

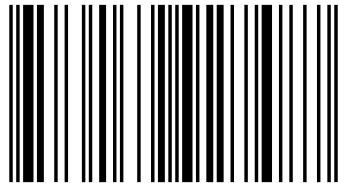
We witness astounding developments in this age of information and communication. Technology has influenced all the aspects of our lives by causing inevitable changes and improvements in every field. Naturally, the world of science has greatly benefited from this change and development. In consequence, the rapid circulation of information and technology in the scientific world has increased the cooperation among scientists. This cooperation highly contributes to researches and studies in the fields of language, history, literature, education, economy, social and cultural life, politics, sports, tourism, and media and communication along with many other areas. Thus, this book contains new horizons in Educational Sciences in parallel with the improvements in the world of science. In this context, educational sciences, classroom education, geography education, physical education, Turkish education, language education, science education, environmental education, psychological guidance and counseling special education, teacher preparation, teaching methods and approaches, voices on education, social issues and researches about art education studies are included.



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New Horizons in Educational Sciences - 1



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New Horizons in Educational Sciences - 1

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NEW HORIZONS IN EDUCATIONAL SCIENCES - I

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Foreword

We witness astounding developments in this age of information and communication. Technology has influenced all the aspects of our lives by causing inevitable changes and improvements in every field. Naturally, the world of science has greatly benefited from this change and development. In consequence, the rapid circulation of information and technology in the scientific world has increased the cooperation among scientists. This cooperation highly contributes to researches and studies in the fields of language, history, literature, education, economy, social and cultural life, politics, sports, tourism, and media and communication along with many other areas.

Thus, this book contains new horizons in **Educational Sciences** in parallel with the improvements in the world of science. In this context, educational sciences, classroom education, geography education, physical education, Turkish education, language education, science education, environmental education, psychological guidance and counseling special education, teacher preparation, teaching methods and approaches, voices on education, social issues and researches about art education studies are included. It took about one year to prepare and print the book. We would like to express our deepest gratitude to our friends who contributed to this process.

Finally, very special thanks go to the authors who contributed to our book with their researches. It is our greatest wish that this book will increase the cooperation among scientists to make the world a better place.

Kind Regards...

Editors

10. 10. 2018

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VIEWS OF GRADUATE AND UNDERGRADUATE STUDENTS OF SCIENCE TEACHING ON TECHNOLOGY USE IN CLASSES¹

Ferda KARA², Merve EKER³, Semra BENZER^{*4}

1. INTRODUCTION

Today, technology has been developing rapidly. Especially in the last 20 years, the races to produce technology among developed countries and the madness of consumption have increased. Turkey, as a major developing country is not yet at the desired level and needs to change this situation. For this purpose, it is imperative that our children, whom we rely on for our future, should receive a good education. In this regard, the task of science teachers is very undeniable.

In the science curriculum updated in 2017, it is aimed to "educate students as science literate individuals". At the same time, it is one of the expectations of the program to educate individuals with an understanding of science, engineering, technology, society and environment and having psychomotor skills (MEB, 2017).

In order for pupils to have psychomotor skills related to technology, teachers who will train them first must have the aforementioned skills. For this reason, Gazi University Faculty of Education provides students with the ability to integrate technology into the

¹ This work was presented at the International Congress on Science and Education (UBEK ICSE 2018) and its abstract was published in the conference abstract book.

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Technological Pedagogical Content Knowledge (TPACK) and Science Course for students studying Science Teaching.

The concept of TPACK has been formed by adding knowledge of technology to the concept of Pedagogical Content Knowledge (PCK) which Shulman put forward in 1986 (Demir & Bozkurt, 2011). The TPACK concept emphasizes that, in addition to teaching a teacher's field, teachers also need to integrate technology into their courses.

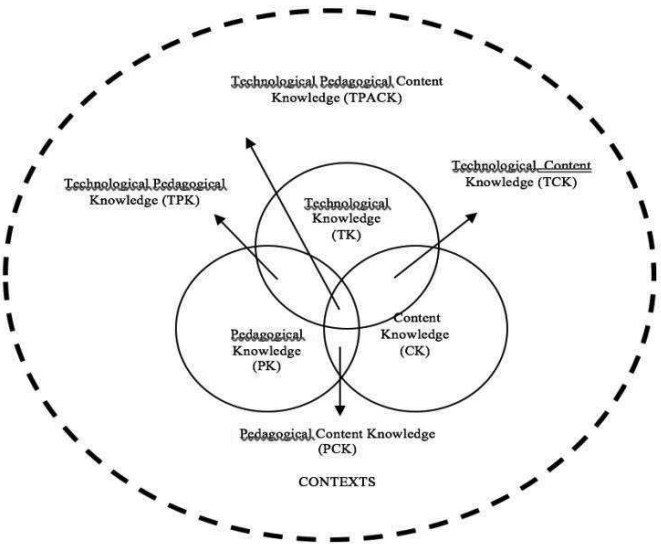


Figure 1. TPACK and types of Knowledge Intertwined by TPACK (Koehler et al., 2009)

It is aimed to determine the use of technology in some classes which are given to undergraduate students in Science Teaching Department at Gazi Education Faculty.

In this study, knowledge about the programs and practices taught in these courses by the graduates of Science Teachers and 1st, 2nd, 3rd and 4th graders were also assessed. These programs include; 1) Microsoft Office Programs 2) Plockers 3) Kahoot 4) Socrative 5) Toondoo 6) Wordpress 7) Prezi 8) Animoto 9) Edmodo 10) Beyaz Pano 11) Classdojo 12) Powtoon 13) Scratch, 14) Tinkercad, 15)

Arduinio, 16) Inspiration, 17) Movie Maker and 18) Eclipse Crossword programs. Briefly speaking of these programs:

Kahoot is one of the applications that can visualize a content or an event. With this application, you can create a small test or a questionnaire online. Your students can mark the correct answers to questions with their mobile devices when the questions you prepare appear on the screen one by one (Yapıcı & Karakoyun, 2017).

Two of the applications that offer digital evaluation in educational environments in effective ways are Socrative and Plickers applications (Yılmaz, 2017). When using the Plickers application from these applications, you do not need to connect to the internet as With Prezi you can your students do in the Kahoot application. The teacher distributes the Plickers cards to the students and the students who read the question ask the students to raise the cards according to the answer they want to give (Yılmaz, 2017).

Scratch is one of the programming languages for users who are new to programming, easy to learn and to hold the visual foreground (Çatlak et al., 2015). Most of the classes which are hard to learn could be learned thanks to this programming language (Çatlak et al., 2015).

Prezi is a presentation program that serves users on the internet. Presentations can be prepared here on a very wide panel. It is a paid program and a trial version exists on the Internet. At the same time, Prezi offers free services for accounts opened from e-mail addresses with .edu extensions. With Prezi, However, for this you need you can see the whole of the presentation and use the features of getting closer to different parts of the presentation (Özsekici & İnce, 2014). With the Tinkercad program you can design 3D (three-dimensional) objects. It is free and easy to use. Moreover, it is one step ahead of other programs with features that enable access from mobile devices (Taştı et al., 2015).

You can program with the Arduinio system. You can process analogue and digital signals. You can design robots that can interact with its environment. By adding features such as sound, motion, and light to the project you design, you can connect with the outside world in this way. However, for this, you need to download the program on the internet as well as buying Arduinio set (Çavuş et al., 2017).

When the field is examined, it is seen that studies conducted with TPACK started in 2010 in our country and conducted mostly with teacher candidates (Baran & Ergün, 2015). A study on the topic was carried out by Balçın & Ergün (2017). In the research, it was tried to determine the thoughts of the science teacher candidates about teacher competencies and the technological tools that should be used in science teaching, why these tools should be used and the problems that may be encountered during the use of the tools as well as the TPACK perceptions.

In 2016, a quantitative analysis study was conducted by Murat and Erten (2016) to determine the perception levels of the science teacher candidates for techno-pedagogical education self-efficacy. In another study conducted with the students of science teacher education in the first, second, third, and fourth grades by Karaa et al. (2015), it was aimed to determine the opinions of science teacher's candidates about technology and how these opinions changed according to class level and gender. The sub-dimensions (technological knowledge, pedagogical knowledge, field knowledge, technological pedagogical knowledge, technological knowledge and pedagogical knowledge) included in the TPACK Scale on a sample of 3rd and 4th grade students and their relationship with the intersection TPACK were investigated by Akarsu and Güven (2014). Another study in this area was carried out by Meriç (2014) with the aim of determining TPACK self-confidence levels of science and technology teacher candidates. In 2012, a study conducted regarding science, mathematics and social science teacher candidates examined their qualifications for using technology in education in terms of technological pedagogical content knowledge (Pamuk et al., 2012).

Bilici & Baran (2015) have studied the effects of education practices comprehensively and aimed at acquiring TPACK given to 24 science teachers on the self-efficacy levels for TPACK.

Purpose of The Study

The aim of this study is to determine the opinions of 1st, 2nd, 3rd, 4th and grade students from Gazi University Science Education Department about the use of technology in classes and which of the technological applications they can use in classes.

It is thought that the results of this work will be very helpful to academicians in Science Teaching Departments.

Problem Situations

What are the opinions of the students studying in the Science Teaching Department at Gazi University and the teachers who graduated from this department about the using technology in education?

Sub Problems

1. Are there any changes in the opinions about the use of technology in classes in terms of class levels?
2. What do the teacher candidates think about what problems they will face when they use technology?
3. Are there any changes in the opinions about the use of technology in classes in terms of which class they attend?

2. METHOD

In the method section, there are subdivisions consisting of the research model, study group, data collection tools and analysis of the data.

Research Model

Qualitative analysis method was used in this study. Qualitative research is necessary to answer questions that are difficult to express with traditional research methods (Büyüköztürk et al., 2014). In the evaluation of qualitative data, the descriptive analysis method was used.

Working Group

The research was conducted in the fall semester of the 2017 - 2018 academic year, on the first, second, third, and fourth grade students in Science Teaching Department at Gazi University Faculty of Education in Ankara and teachers who graduated from the same department in 2016 and 2017. Fifteen participants from each class participated in the study and it was started with a total of 75 people. Then, 3 participants from each participant level were eliminated due to inconsistent responses and the study was completed with a total of 60 participants, 12 from each participant group. Among the candidates participating in the study, 50 candidates are girls and 10 candidates are boys.

Table 1. Demographic Characteristics of Participants

Class	Features	N	%
1 th	Female	10	16.68
	Male	2	03.32
2 nd	Female	10	16.68
	Male	2	03.32
3 rd	Female	10	16.68
	Male	2	03.32
4 th	Female	10	16.68
	Male	2	03.32
Graduate	Female	10	16.68
	Male	2	03.32
Total		60	100

As can be seen, participants do not have a gender-related distribution Table 1. While 83.4% of the participants are females, 16.6% are males. The codes given to participants by researchers were shown in Table 2.

Data Collection Tools

The qualitative research design was used in this study, which was carried out with the aim of identifying the opinions of Gazi University Science teacher candidates and their graduates about the use of technology and their Technological Pedagogical Content Knowledge.

As a means of data collection in the research, an interview form consisting of 9 questions developed by the researchers and given the final form by taking expert opinion was used. The interview form was submitted via Google Forms to the graduate participants. Answering all of the questions is compulsory.

Table 2. Codes of Participants

1 th Class	2 nd Class	3 rd Class	4 th Class	Graduate
P01	P13	P25	P37	P49
P02	P14	P26	P38	P50
P03	P15	P27	P39	P51
P04	P16	P28	P40	P52
P05	P17	P29	P41	P53
P06	P18	P30	P42	P54
P07	P19	P31	P43	P55
P08	P20	P32	P44	P56
P09	P21	P33	P45	P57
P10	P22	P34	P46	P58
P11	P23	P35	P47	P59
P12	P24	P36	P48	P60

Firstly, participants were given 18 technological applications and program tables that they could use in Science courses in the scale and it was tried to determine the programs that they had heard and had known how to use before. Later in the scale, open-ended questions whose aim was to identify the participants' views on the TPACK and their views on technology integration into Science were given. Descriptive analysis method was used in the evaluation of the qualitative data obtained in the research.

Analysis of Data

Descriptive analysis method was used in the evaluation of the data obtained from the participants. The main purpose of the descriptive analysis method is to present the findings to the reader as summarized and interpreted. However, the researcher can often cite the participants' answers without ever changing them (Yıldırım & Şimşek, 2003).

3. RESULTS

In the research, 48 science teacher candidates and 12 science graduates were asked about the TPACK applications. Their answers given to the questions were divided by the themes and sub-themes, and sometimes directly by quoting them. Opinions that are given directly in the citations are opinions that the majority thinks. The answers given to the 9 open ended questions asked below were evaluated one by one and were described according to the classes.

The distribution of participants by gender was shown in Table 3. Age and grade average also vary in the range given in the table. Ages show a regular distribution at given intervals. Grade averages are less at the beginning and end of the intervals, and more at medium values. First, 18 programs were given to the participants and then the participants pointed out that they had already heard and learned how to use these programs.

Table 3. Information Regarding the Participants

	Gender	Age	Grade Average
1 st Class	10 Females 2 Males	18-19	No Average
2 nd Class	10 Females 2 Males	19-20	1.90-3.29
3 rd Class	10 Females 2 Males	20-22	2.00-3.51
4 th Class	10 Females 2 Males	21-23	2.68-3.60
Graduate	10 Females 2 Males	22-23	2.50-3.32

As can be seen in the Table 4, Microsoft Office programs (MS Office) have been heard and understood by all 1st class participants. 1st class participants have never heard about Prezi, Classdojo, Powtoon, Scratch, Arduino, Inspiration and Eclipse Crossword programs.

Table 4. The Situation of the 1st Grade Students about the Technological Programs

Technological Programs	Participants who heard before	Participants who know how to use them
MS Office	All	All
Plickers	P9	-
Kahoot	P2 P3 P4 P8 P9 P11 P12	P3 P4 P11 P12
Socrative	P3 P2 P1	-
Toondoo	P12	-
Wordpress	P3 P8 P10 P11	P11
Prezi	-	-
Animoto	P7 P10 P12	
Edmodo	P10	
Beyaz Pano	P5 P10	
Classdojo	-	-
Powtoon	-	-
Scratch	-	-
Tinkercad	P12	
Arduino	-	-
Inspiration	-	-
Movie Maker	P2 P5 P6 P7 P8 P12	P12
Eclipse Crossword	-	-

Microsoft Office programs have been known by all participants (Table 5). Wordpress and Beyaz Pano programs have been heard by one participant. The Movie Maker has been used by two participants while the Scratch has only been used by the P18.

Table 5. The Situation of the 2nd Grade Students About the Technological Programs

Technological Programs	Participants who heard before	Participants who know how to use them
MS Office	All	All
Plickers	P22	P22
Kahoot	P18	P18
Socrative	-	-
Toondoo	-	-
Wordpress	P14	-
Prezi	-	-
Animoto	-	-
Edmodo	-	-
Beyaz Pano	P14	-
Classdojo	-	-

Powtoon	-	-
Scratch	P18	P18
Tinkercad	-	-
Ardunio	-	-
Inspiration	-	-
Movie Maker	P13 P18 P16 P23	P15 P18
Eclipse Crossword	-	-

As for Table 6, the Microsoft Office programs, Plickers and Kahoot programs have already been heard and known by all 3rd class participants. Movie Maker Socrative, Toondoo, Animoto, Classdojo, Powtoon, Inspiration, Eclipse Crossword, Wordpress, Ardunio programs have been heard and known by the majority. The Prezi program has been heard by all participants, but it is known how to be used by 9 participants.

Scratch program has been heard by 5 participants, but no participants know how to use it. The Tinkercad program is the second least known program to be used after the Scratch program. It has been heard by 6 participants and it is known how to be used by 3 participants.

Table 6. The Situation of the 3th Grade Students About the Technological Programs

Technological Programs	Participants who heard before	Participants who know how to use them
MS Office	All	All
Plickers	All	All
Kahoot	All	All
Socrative	P25 P27 P29 P30 P31 P32 P33 P35 P36	All
Toondoo	P25 P27 P29 P30 P31 P32 P33 P35 P36	All
Wordpress	P25 P27 P29 P30 P31 P32 P33 P34 P35 P36	P25 P27 P30 P31 P32 P33 P34 P35 P36
Prezi	All	P25 P27 P30 P31 P32 P33 P34 P35 P36
Animoto	P25 P27 P29 P30 P31 P32 P33 P35 P36	P25 P27 P30 P31 P32 P33 P35 P36
Edmodo	P25 P27 P29 P30 P31 P32 P33 P35 P36	P25 P27 P29 P30 P31 P32 P33 P35 P36
Beyaz Pano	P25 P27 P29 P30 P31 P33 P35 P36	P27 P29 P30 P31 P33 P35 P36

Classdojo	P25 P27 P29 P30 P31 P32 P33 P35 P36	P25 P27 P30 P31 P33 P35 P36
Powtoon	P25 P27 P29 P30 P31 P32 P33 P35 P36	P25 P27 P30 P31 P32 P33 P35 P36
Scratch	P25 P27 P30 P31 P35	
Tinkercad	P25 P27 P30 P31 P35 P36	P36 P31 P27
Ardunio	P25 P26 P27 P29 P30 P31 P32 P33 P35 P36	P26 P27 P30 P31 P32 P33 P35 P36
Inspiration	P25 P27 P29 P30 P31 P32 P33 P35 P36	P25 P27 P30 P31 P32 P33 P35 P36
Movie Maker	P25 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36	P25 P27 P30 P31 P32 P33 P34 P35 P36
Eclipse Crossword	P25 P27 P29 P30 P31 P32 P33 P35 P36	P25 P27 P30 P31 P32 P33 P35 P36

Table 7. The Situation of the 4th Grade Students About the Technological Programs

Technological Programs	Participants who heard before	Participants who knows how to use them
MS Office	All	All
Plickers	All	P37 P38 P39 P40 P41 P44 P46 P47 P48
Kahoot	All	P37 P38 P39 P40 P41 P44 P45 P46 P47 P48
Socrative	All	P37 P38 P39 P40 P41 P43 P44 P45 P46 P47 P48
Toondoo	P37 P40 P41 P42 P43 P44 P45 P46 P47 P48	P37 P45 P46 P47 P48
Wordpress	P37 P40 P41 P43 P44 P45 P46 P47 P48	P45 P46 P48
Prezi	P37 P38 P40 P41 P44 P45 P46 P47 P48	P37 P41 P45 P46 P47
Animoto	P37 P41 P44 P45 P46 P47	P37 P41 P45 P46 P47
Edmodo	P37 P40 P41 P44 P45 P46 P47	P37 P45 P46 P47
Beyaz Pano	P37 P41 P42 P44 P45 P46 P47	P37 P45 P46
Classdojo	P37 P41 P44 P45 P46 P47	P37 P45 P46
Powtoon	P37 P41 P44 P45 P46 P47 P48	P37 P45 P46 P48
Scratch	P37 P41 P44 P45 P46 P47	-
Tinkercad	P37 P41 P44 P45 P46 P47	P47 P46

Ardunio	P37 P41 P44 P45 P46 P47	P47 P46
Inspiration	P37 P38 P39 P40 P41 P44 P45 P46 P47 P48	P48 P47 P46 P45 P44 P41 P40 P39 P38 P37
Movie Maker	P37 P39 P40 P41 P43 P44 P45 P46 P47 P48	P37 P39 P40 P44 P45 P46 P47 P48
Eclipse Crosword	P37 P38 P39 P40 P41 P43 P44 P45 P46 P47 P48	All

4th grade participants express that they know how to use Microsoft Office Programs (Table 7). While there are only two participants who do not know how to use Kahoot program (P43 ve P42), it is only P42 who do not know how to use Socrative program. Although most of the 4th grade participants heard about Scratch program in advance, none of them knows how to use it (Table 7). Participants state that they know how to use Inspiration, Movie Maker, Eclipse Crosword applications.

Table 8. The Situation of Graduated Participants About the Technological Programs

Technological Programs	Participants who heard before	Participants who knows how to use them
MS Office	P49 P50 P51 P52 P53 P54 P55 P57 P58 P59 P60	P49 P50 P51 P52 P53 P54 P55 P57 P58 P59 P60
Plickers	P49 P50 P51 P52 P53 P54 P55 P57 P58	P49 P51 P54 P55 P58
Kahoot	P49 P50 P51 P53 P54 P55 P56 P57 P58 P59 P60	All
Socrative	P49 P50 P51 P52 P54 P55 P56 P57 P58 P59 P60	P49 P50 P51 P52 P54 P55 P56 P58 P60
Toondoo	P49 P50 P51 P54 P55 P57 P58 P59 P60	P49 P50 P51 P54 P55 P58 P60
Wordpress	P49 P50 P51 P52 P53 P55 P59 P60	P49 P50 P51 P52 P53 P55 P59
Prezi	P49 P50 P51 P53 P54 P55 P57 P58 P59 P60	P49 P51 P53 P54 P55 P58 P59 P60
Animoto	P49 P50 P51 P54 P55 P57 P58 P59 P60	P49 P50 P54 P55 P57 P58 P59 P60
Edmodo	P49 P50 P51 P54 P59 P60	P49 P50 P54 P60
Beyaz Pano	P49 P50 P51 P52 P55 P58 P59	P49 P50 P58
Classdojo	P49 P50 P51 P52 P54 P60	P49 P50 P54 P60
Powtoon	P49 P50 P51 P52 P55 P58 P60	P49 P50 P55 P58 P60
Scratch	P49 P50 P51 P52 P55 P56 P60	P49 P50 P52 P55 P56 P60

Tinkercad	P49 P50 P51 P52 P54 P55 P60	P49 P50 P51 P52 P55 P60
Arduinio	P49 P50 P51 P52 P55 P60	All
Inspiration	P49 P50 P51 P54 P55 P57 P58	P49 P50 P54 P55 P58
Movie Maker	All	P49 P50 P51 P52 P53 P54 P55 P56 P58P59
Eclipse Crosword	P49 P50 P51 P52 P55 P57 P58 P59	P49 P50 P55 P58 P59

All graduate participants stated that they heard the Movie Maker program, but 2 graduate participants do not know how to use it (Table 8). There is one participant who has not heard Microsoft Office programs. The remaining 11 participants indicate that they know how to use these programs. Likewise, while only one participant has not heard about the Kahoot program, other 11 participants can use this program. Moreover, there are 3 participants who know how to use Beyaz Pano program and so it is the least known program.

Table 9. The Place Where the Participants Report They Learned to Use the Applications and Programs

Lessons	1 st Class	2 nd Class	3 rd Class	4 th Class	Graduates	Total (&)
Introduction to Educational Sciences	3	-	-	-	-	1.8
Computer (Secondary)	6	-	-	-	-	3.6
Information Technologies in Education	-	12	-	4	3	11.4
Material Design and Teaching Technologies	-	-	3	5	-	4.8
Optional Physics	-	-	7	3	-	6
Optional Chemistry	-	-	1	-	-	0.6
Special Topics in Physics	-	-	1	4	-	3
Special Teaching Methods I and II	-	-	-	4	4	4.8
quantification and evaluation	-	-	-	1	1	1.2
Technology and Project Design	-	-	-	-	6	3.6

Another notable point in this table is that P56 has not heard about most applications and P49 knows all applications. The two questions asked to the participants are the questions to determine where they learned to use the programs and applications and what courses they took for TPACK. The answers were given in the table below.

As far as the data presented in Table 9, nine participants who participated in the research stated that they took the course of Information Technologies in Education to acquire technology knowledge. In the course of Education Technologies, students learn Microsoft Office (Word, Excel, PowerPoint Publisher, Movie Maker) programs. It is also understood that the topic which students learn poorly about technological programs is the optional chemistry course.

When Table 4, Table 5, Table 6, Table 7 and Table 8 are examined, it is seen that the participant groups that dominate the technological applications and programs are the 4th class and grades groups. Participants in the 4th class stated that they took Material Design and Teaching Technology courses comprehensively while graduates stated that they took Technology and Project Design courses fruitfully. When the course achievements of the university are examined, it is seen that Technology and Project Design and Special Teaching Methods I and II courses are more beneficial than TPACK. Apart from the classes given in Table 9, 2 of 1st class participants and 1 graduate participant stated that they had learned some of their programs out of their own curiosity. In addition, 1 participant from 4th class stated that he attended an educational summit and he learned the programs there. 1 participant from 1st grade, 1 participant from 2nd grade and 1 participant from graduation stated that they took a computer programming course beforehand.

Some of the participants' opinions are as follows:

"I took Microsoft Office Programs and Movie Maker Program in the course of Education Technologies. In Technology and Project Design course; I took Tinkercad, Arduino, Scratch programs. I took the other programs in Special Teaching Methods II course. We performed lab classes to implement what we learned." (P49).

Only 4th grade participants stated that they did not take any courses for TPACK (P37). Other participants P42, P43 and P47 said that they did not practice. 8 of the first-class participants emphasized that they did not take courses for TPACK and did not learn these programs. Participants tried to determine what technological applications and programs should be used in science course and how they would pay attention during technology integration.

Most of the first and second grade participants are also unaware of what to be focused on since they did not know the programs. Participants who know how to use the Kahoot program emphasized that this program should be used but attention should be paid to internet troubles. Several participants stated that Power Point and Excel program must be used among Microsoft Office programs. The participants attending 3rd grade stated that Kahoot, Plikers, Powtoon, Prezi, Socrative applications should be used. This participant group emphasized that the course plan should be done according to the age group in general and the number of students should be considered. The participants in the 4th grade participating in the research said that the programs, especially the Kahoot and Socrative programs, should be used. The points to be considered according to the 4th grade participants are in general that the time should be used effectively, the subject and the application must be judged, and attention should be paid not to make a misconception. In addition, 12 graduate participants stated that the programs should be used. Participants also stated that a separate application should be used for each subject.

Some of the participants' opinions on the subject are as follows:

"I do not support the use of computers in science classes." (P13)

"It is necessary to prevent the course to be boring while technological programs are used." (P22)

"Particularly, I think that Prezi will be more attractive than Microsoft Office programs in slide presentations. I think Kahert, Socrative, Plickers should be used for the quizzes that can be enjoyed by the students who can practice easily. Besides, Inspretion, Eclipse Crossword, Toondoo can be used." (P43)

"I think that very nice materials can be designed at Tinkercad. However, I think that other class programs have taken away the student and transformed into a more virtual one, so they are moving away from motor skills and sociality." (P51)

"I think all of them should be used. Because the facilitation of lectures has many benefits such as 3-D thinking and time-saving. Not every program is suitable for every subject. We must pay attention to choose which program to use and by this way we can get more efficiency." (P55)

In this research, the researchers tried to get opinions about the problems and limitations that could be encountered during the technology integration of the participants into the science courses.

Six participants from the 1st class and 2 participants from the 3rd grade answered as "I do not think I will encounter any problems or limitations." The problems and limitations that could be confronted by the 3 participants from the first grade were listed as inadequate projection equipment, inadequate sound system, inadequate teacher information and inadequate equipment. Third class participants except for the 2 participants ranked their problems and limitations as internet deficiency, material inadequacy, inadequacy of village schools, time constraints and student prejudices.

Participants in the survey who are attending the second grade have indicated that lessons cannot be taught in schools where the technology is inadequate and internet access is not possible. According to 4th grade participants, the greatest limitation is that Kahoot and Socrative applications require students to have an Android phone with internet connection. While these two applications are being used, they are of the opinion that the lack of Android phone with internet connection in every student will not provide an equal opportunity in education. Besides, they think that students' having a phone can cause discipline problems in the class. For the use of Kahoot and Socrative applications, students have to have smartphones with internet connection. If students do not have this possibility, it is better to use the Plickers application.

Graduated participants in the survey generally state that technological opportunities are limited in the schools and see this as a problem. In addition, there are participants who are convinced that these programs can be removed from the subject when used.

Some participants' opinions on this issue:

"I would rather give more information than deal with these programs because it would be a lot of time." (P9)

"I worry that students will not take classes seriously." (P14)

"The use of technology in lessons will prevent teachers from developing themselves. Because the information is easily accessible." (P20)

"Some of these applications require smartphones. Not everybody can have a cell phone with internet connection." (P28)

"I need a 'strict education' for every program" (P42).

"Technological tools may not be enough for every class. Our country is not ready for this yet." (P48)

"More than one teacher should guide a lesson that will be taught using these practices." (P52)

Participants were also asked about the solutions to the problems and limitations that they might encounter during the technology integration into the science course. Many of the 1st grade participants in the survey responded by saying, "There is no idea" because they do not know how to use the programs. Other participants think that an expert help can be used when there is a general problem with the program. Programs can be taught by training teachers and students. The deterioration of the materials can be corrected by having a technician on the school.

Second grade participants stated that a teacher who wants to use technology in their classes should know all the programs and cover inadequacies. In addition, third grade participants think that they will be able to meet the prejudiced students by providing pre-training to them by popularizing the equipment to all schools, by having the labs run, by adjusting the lesson plans properly and by giving importance to classroom management.

A fourth-grade participant stated that the teachers have to be prepared before classes. Graduated participants generally suggested increasing application of the classes for these programs. They said regular maintenance of these tools was necessary to prevent problems that might arise during the course.

"The assistance of the education foundations can be called for to the issue of insufficient technological opportunities." (P22)

"Other programs may be used instead of programs that require Internet." (P26)

"Equal opportunities should be provided for schools at all different socio-economic levels." (P47)

"Classes should be given to increase the number of technology literate individuals." (P48)

In addition, participants also indicated that the reasons whether the programs given in the table are suitable for the science class.

P6, P7 and P12 from the first-grade participants stated that the programs are not suitable for science classes. Moreover, these three participants do not know most of the technological applications. Several participants emphasized that they do not know about the programs and the remaining participants said that it is appropriate. These participants are of the opinion that the programs are both visual and auditory and help them learn more easily and permanently.

Four participants in second grade stated that they cannot give a definite answer because they do not know about the programs. P13 said that he does not know the programs and does not think that they are appropriate. Other than these 5 participants believed that Microsoft Office programs should be used in science classes. Although two participants do not know about the other programs, they said that the technology attracts new generation students, so it should be used.

Third-year participants think that the aforementioned applications are appropriate for science classes. In addition, they stated that thanks to these programs and practices, science classes become interesting for students, they can make the classes fun, also useful for measurement and evaluation, and by providing permanent learning they can save time.

Likewise, all fourth-grade students are of the opinion that technological applications are appropriate for science. They think that learning will become permanent when these applications are used.

Graduated participants agree that the programs are appropriate. P55 is of the opinion that "Even if an application does not demonstrate competence for all subjects, there is an application where we support each topic if all are known" and the views of these two participants also represent the views of the other participants.

Some participants' opinions are as follows:

"I think that science courses should be carried out mainly in a laboratory. Therefore, I think that technological applications are not appropriate for science courses. "(P7).

"Teachers are required to spend time on teaching the appropriate but time-consuming programs. I do not think that teachers spend much time on this. "(P37).

"It is suitable. Exams are prepared in most programs. The circuit is installed. I can prepare my exams with these applications." (P46).

"Whether or not it is appropriate depends on how the teacher uses the technology in his/her classes." (P53)

"We science teachers are obviously having difficulty in transferring abstract concepts or abstract events of science to our students. At this point, undoubtedly these programs will be beneficial." (P54).

Participants were also asked about the advantages of TPACK practices. In this regard, all participants generally stated that TPACK applications catch the attention of students. They are also of the opinion that they make the course fun, increase the understanding and permanence, concretize the abstract subjects, provide to try and prove the information.

Three participants from the second-grade students stated that students use technology actively and that teachers should integrate technology into their courses. Participants in the third class thought that it will make learning permanent and easier, also will prevent loss of time.

Fourth grade participants indicated that the permanence of learning will increase because the learners who are taught using TPACK applications will be addressed to more than one sensory organ. Graduated participants suggested that these programs concretize and visualize the course being taught. Two graduated participants emphasized that the dream world of the students will also expand.

"Technology is now one of the most attention-grabbing elements of young people. Therefore, if the lesson becomes technology-intensive, it may become more attractive." (P9).

"I think that these programs can be used in measurement and evaluation." (P30).

"While these programs are in use, the student can be given quick feedback and correction." (P31).

"Technological practices will embody the abstract issues and enable the student to understand the issues." (P39).

"Experiments which cannot be done in class by preparing simulation and animation, can be done in a virtual environment." (P45).

"The rate of cheating will decrease in a test using these programs." (P46).

"I think that technological applications do not do any good." (P48).

"I think that the concept cartoons prepared using technological programs (Toondoo or Powtoon) prevent the misconception of students." (P50).

Participants also talked about the possible disadvantages of technological applications. Two participants from the first grade said that the applications do not have disadvantages. Apart from these participants, in general, they argued that it is a disadvantage that students did not hear about these applications before. Participants in the second grade said that in general students will start to spend more time at the computer and this will lead to visual disturbances and skeletal system disorders in the students. They added that students will not be able to spend much time with other individuals in their environment and this situation will prevent socialization. Two participants stated that they cause time loss in classes.

While five students from third grade participants said that applications do not have disadvantages, other students stated that the necessary technological materials cannot be found in every school because of the limited possibilities.

Some programs requiring internet access are seen as a disadvantage by fourth grade participants in general. They thought that students can spend more time on harmful sites on the internet on the pretext of homework. Besides, they also stated that there may be students who are not interested in such activities and that the attention of these students can be dispersed.

In this regard, the graduated participants expressed different opinions. In the previous question P59, for example, indicated that these programs save time, while participants with the code P55, P52 and P49 were of the view that these programs lead to a waste of time. P51 thought that these programs can cause social and physiological harm to children. P53 stated that the end result of using the technological programs in classes is that the children will get away from the real world and get caught up in the virtual world. On the other hand, P50 said that these programs cannot have any disadvantage when used for educational purposes.

"Technological applications can positively influence learning, but facilitation of everything can lead to student laziness." (P4).

"Physical discomfort can occur in a student sitting in front of a computer." (P7).

"In case of overuse of these programs, the efficiency of the lessons will decrease." (P24).

"It is a disadvantage that the language of some programs is English." (P30).

"I think that far-away children from technology cannot understand lessons and will fall behind." (P32).

"Students may cheat when practising individually." (P43).

4. CONCLUSION AND DISCUSSION

In this study which gathered the views of science and technology teachers who study at Gazi University about the integration of technology to the subjects of TPACK and Science, most participants think that technology should be integrated into science courses. Participants generally stated that before the use of technological programs, the instructor must have knowledge of technology integration. They said that if the class is well planned by the teacher, the situations that they think are disadvantageous will be eliminated. In a similar study on this subject, firstly it was determined that teachers are required to be literate in technology and use the information they have in the class (Balçın & Ergün, 2017).

As a result of the study, it was determined that 1st and 2nd grade participants did not have TPACK. In addition, there are students who are prejudiced against technology in these participant groups. This is why TPACK is not yet fully understood and technology integration courses have not been completed yet. This is because these students have not taken the classes yet that are required to learn TPACK and the technology integration of candidate Science Teachers course mentioned above on the internet sites of Gazi University (Course List, 2018) and YÖK (2018) (Council of Higher Education, Turkey). In the 3rd grade, there are participants who know the classes and some technological applications we are talking about. These participants also pointed out that they are applying technological applications in classes, and that technology integration is important for the Science of Science class, and those technological applications, especially Kahoot, Plickers and Socrative, should be used in classes. In a study examining the effect of Kahoot on the motivation of students, it was

determined that the Kahoot application increased the motivation of the students towards the class. On the other hand, some teacher candidates also stated that taking place in the lower steps in the application result may negatively affect the students (Yapıcı & Karakoyun, 2017). The 4th grade participants took technology integration and classes that give TPACK. They know most of the technological applications given to them and agree that the practices should be used in classes. The 4th grade participants also indicated that Kahoot should be used. Graduates are aware of the majority of programs. There is information on technology integration and TPACK. Thanks to this information, they gave more realistic answers.

In general, lectures on technology integration in Science Teaching Department at Gazi University, Special Teaching Methods, Material Development, Elective Physics, Special Topics in Physics, Technology and Project Design, Teaching Information Technologies, Measurement Evaluation, Introduction to Educational Sciences are the courses. The students stated that their technological practices are mostly learned in Special Teaching Methods. This course is given as Special Teaching Methods I and II.

Special teaching methods are given in the second semester of the 3rd grade and first semester of the 4th grade. Special teaching methods I course is designed to teach science to students, basic aims of science teaching, science literacy, concept teaching (concept misconceptions, concept maps, conceptual cartoons, V diagrams, etc.), methods and materials used in science teaching, (theme, achievements, learning situations, evaluation techniques, etc.) of the Science and Technology Teaching Program applied in classrooms, and examining and evaluating examples of the course, teacher and student workbook. The Special Teaching Methods II course covers the micro-teaching practices (preparing the lesson plans, preparing the lessons, organizing the class, teaching the lessons and teaching the lessons according to their teaching skills and knowledge) in the subjects to be selected from the Science and Technology Teaching Program applied in the 3rd and 4th grades.

Additionally, the Technology and Project Design course, which was elected in the spring semester of the 4th grade, was also taken by 6 graduate participants. The aim of this course is to teach the

development of technology in history and its importance for humanity, its place and importance in everyday life. In addition to this, it is to teach the interrelationships of technology with science, individual, society and environment, the sources of information used in making technological products (natural inspiration, pure mathematics, imagination, cultural knowledge, scientific knowledge, etc.), Technological work and technological design cycle. During this course, students learn the concepts of inventions and inventor. They learn the elements of invention, patent concept and historical development, quality concept in products and quality elements. Other acquisitions, quality assurance systems and certification, location and importance of technology education in primary education, short-term design and technological product development activities that can be done at primary level, technology related professions. As can be seen, the achievements of this course are very important for TPACK (Course List, 2017). This elective course is, in fact, a very important for educators and it is clear that teacher candidates who are compulsory in all universities will contribute more to the development of TPACK.

Participants indicated that they are implementing the technology integration and lessons that teach TPACK, but it seems that the applications are inadequate because some of the participants stated that they forget how to use technological applications after the course. In this context, it will be more efficient for the students to increase the number of these courses and the duration of the courses. In addition, for the courses to be more efficient, they need to be well planned. The number of students and the number of teaching staff to take the course must be planned well. Students can receive the same courses from different faculty members. Therefore, the instructors need to collaborate on the collaborative content in the processing of classes.

When they learn technological applications, participants do not think they will encounter a problem that arises from them during practice in their classes. Murat and Erten (2016) found that third and fourth grade prospective teachers in the science profession have a higher level of technical pedagogical competence in the field of technological pedagogical education. However, they are not able to

use these applications in classrooms where there are inadequate tools and an excessive number of students.

According to the study, students think that they have Technological Pedagogical Area Knowledge when they know how to use technological applications. However, to have TPACK, it is also necessary to know how to integrate technological applications into the course. TPACK is the knowledge of choosing the appropriate pedagogical approach and technological application while teaching a topic and making meaningful technology integration by considering the difficulties that students may encounter when the course is being processed (Canbazoglu & Baran, 2015). In this context, it appears that the participants did not have a sense of exactly what the Technological Pedagogical Domain Knowledge means.

When the grades of the students are examined, the grading averages are not clear as the first graders are at the beginning of their education. When the average of the 2nd, 3rd and 4th class participants and the graduate participants was examined, it is concluded that the relationship between the grade average and the TPACK information and the views on technology integration into the classes cannot be established.

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ANNEX-1 CONSTRUCTED INTERVIEW FORM

Hello Dearest Science Teacher Candidates

This form is designed to determine your views on the use of (TPACK) and the use of technological programs in lessons.

PART I: PERSONAL INFORMATION

1. Gender
Female ()
Male ()
2. Birth date:
3. University:
4. Current GPA:

PART II :

1. The table below shows the names of some technological applications and programs. Mark the boxes that correspond to what you hear names and use before these programs.

Technological programs	Participants who heard before	Participants who know to use
MS Office		
Plickers		
Kahoot		
Socrative		
Toondoo		
Wordpress		
Prezi		
Animoto		
Edmodo		
Beyaz Pano		
Classdojo		
Powtoon		
Scratch		

Tinkercad		
Ardunio		
Inspiration		
Movie Maker		
Eclipse Crossword		

2. Where did you learn from the above programs if you know how to use them?
The course I took during the Undergraduate ()
Course title :
A course I went to ()
Course title :
Course Duration :
Other ()
:
3. What lessons did you have for TPACK so far? What courses did you learn in these courses? Did you practice during the course?
4. What kind of technological applications do you think should be used in the course of science course? What should be considered when using these technological applications? Why?
5. What problems and limitations do you think you might face when you use technological applications that process your science courses? Why?
6. How can you overcome the problems and limitations that you think you might encounter about the technological applications used in the science class?
7. Are the applications given to you in the tabluture appropriate for the science course? Explain why.
8. What are the advantages of using these applications for TPACK? Please explain.
9. What are the disadvantages of using these applications for TPACK? Please explain.