELT can be a danger for local cultures. It can assimilate the learners in favor of English culture. In order to minimise this danger a solution is developed in this article. Thus, the Content-based Language Learning (CLIL) Method was applied to a 30-person experiment group. CLIL aims to teach content and language at the same time. The content of this study was chosen as Turkish Art History because the researches show that young people do not have knowledge about Turkish Art History and consequently their own local artistic culture. While Action Research Method was used, pre-tests and post-tests were evaluated using Arithmetic Mean Method. Open-ended questions, conversation, observation book and interview methods were included, too. As a result, in the experiment group, an increase in Turkish Art History knowledge was detected. Both groups learned English at a similar rate, but the control group did not have any knowledge about Turkish Art History. Thus, it can be said that CLIL can reduce the assimilative elements that English may reveal as a hegemonic language. **Key words:** Science education, Student engagement, Scale adaptation, Secondary school students

## Introduction

English is a language that can be defined as a lingua-franco of today (Brutt- Griffler, 2002; Llurda, 2004). Rise of English as a lingu-franca is related to the economic, social, historical and political developments in the world. It can be said that English started to become dominant language with 1950s (Eskicumalı ve Türedi; 2010; Tözün 2012). From that time onwards, with the help of economic and political power of the USA and UK, English started to spread all over the world. Today, people try to learn English for different reasons like career, reaching knowledge, education and so on. Taking into account the positive roles that English plays internationally, this study focuses on the negative effects of English Language Teaching (ELT) over the local cultures of non-native speakers.

It is actually not just for English, all the hegemonic languages can pose the same cultural problems. As a matter of fact, the researches about the relationship between language and culture goes back to Herder (Andarab, 2014: 66). At the end of the 19th century, language was a part of national identity and a tool for the nation-buildings (Anderson, 2015). However, political effects of the learning a foreign language was overlooked until 1970s. When neo-Marxist ideas in education were in rise during 1970s, the relation between language and politics were emphisized more. The writings of Antonio Gramsci about language and hegemony were rediscovered and Louis Althusser's ideas about education paved the way. The concept of "habitus" by Pierre Bourdieou or Basil Bernstein's "code of speech" theory were all related to the relationship between politics and language in 1970s (Aronowitz ve Giroux, 1985:84-87; Lynch, 1989:21-25; Bernstein, 2000: 107-197).

The book called Linguistic Imperialism written by Robert Phillipson in 1992 caused big debates about politics and language. The debate still continues today. Phillipson defines Linguistic Imperialism as follows: "For example if an aid project provides funds for language X, and not for language Y, when both X and Y are central to the linguistic ecology of a given country, there may be linguistic imperialism at play" (Phillipson, 1997: 239). His definition of the concept seems much more related to the economical side of the language learning. However, his development of the concept includes much more than the economics.

For example, to Phillipson, the ideas like "only European languages are suited to the task of developing" is again about linguistic imperialism (Phillipson, 1997: 240). Linguistic imperialism is a sub-type of cultural imperialism for Phillipson. According to Linguistic Imperialism, English as a language spreads "Anglo-Saxon scientific tradition and academical manners" all over the world (Kayıntu, 2017: 70). English is accepted as a leader and unique for cultural and scientific areas (Phillipson, 1992: 47). Phillipson says that "English is marketed as a language that everyone needs to know", so a big industry about it was established and the center of this industry in England and USA (Phillipson, 1997: 89). As a result, these very countries control the language learning all over the world. And this controlling issue is the main element of the Imperialism.

For Phillipson, Linguistic imperialism is mostly about "linguistic hierarchisation, addressing issues of why some languages come to be used more and others less, what structures and ideologies facilitate such

processes, and the role of language professionals" (Phillippson, 1997: 238). For him, "inequalities between native speakers of English and speakers of other languages" can be seen as one of the most important indicator about linguistic imperialism (Phillippson, 1997: 86). Phillipson reminds that the very symbols of English "glorifies the dominant language and stigmatize others". The worst of all is that the target language, that is English, is put at the highest place at the hierarchy and it is "rationalised and internalized as normal and natural" (Phillipson, 1999: 4). The central exams like TOEFL or IELTS, having the dominancy of course books or other materials for ELT by USA and UK increase the suspicions about ELT.

Shortly, Phillipson turns the attentions to three elements of Linguistic Imperialism: 1) money transfer or "aid" from abroad for language learning, 2) inequality of English speakers and other languages' speakers,3) putting English on top in the hierarchy and make it untouchable. When these three elements are detected in a country, it can be said that there is a linguistic imperialism in this country.

In the Turkish case, things do not seem clear. Can one say that ELT in Turkey is in line with the definition of Linguistic Imperialism of Phillipson? Actually for a clear answer, the money transfers or "aid" that comes from abroad for ELT should be detected detailly. Turkey was not a colonial country. And the money part of Phillipson's book seems mostly about former-colonial countries. However, the issues like the native-speaker teachers, monolingual education efforts, using coursebooks or other materials coming from abroad, early start to ELT, having English as a communication languge in universities or the request by employers for the English exam results done by USA or UK rise the suspicious about ELT in Turkey. Does English have an untouchable position in Turkey? There is not such a study, too. These three elements should be detected detailly in terms of Turkish case.

Moreover, the researches show that the course books used by Turkish Ministry of Education are not in line with Turkish traditions or national values (Altunal, 2015; Dinçer, 2019; Dündar 2018). Although there are some international cultural elements in the coursebooks, the culture of target language seems more dominant (Barışkan, 2015). The so-called "touristic perspective" that exists in the books is so clichê and does not cause any realisation of the local culture on the behalf of the students (Dlaska, 2000). The course books written by the printhouses of UK or USA are needed to be evaluated in terms of local culture, too. And some researches show that, Turkish young generation use English words in their daily speeches. Also the effect of Internet, global economy, tourism, American movies and having multi-channels cause English to play bigger role in Turkey (Acar, 2004). Furthermore, not only in some universities but also in some schools medium of instruction is English, the age for learning English getting earlier and the hours for English instruction in schools are increasing.

As a result, about linguistic imperialism in Turkey, at least it can be said that even if Turkey does not carry all the symptoms to be a victim of linguistic imperialism, for Turkish students it is really difficult to learn English by preserving their own culture. More researches should be done about the subject and the negative effects of ELT should be discovered. Unfortunately, there are not enough studies or enough emprical information about negative effects of ELT or linguistic imperialism. This article may rise a curiosity about linguistic imperialism and lead the way for additional researches.

At this point comes the research question of the article: "What kind of a teaching method should be used in order to decrease the negative effects of ELT over the local culture?". In this article, there is a search for a solution within ELT. Some argue that the culture of the target language should be taught during the language teaching. In doing this, it is argued that the students can have a stronger communication with the speakers of the target language. H. Brown equalizes learning of a language with learning of a culture (Brown, 2007). R. Tang thinks that "culture is language" (Tang, 1999). Researhers like J.F. Kuang and D. Atkinson also argue that learning culture of the target language is "a natural process of the language learning" (Kuang, 2007; Atkinson, 1999).

However, Kramsch thinks that the culture of the target language is not a necessary issue to teach to the learners (Kramsch, 1998). McKay also argues that the importance of the local cultural elements are understood by lots of countries and these countries are trying to include the local cultural elements to the course books (McKay, 2003). The theories called Sapir -Whorf warns about the negative effects of the target language over the learners. The theory says that people's frame of mind is determined by their own language (Acar, 2013: 16). Therefore, learning a new frame of mind can distort what exist in a person's mind. If the states are not sensitive enough, their people can end up with an underestimation and alienation of their own language and culture (Ngugi, 1985). Therefore, "cultural content hidden in the language teaching" should be examined carefully (Dlaska, 2000).

This article suggests a solution against that aforementioned problem. The solution is within English. It is a ressistance to English within English. Content-based English Teaching Method (CLIL) can be a way to prevent the one's alienation to his/her own culture. CLIL which re-emerges in 1994 preaches that the foreign languge should be taught around a specific context (Sulistova, 2013: 47; Belles-Calvera, 2018: 110; Yılmaz ve Kaya, 2018: 4). It aims to teach both foreign language and content "at the same time", although "different intensity" (Yalçın, 2016; Yılmaz ve Kaya, 2018:4). By establishing a "meaningful relationship" between

language and content, the language learning is made meaningful for the student. While teaching the foreign language is one of the aims, the language is also used as a tool for teaching the content. In other words, for the CLIL, both language and content are simultaneously given attention and they are both essential in the learning process." (Bonces, 2012: 180). This method has the advantages like "deepening student's knowledge, e.g. of history, geography, arts, or mathematics, producing life-long learners and enhancing motivation and self-confidence" (Klimova, 2012: 575)

Motivating students by using interesting contents is one of the most important goal of the method. (Geneese, 1994; Mohan, 1986). Another purpose of the method is to develop students in cultural and professional fields. While this method can be applied to the language teaching at all levels, it helps to save time in terms of the curriculum (Wolf, 2003; Yılmaz ve Kaya, 2018, 5). In some researches, it is seen that the curiosity and motivation of the students increase and the course becomes more enjoyable for the students with the CLIL (Mehdiyev vd., 2019; Yalçın, 2016:113).

CLIL can be used to teach the local culture to the students while they are learning English. The researches show the positive effects over the students when the English lessons are taught through local cultural elements (Gimatdinova, 2009; Acar, 2013; Prodromou 1992). In Italy, Chech Republic, Colombia, Taiwan, Sweden, Finland, Japan, it is observed that the implementation of CLIL is successful (Capone et.al, 2017; Klimova, 2012; Bonces, 2012; Yang, 2016). Belgium, Luxembourg, and Malta are countries that also apply CLIL throughout all education system (Cinganotto, 2016)

This article tries to show an example study about CLIL that will be using in order to combat the effects of lingusitic imperialism. At the same time, this study tries to supply emprical data to the academic literature about the implementation of CLIL in Turkey. CLIL was implemented with a local cultural content in a Turkish high school. The results will be helping the CLIL methodology and the solutions that are searched to struggle against the linguistic imperialism..

## Method

In order to implement CLIL in a Turkish school, a project was developed. In the project called "Learning English with Art" , it is decided to use Turkish Art History for the content of CLIL. The reason for that is the researches which show that Turkish education system is not successful to teach Turkish Art History to their high school students (Uysal, 2005; Halıçınarlı, 1998; Aslan, 2016). Moreover, art is an action that can help people to come over some psychological problems. There is such a field called Art Theraphy that help people to gain self-confidence (Nguyen, 2015: 29). Art also can help young people to develop their creativity. It is thougt that Turkish Art History as a content of CLIL can teach the students a sense of beauty together with the knowledge Turkish Art History. With the artistic activities carried out in English classes, the students can also have a self realisation and sense of artistic creativity.

The project was implemented in Bakırköy Fine Arts High School in Istanbul for the first semester of 2019-2020 education period . The universe of the research is 9th grade students (60 students). Two groups of 30 students are formed as study groups. The Action Research Method was used for the research. The collected data from open-ended questions and interviews were analysed with Content Analysis Method. Mean Average has been also used as a tool for analysing pre-tests and post-tests.

Firstly, the literature research was carried out about the CLIL and the examples in the world were examined. A search about the Turkish Art History was carried out. The multiple-choice pre-tests about Turkish Art History and English were prepeared . After the preperation stage, the pre-tests were implemented into two study groups. The students were unaware that there would be an exam before the application of the pre-tests and post-tests. Then, in the experiment class, CLIL with Turkish Art History was implemented from September to January. In the control group, the traditional ELT continued. During the implementation of the CLIL, observations were made and observation books were kept by the teacher. The teacher interviewed with the students and took notes. In the last stage, the post-tests were issued and the results were evaluated. In the end, observation book, interview, pre-tests, post-tests and applied lessons were used to evaluate the results.

Turkish Art History as a content of CLIL composed the information about art of Miniature and Tezhip. Moreover, it consisted of the life stories of the artists like Osman Hamdi, İbrahim Çallı, Mihri Müşfik, Şeker Ahmet Paşa, Fikret Mualla, Nuri İyem, Bedri Rahmi Eyüboğlu, Mehmet Siyahkalem, Fausto Zonara, Guillement, Aivazovski, Namık İsmail. The planned lessons aimed to attract the attention of the students. The exercises covered the interesting life stories of the artists. Every student represented an artist throughout the year, which was determined by students at the beginning of the year through drawing. The students put on the names of the artists that they represented on to their collars. The posters about the artists and their works were hanged over the walls of the class. Moreover, the students disguised and presented the artists. They made English speeches to reperesent the artists. Each lesson was assigned to a student artist and reading-listening-writing exersices were carried out about this very artist. All students talked about this artist and asked questions

to the student artist. When they watched the listening videos or read texts about the artists, they had a word to say. Furthermore, competitions and theatre plays were issued about the artists.

With the control group, the coursebook send by the National Education Ministry was used and traditional ELT method was implemented. For two groups, there were 2 hours English lessons weekly. The official curriculum was implemented into both groups. The CLIL program of experiment group was prepared in line with the official curriculum.

## Results

Tablo 1 The Result Table of Pre-tests and Post-tests

| | **LGS Avrg** | **Num of st.** | **English Pretest** | **English Posttest** | **Pre test** | **Post test** |
|---|---|---|---|---|---|---|
| **Experimental Group** | 305 | 30 | 46 | 60 | 26 | 67 |
| **Control Group** | 312 | 30 | 49 | 56 | 17 | 13 |

When evaluating the findings related to the research, some negative factors should be told about the implementation of the project. For example, it should be kept in mind that the LGS (The Entrance Exam to High School) average of the students to whom the project was implemeted is not high. Therefore, it can be said that the motivation of the students for the academic success was not high. According to the survey that was carried out among the students, they came from the families which had low income. Some students decleared that they worked at the weekends. It was a negative effect over the success of the students. There were students transfers coming and going from schools and it was a big handicap to measure the success of the CLIL.

According to the results of the pre-test and post-test,

1. The average of the post-tests about Turkish Art History for experiment group is higher that the control group. The experiment group has almost 40 points higher average compared to the pre-test. It seems that the control group didn't learn anything about Turkish Art History even the average fell.
2. The average of the post-tests about learning English seems similar although the experiment group seems a bit more successful compared to the control group.
3. In experiment group, there were no students who took 100 points neither in English nor in Art History pre-tests. However, in the post-tests there were 5 students who took 100 points in Art-History and 3 students in English post-tests. In control group, there were no students who can take 100 points in Art History pre-tests and post-tests while in English post-test 2 students could take 100 points.
4. "Who is the best artist for you?" was an open-ended question and the answers to the question did not consist of any Turkish artists. In experiment and control groups, the students wrote their best artists as Picasso, Munch, Salvador Dali, Da Vinci, Frida and Van Gogh . However, in the post-tests of Experiment group, the artists like Osman Hamdi, Mihri Müşfik could become the best artists for the students. 12 students in the experiment group changed the idea of the best artist in the favor of Turkish Artists. When they were asked about the reason they said that they hadn't known Turkish artists really and what they had written in the pre-tests were just what they had heard from the media. As they learned about the Turkish artists and their life stories, they started to get a realisation about the art and artists. One student said: "every day the painting of İbrahim Çallı was in front of me. Then, I wondered about him and made a small search. Then, I started to like him".

   The students in the control group didn't change their ideas about the best artist and continued to write the names of Picasso, Munch, Salvador Dali, Da Vinci, Frida and Van Gogh.
5. Only three students in experiment group knew in pre-test that the Tortoise belonged Osman Hamdi. In the post-test, all of the students in experiment group had lerned about Osman Hamdi and his painting.

   In the control group, only 1 student could know about Tortoise and Osman Hamdi.
6. In pre-test, it was asked to the students to complete the surnames of the artists (Namık……./İbrahim ……..). None of the students knew the question in pre-tests. Hovewer in the post-test, all students in experiment group could completed the names of the artists.

   None of the students in the control group could answer the question.

7. None of the students knew about the headpainter of the Ottoman Palace in the pre-tests. However, in experiment group 23 students out of 30 students could remember the names of the headpainters in the post-tests .

None of the students in the control group could answer the question.

8. None of the students knew about Turkish Miniature and even astonishingly 21 out of 30 students in experiment group thought Nedim was a miniature artist. However, it is observed that in the post-tests, 18 students in the experiment group could learn about the Miniature. All the students in the experiment group learned that it was not Nedim but Levni who was the most famous Turkish miniature artist. It should be noted that all the students in experiment goup drew a miniature from Levni into a paper and wrote what it tells us in English. It seems that the project worked.

In control group, none of the students knew anything about the Miniature neither in pre-tests nor in post-tests.

9. None of the students knew about Mehmet Siyahkalem but in the post tests of the experiment group, all of the students could learn who Mehmet Siyahkalem was. It should be noted that a group project was issued about Mehmet Siyahkalem and the groups made presentations in English to the class about him.

However, the control group didn't know anything about Mehmet Siyahkalem even in the post-tests.

10. It is understood that students had difficulty to learn about the periods like Rokoko or Barok. Although there were true answers about it in experiment group, the general average of the experiment group was not high about the questions of art periods. Again, the control group didn't know anything about the periods of art.

## Discussion

If it is looked at the results closely, it can be seen that CLIL became successful in teaching both English and Turkish Art History. Students had an idea about the Turkish Art History that was not told in other lessons in high school. They could have a general knowledge about Turkish painters, their paintings, their life stories, Tezhip, Miniature and famous Miniature artists.

Today, trend in ELT is moving towards authentic subjects in order to motivate the learners. These authentic subjects can be chosen from the local culture so the learners will have a word to speak about. Each country could implement such an ELT curriculum in order to hinder negative effects of ELT.

It is obvious that new materials will be needed in the form of textbooks, workbooks, coursebooks, videos, handouts, posters. There will be a need for the teachers to be educated. Because student competancy will increase as the quality of the input (teacher, coursebook, listening etc) increases. However it is difficult to struggle against British or American "soft power of the ELT industry, for universities, publishers, language schools, 'aid', consultancy etc" (Phillipson, 1997: 82). However, the danger of the "lingusitic imperialism" coming from English over the local culture can be lessened by giving importance to the local culture.

As mentioned above, the coursebooks written in the United States or Great Britain can lead to the students to have an alienation towards their own culture (Andarab, 2014: 90). Therefore, the coursebooks, story books or other materials should be prepared by local educators who know the importance of "linguistic imperialism".

It is also suggested that English is a world wide language and it doesn't stuck with only English or American culture. English is always reshaped and uploaded with new different cultural elements. However, it is accepted in anyway that English culture does exists in the coursebooks or in other teaching materials (Nault, 2006). This existence affects the learners inevitably.

It should be noted that the role of the teachers in the class is very important. Teachers can have the power in order to rise the significance of the local culture in the eyes of the students whether CLIL they are implementing or not. Therefore, the realisation of the negative effects of ELT should be taught to the teachers.

In the course books, there can be some themas like culture of target language, culture of local language, international culture or the mixture of three. In this study, it is seen that it is possible to teach English using only local cultural elements. In other words, it is possible to teach English using the local cultural content. When there is a meaningful content and if this meaningful content insists to exist througout the year, students will learn it as it can be seen in the experiment group. In order to catch the internatonality of the language, for example to the content of Turkish Art History, some famous artists can be added from different countries. Knowledge about Art History of the students will be increasing again but this time adding foreign artists to the content.

The good thing is that CLIL is appropriate for all levels at schools. It is flexible. Not only Art History but all kind of different themas can be used. However, Turkish Art History can be a good example for CLIL content. Art and Art History pose enjoyable activities and again enjoyable subjects for the students. Moreover, the students will be developing an understanding of beauty. The issue of Art Theraphy should not be forgotten, too. Learning one's own Art History is a very importantant cultural improvement and a way to know about the local culture. As a result it can be said that whatever content is chosen, since the aim is to decrease the effects of linguistic imperialism, it is important to select the content from the local cultural elements. .

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