Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 8, Issue 1, January 2017: 91-121
DOI: 10.17569/tojqi.288857

Research Article

Pre-service Mathematics Teachers' Opinions about FATİH Project and Technology Use in Mathematics Education[1]

Mehmet Fatih Öçal[2], Mertkan Şimşek[3]

Abstract

FATİH Project is one of the most extensive movements on the way of integrating technology into schools. One crucial factor for FATİH Project to be successful is teachers who are the first degree practitioners of the Project. At this point, pre-service teachers who are the near future's teachers need to know the requirements of the Project. Therefore, the necessity of providing trainings intending FATİH Project during undergraduate education is heated-debate to discuss. Another point under discussion is to provide domain specific (mathematics domain in this study) training for teachers. With this respect, the purpose of this study was to investigate pre-service mathematics teachers' opinions about technology use and FATİH Project before and after given preparatory training towards it. The participants of this study with qualitative paradigm were composed of 15 pre-service elementary school mathematics teachers who were enrolled in the fourth grade in a public university. FATİH Project preparatory training was prepared according to the in-service training provided by Ministry of National Education for teachers and was designed in line with mathematics lessons specifically. This training lasted

[1] This study was supported by Ağrı İbrahim Çeçen University, Department of Scientific Research Projects with EF.15.006 Project number

[2] Assist.Prof.Dr., Ağrı İbrahim Çeçen University, Faculty of Education, Mathematics and Science Education Department, fatihocal@gmail.com

[3] Res. Asst., Ağru İbrahim Çeçen University, Faculty of Education, Mathematics and Science Education Department, mertkans@gmail.com

Received: 21.06.2016, Accepted: 23.12.2016

10 weeks with practical applications. An open-ended opinion questionnaire was subjected to pre-service teachers before and after the training. In addition, each participant was interviewed. The findings gathered before and after training were compared. According to the results of the study, it was observed that the definitions of pre-service teachers for FATİH Project were deepened and they used concepts specific to mathematics lesson. In addition, they reported opinions about the positive, negative aspects of and applicability for the Project. Lastly, it was observed that pre-service teachers' awareness towards technologies such as software, hardware and educational portals that were used specifically to mathematics increased in mathematics lessons.

Keywords: *FATİH Project, pre-service mathematics teachers, technology, interactive whiteboards.*

Introduction

Technology makes itself felt in everywhere in daily life. Particularly, since technology brings various facilities to human lives, many individuals encounter it at home and work and they try to use such technology (Daşdemir, Cengiz, Uzoğlu, & Bozdoğan, 2012). Considering the facilities that technology brought for human life, it is inevitable to use technology in education (Aydın, 2005). Using technology in education has various benefits such as facilitating learning, diminishing the learning period and reducing the teaching costs (Akkoyunlu, 1998; Daşdemir, et al., 2012). Therefore, technological development movements are always tried to be observed in order to make the education more effective (Demir & Bozkurt, 2011; Ersoy, 2005).

In our country, a project called FATİH Project which can be translated as an acronym for *Fırsatları Arttırma ve Teknolojiyi İyileştirme Project* [movements to enhance opportunities and improve technology] has been initiated to use technology actively in education. With this project, touch-sense interactive whiteboards were established in the classrooms, interactive whiteboards were connected to internet network, and tablet computers were distributed to students and teachers. In addition, establishment of Education Information Network (Eğitim Bilişim Ağı-EBA) in order to provide and share educational contents that contribute to the effective use of these technological equipments was one of the sub-stages of continuing project (Yıldız, Sarıtepeci, & Seferoğlu, 2013). Examples of similar projects were also initiated in international base. Some of international projects, for example, were Project of Preparing Tomorrow's Teachers to Use Technology initiated in USA (Whittier & Lara, 2006) and Smart Education in Korea-Digital Textbook Initiative Program initiated in South Korea (Seo, 2012). Moreover, an organization called One Laptop Per Child supplied very cheap computers and tablet-computers and distributed to children living in underdeveloped countries in order to familiarize them with technology. Therefore, this organization aimed at providing better education for these children. In line with this aim, it distributed more than 2.5 million computers and tablet-computers to children in underdeveloped countries (Warschauer & Ames, 2010). As it can be seen from these examples, the use of technology in education for some countries takes important place in order to raise the level of education to higher levels and they make more efforts for integration of technology in education.

Considering the resources related to the use of technology in mathematics education, it is generally used while presenting during lecture, while dealing with some mathematical calculations and while preparing mathematical materials (Kayaduman, Sırakaya, & Seferoğlu, 2011; Moreno-Armella, Hegedus, & Kaput, 2008; Tatar, 2013). Presentation based use was characterized as its incomplete and out of purpose use or inadequate use of technology (Kayaduman et al., 2011). Its use for mathematical

calculations is intended to facilitate complex operations. It can be likened to an engineer receiving support for mathematical operations from a computer (Moreno-Armella, Hegedus, & Kaput, 2008). Lastly, its use as preparing mathematical materials involves the other uses inside, because it may be easy to make presentation during mathematical activities and it might usual to make calculations during mathematics activities. Beyond that, on the other hand, technology as an educational material can be used for listing and analyzing the data (Baki, 2008; Iranzo & Fortuny, 2011), for making 2D and 3D visualizations (Tatar, 2013), for making drawings permitting changes by dragging the elements in it instead of using static ones (Kabaca & Tarhan, 2013; Özen & Yavuzsoy-Köse, 2013) and for getting support from simulations (Polly, 2014).

In the literature, there were various studies on using technology in classrooms (e.g, Baki, 2008; Kayaduman et al., 2011; Zengin, Kağızmanlı, Tatar, & İşleyen, 2012). In addition, some studies in the literature focused on teachers' and students' perceptions about technology and technology use in mathematics education (Aktaş, Gökoğlu, Turgut, & Karal, 2014; Gürol, Donmuş, & Arslan, 2012; Pamuk, Ergun, Çakır, Yılmaz, & Ayas, 2013) and investigated change in teachers' attitudes and beliefs towards technology after they were provided with in-service training related to technology use (e.g., Ertmen, 2005; Kabaca & Tarhan, 2013; Usta & Korkmaz, 2010).

Although Aktaş et al. (2014) indicated that teachers' awareness about educational technologies is high, Gürol, Donmuş and Arslan (2012) stated that teachers might experience difficulties in using such technologies. In addition, they emphasized the necessity of providing in-service trainings related to the use of technology, which should be carried out in long term, based on practice, in small groups and should be domain specific. In similar study, the necessity of technology integration in classrooms with school-university cooperation was emphasized (Eren & Yurtseven-Avcı, 2016). In their study related to FATİH Project, Pamuk et al. (2013) found that teachers and students were prone to use interactive boards. According to the findings of this study, however, teachers had the thought that the tablet-computers were not an effective tool for learning. Moreover, Pamuk et al. (2013) indicated that technological problems and teachers' lack of pedagogical and professional skills related to the use of technology restricted teachers from using readily available technological possibilities. The lack of appropriate contents is also one of the results of the study by Pamuk et al. (2013), which limits the use of technology in classrooms. Similarly, Kayaduman et al. (2011) who studied on FATİH Project pointed out that teachers have deficiencies and negative attitudes about computer literacy and emphasized that these deficiencies should be addressed through various in-service trainings. In another study related to FATİH Project, Banoğlu, Madenoğlu, Uysal, and Dede (2014) found that teachers mostly preferred to use the interactive boards and they were in different levels of capabilities for content selection and development. Moreover, they discussed about the necessity that, firstly, teachers should be ready and willingly to learn in order to ensure that the training given in line with the project is successful for them.

Similar to the studies conducted in Turkey, Wachira and Keengwe (2011) indicated that teachers were lack of knowledge about technology and instead of old habits of using technology, they created fear and anxiety against innovation in educational technologies. Therefore, Wachira and Keengwe (2011) emphasized the necessity of taking teachers' old habits and anxieties into account while providing them with technology related in-service trainings. Similarly, Ertmen (2005) stated that it is necessary for technology integration of the lessons to change teachers' beliefs about using technology by providing them trainings on how to facilitate their teaching activities.

It is important to consider prospective teachers', who are our future teachers, opinions about the technology and the use of educational technology in classroom environment. In the near future, the prospective teachers would be the practitioners of educational technologies in classrooms, therefore, the importance of the studies conducted with them becomes obvious. With this respect, findings of the study conducted by Kayaduman et al. (2011) with teachers were parallel to the that of study conducted by Usta and Korkmaz (2010) who indicated that increasing pre-service teachers' levels of technology literacy influences their attitudes positively towards their use of technology in education. Similarly, in Topal and Akgün's (2015) study investigating pre-service teachers' use of internet for educational purpose, it was stated that pre-service teachers' qualifications of using FATİH Project technologies and finding resources for educational purpose from internet and their experiences in doing so were directly related. In this context, their self-efficacy perceptions have also improved. As recommendation, they stated that trainings aiming to develop these perceptions should be provided (Topal & Akgün, 2015). Considering that FATİH Project is a crucial educational reform for Turkey, it was known that pre-service teachers were not sufficiently tracking these reforms and the developments regarding their professional areas and that they were only interested in hearsay information about these issues (Duman, Kural-Baykan, Köroğlu, Yılmaz, & Erdoğan, 2014). Technologies and software specific to mathematics education are among them. When the mathematics education was taken into consideration, there was no study about FATİH Project particularly conducted to pre-service mathematics teachers.

Significance and Purpose of the Study

One of the activities in order to reach for the success of FATİH Project is to provide teachers with in-service trainings based on the purpose of FATİH Project (Banoğlu et al., 2014). Considering the gains of necessary knowledge and skills for teachers to apply effectively the opportunities of FATİH Project (Yıldız, Sarıtepeci, & Seferoğlu, 2013), it is obligatory for teachers to receive such trainings. When the courses that the pre-service teachers took during their university education are examined, two courses including the basic computer course for computer use and the course of instructional technology and material design are aim at preparing pre-service teachers for the use of educational technologies (Council of Higher Education [YÖK], 2007). Related to technology use, in addition, pre-service

teachers are taught about some software in selective courses. However, there is no course or content covering the contents of how to use interactive boards and tablet-computers distributed, of how to integrate Antropi or different applications previously uploaded into these technologies in the lessons, of how to benefit from EBA or different portals, of how to reach readily available content related to lessons taught, and of how to use e-books effectively with students in the lessons for the sake of FATİH Project in educational curricula of faculty of education for preparing pre-service teachers. Considering the necessity of pre-service teachers' awareness about FATİH Project, the purpose of this study was to reveal the pre-service teachers', who received preparatory training for FATİH Project, technology use and opinions about FATİH Project before and after the training given. With this respect, the sub-research problems were as follows.

1- How do pre-service mathematics teachers define FATİH Project before and after preparatory training given for FATİH Project?
2- What are pre-service mathematics teachers' opinions about FATİH Project before and after preparatory training given for FATİH Project?
3- What are pre-service mathematics teachers' opinions regarding the use of technology in mathematics education in context of FATİH Project before and after the preparatory training given for FATİH Project?

Methodology

In this section, the research design was presented in line with the purpose of the study and research problems. In addition, the information about participants, data collection tools, the training given, data collection procedure and the analysis of the data gathered.

Research Design

This is a qualitative study due to its aims of in-depth investigation of the group studied with the data obtained by different data collection tools and of explaining and presenting the findings obtained in this direction (Creswell, 2007). In this study, pre-service teachers' opinions about FATİH Project and the use of technology in mathematics education were obtained from semi-structured interviews, opinion survey involving open ended questions and field notes during the preparatory training.

Participants

The participants of this study were composed of 15 pre-service teachers who were enrolled in the department of Elementary School Mathematics Education in a public university located in the East Anatolia Region of Turkey. Participants were required to have full participation during the 10-week preparatory training. In this context, volunteer participants were selected for the study. Therefore, convenience sampling method was used in the participant selection process (Yıldırım & Şimşek, 2006). There were 15 pre-service teachers, six of whom were male and nine of whom were female. All the participants were selected from senior pre-service teachers who completed theoretical courses on the teaching profession and were attending courses such as practical school experience and teaching practice courses. Pre-service teachers were coded as PT1, PT2, …, PT15.

Data Collection Tools

In this study, semi-structured interviews, opinion survey involving open-ended questions and field notes during preparatory training were used as data collection tools. The semi-structured interview form and open-ended opinion survey were carefully designed to show parallelism with and were developed by researchers by using the related studies in the literature. These data collection tools were examined by two experts, one of whom was in instructional technologies and the latter of whom was in mathematics education. Therefore, the content validity was tried to be ensured. In addition, three pre-service who were not the participants of this study were interviewed. The final version of this data collection tool was prepared after the pilot study. In addition, field notes gathered during the preparatory training were also used to support the data obtained from other data collection tools.

Application of Preparatory Training and Data Collection Procedure

After the completion of preparing data collection tools, 15 pre-service teachers were subjected to opinion survey involving open ended questions. In addition, semi-structured interviews were performed with each pre-service teacher as pre-interviews and the voice records were gathered in accordance with the participants' permissions. Then, the process of 10-week preparatory training for FATİH Project began. In addition to the mandatory courses to which the pre-service teachers were required to attend, this training was completed in 40 hours in total (four hours per week). The work calendar and the content of this training was presented as follows.

Table 1

The Work Calendar and the Content of the Preparatory Training

Weeks	Content
1st Week	General Introduction for FATİH Project and the preparatory training
2nd Week	Safe use of information technologies
3rd Week	The use of interactive whiteboard
4th Week	Reaching lesson contents in the context of FATİH Project – Education Information Network and external sources [Eğitim Bilişim Ağı] (EBA)
5th Week	Reaching lesson contents in the context of FATİH Project – Education Information Network and external sources [Eğitim Bilişim Ağı] (EBA)
6th Week	Preparing content and additional applications on mathematics teaching – with dynamic geometry software
7th Week	Preparing content and additional applications on mathematics teaching – with dynamic geometry software
8th Week	Preparing content and additional applications on mathematics teaching – Word, Excel, Power-point
9th Week	Preparing content and additional applications on mathematics teaching – Online tools (Wolfram Alpha etc…), creating and organizing video-picture
10th Week	The use of tablet computers and e-books (enriched book) in teaching mathematics

While the content of this training was being prepared, the content of the preparatory training for FATİH Project given to the teachers by Ministry of National Education was taken into consideration. However, this training does not provide any branch specific content for teachers, because it was given to the teachers from different branches of a school together. In this context, this training, which was specific for teaching mathematics, was particularly prepared for pre-service mathematics teachers and, therefore, its content included the software and tools that can be used in teaching mathematics. First of all, the lessons began with the knowledge of how to use information technologies safely. In the third week, the properties of interactive board and how to use applications such as Antropi, which was already uploaded and continuously used by teachers, were presented with practical applications. In the fourth and fifth weeks, information about EBA and external sources for reaching mathematical contents that could be used in lessons were given and applications related to these issues were done. In the weeks from sixth to ninth, trainings for developing content for mathematics education were provided starting

with Geogebra, a special dynamic geometry software for mathematics. Pre-service teachers took an elective course regarding how to use this software in the semester before the semester that this training was provided. In this training, however, they did applications about preparing contents and how to reach readily available contents. How to make a model for a given mathematical problem was presented. For example, an application was done by means of Geogebra which checks whether the number entered in the input field is prime number and lists its positive divisors if it is not prime number. In addition, the benefits of Geogebra such as its computer algebra system, geometry, three dimensional graphing screens, spreadsheet property and the relation among different representations in mathematics were presented to pre-service teachers in the lessons. Moreover, how to use the readily available contents from the Materials section of Geogebra's internet site was instructed. Then, how to benefit from programs in Office software was shown. Information about the equations and symbols parts of Word and MathType that can be embedded into Word as additional application was mentioned. In addition, how to use the properties of Word program including table, equation, symbol, graphics and so on to prepare materials for lessons was shown. It was presented that the Excel could be used for algebra applications and PowerPoint could be used to visualize two and three dimensional drawings. In the ninth week of the training, they were informed about the online mathematics applications such as WolframAlpha software. In addition, pre-service teachers were informed about how to merge videos and pictures related to mathematics in order to prepare mathematical content. They were also informed about who to present the new material as an effective material to students in the lessons. In the last week of the training, how to use e-books found in FATİH Project's tablet-computers distributed and in interactive board was presented.

This preparatory training was carried out in the university's computer labs. Lastly, each pre-service teacher was expected to apply two activities in classroom environments in the schools that they go for the requirements of school practice course. With these activities, it was expected from pre-service teachers to observe the situations when they encounter with real-classroom environment in line with FATİH Project. Therefore, pre-service teachers had opportunities to practice in line with the training provided.

During the training, both researchers were present. While a researcher was presenting the content of the training, the other researcher took the field notes and helped participants for the applications and questions asked.

After the training ended, the participants were again subjected to the open-ended questionnaire. In addition, semi-structured interviews were performed with each one as post-interview. During the interviews, both researchers were present and participants' permissions were gathered for voice-record. The interviews lasted between 20 and 32 minutes with an average of approximately 26 minutes.

Data Analysis

The data were gathered via the qualitative data collection tools. In the data analysis, content analysis method was used. The preliminary and post surveys and preliminary and post interviews were analyzed together. In this context, the categories and main themes were formed by arranging the codes that emerged in the analysis of the data. As a result of the organization of the categories and themes, the processes of reporting the data and its interpretation have begun. Therefore, the Corbin and Strauss' (2007) suggestions were taken into consideration. Corbin and Strauss (2007) indicates that the qualitative data obtained from interview forms or interviews are tried to be combined under the general themes according to their characteristics. While doing so, the codes gathered from qualitative data are evaluated and the categories are created. The related codes are reported under the general themes previously determined. In this study, the main themes were determined as the pre-service teachers' definition of FATİH Project, their opinions about FATİH Project, and their opinions about the technology use in mathematics education. In order to present the data in enriched way, frequency and percentage tables were used.

The data gathered from the interviews, opinion surveys and field notes were triangulated in order to ensure internal validity. For external validity, there were direct quotations from participants' responses to the survey and interviews during presenting the data. The data gathered from data collection tools were analyzed by both researchers separately and the inter-coder agreement was sought at the end (Miles & Huberman, 1994). Agreement percentages for main themes were 75%, 83%, and 86%.

Findings

The data gathered before and after pre-service mathematics teachers were provided with preparatory training for FATİH Project were presented under three main parts. These themes were how pre-service mathematics teachers define the FATİH Project, their opinions about the project and their opinions about the technology use in mathematics education.

Pre-Service Mathematics Teachers' Definitions for FATİH Project

Pre-service mathematics teachers were expected to define FATİH Project in the interviews and open-ended survey. As a result of data analysis, it was observed that they made superficial definition before the preparatory training provided for FATİH Project. Their definitions were skewed towards its

objectives. Five pre-service teachers' definitions before and after the training provided were presented in the Table 2.

Table 2

Pre-Service Mathematics Teachers' Definitions for FATİH Project

Pre-Service Teacher	Definition before the Training	The Definition after the Training
PT7	*I don't know anything*	*The FATİH Project aims at students' active use of technology and technology structured education system in classrooms by bringing smart board and tablet-computers to all schools in Turkey.*
PT8	*FATİH Project is a system that facilitate students' studies at desired time by recording the courses instructed to students*	*The FATİH Project is a project that embodies the subjects on smart boards with visual materials and adopts a student-centered approach to the education by diversifying instructional methods and techniques*
PT10	*I know that tablet computers were distributed to students.*	*I know that the smart boards are used in classrooms with FATİH Project. I think that the written materials are loaded into smart boards with smart board applications, the materials related to the subjects which the teacher is working with are sent to the tablet-computers given to the students, this kind of interaction is provided for students to learn, and the lessons are tried to be more efficient by using technology*
PT11	*Smartboards at schools, distributing tablet-computers to children and listening to the lessons from the addresses of internet sites provided.*	*The FATİH Project is a project aimed at ensuring that students who are distributed smart boards and tablet*

Pre-Service Teacher	Definition before the Training	The Definition after the Training
		computers in all schools will better understand the lesson with technology.
PT12	*I know it provides equal opportunities for students. It aims to integrate technology into education and teaching.*	*FATİH Project is a project aiming at increasing the quality of the education by integrating the technology into education. Providing equal opportunity and increasing the functionality of education by saving time are among its aims.*

Investigating pre-service teachers' definitions, it was observed that their opinions about the project before the training were limited to a few points. As a result of the analysis of all pre-service teachers' definitions, pre-service teachers' ideas were concentrated on distribution of tablet-computers to students (f=9, 60%), use of smart (interactive) board (f=7,47%), and technology use in education (f=6, 40%). In addition, some codes such as possibility of distant education, use of smart phones were also found in pre-service teachers' definitions. It was an interesting finding that two pre-service teachers (13%) stated that they had no idea about the project.

After the training, pre-service teachers' opinions were not limited to these three points. Although almost all pre-service teachers mentioned about smart (interactive) boards, distribution of tablet-computers and technology integration, these were not superficial awareness. Instead, they used these terms in their definitions in line with objectives of FATİH Project. For example, PT7 made the definition in the direction of presenting the technology in structured form in education. In addition, it should serve the active participation of the students. On the one hand, PT10 stated in his definition that the project would contribute to teacher-student interaction and make the lessons more efficient, on the other hand, PT11's definition was about more meaningful understanding of the lessons. In addition, PT11 stated a definition covering the acronym meaning of FATİH Project. PT11's definition was involving the information about the equal opportunity. Moreover, PT8 stated in her definition that instructional methods and techniques would be diversified by means of FATİH Project.

After the training, the concepts for the definition that pre-service teachers used for FATİH Project were also diversified. Some of the concepts that pre-service teachers used in their definitions were student-

centered education, visualization, equal opportunity, computer assisted education, motivating students, reaching the knowledge easily, student-teacher interaction, saving time, and structured education.

The provided training was shaped particularly for mathematics education. In this context, this situation was observed in pre-service mathematics teachers' definitions. For example, PT8 stated that the subjects could be concrete and visual materials could be presented in the lessons. Similarly, PT2 stated that it would be easier to present visual materials in mathematics lessons. In addition, PT3 made a definition of how mathematical concepts would be presented more easily by mentioning about the visualization and opportunity of student-teacher interaction that interactive boards satisfy.

Pre-Service Teachers' Opinions about FATİH Project

Pre-service mathematics teachers' opinions were sought about FATİH Project. Their responses before and after preparatory training were investigated over a few themes. These themes were shaped according to pre-service teachers' opinions about the benefits of the projects, possible negative aspects of it, and its applicability. Table 3 presented the pre-service teachers' opinions about the benefits of the project.

Table 3.

Pre-Service Mathematics Teachers' Opinions about the Benefits of FATİH Project

Categories		Codes	Before the Training		After the Trainig	
			f	%	f	%
Related to Course Content		It provides visualization in the lesson	4*	27	7	47
		It provides relation with daily-life.	1	7	6	40
		It eases the understanding of the lessons.	1	7	5	33
		It provides concretization of the concepts	2	13	3	20
		It supports the interdisciplinary studies.	-	-	3	20
		It provides permanent learning.	-	-	1	7
Related to Process of Instruction		It saves time.	3	20	8	27
		It provides rich material possibilities (video, film, visuals, vb..)	1	7	2	13
		It increases productivity	2	13	2	13
		It reduces teachers' load.	-	-	2	13
		It supports the consolidation of the courses.	-	-	2	13
		It provides student-teacher interaction.	-	-	1	7

Categories		Codes	Before the Training		After the Trainig	
			f	%	f	%
		It supports teachers' effective teaching.	-	-	1	7
Related to	Belief/Interest	It increases students' motivation to the lessons.	-	-	4	27
		It increases students' interests to the lessons.	1	7	3	20
		It allows the lessons to be enjoyable/plausible.	2	13	3	20
		It reduces/inhibits students' prejudices to the lesson.	-	-	2	13
Miscellaneous		It provides economic learning environment.	-	-	2	13
		It provides students with equal learning environment.	-	-	1	7
		No Idea	2	13	-	-

*Each pre-service teacher may state more than one response.

Pre-service teachers' responses were summarized in different categories in Table 3. Comparing their opinions before and after the training, pre-service teachers' preliminary opinions were superficial. However, it was found that they showed more comprehensive answers after training. In general, the benefits of FATİH Project were appeared to be collected in three categories. These were related to course content, processes of instruction, and beliefs/interests. Before the training, pre-service teachers' opinions were limited to visualization of the lessons (f=4, 27%) and concretization of the concepts (f=2, 13%) when the content related category was considered. After training, on the other hand, they stated that FATİH Project helps to visualize the lessons (f=7, 47%), relate the lessons to daily-life (f=6, 40%), ease the understanding of the concepts (f=5, 33%) and concretize the concepts (f=3, 20%). In addition, they stated that it supports the interdisciplinary studies (f=3, 20%) and permanent learning (f=1, 7%) after the training. For the visualization of the lessons and concretization of the concepts, PT3 and PT9 stated the following statements before the training.

> "*The project supports learning by visualizing the lessons without losing too much time*". (Before the training, PT3, Survey questionnaire)
>
> "*With the FATİH Project, it is possible to break down the abstract rules of education, be more concrete, permanent and more enjoyable"*. (Before the training, PT9, Survey questionnaire)

For the visualization of lessons and concretization of the concepts, on the other hand, PT8 stated as follows after the training.

> "*FATİH Project is a useful application for students because it activates visual senses by providing concrete narratives*". (After training, PT8, Survey questionnaire)

For the interrelation with daily-life, PT10's statement before the training and PT15's statement after the training were as follows.

> "*I think it is useful positive to move the use of technology into schools because it is used in daily-life"*. (Before training, PT10, Survey questionnaire)
>
> "*It is a shortcoming to instruct lessons lacking of daily-life. In order to better understand the lessons, examples are needed to be chosen from daily-life. This can also be achieved with FATİH Project*". (After training, PT15, Interview)

For the process of instruction, pre-service teachers' opinions were focused on saving time, providing rich material opportunities, increasing the effectiveness of the lessons both before and after the training. In addition, pre-service teachers stated ideas about consolidation of the lessons (f=2, 13%), reduction of teachers' load (f=2, 13%), student-teacher interaction (f=1, 7%) and effective instruction (f=1, 7%) for the benefits of the project after the training. In this context, the training provided for pre-service teachers contributed to them in such a way of diversification and deepening of their opinions about the project. After the training, PT2, PT3, PT7, PT9 indicated the following statements related to this category.

> "*Due to readily available presentations, questions and examples, it saves time*". (After training, PT2, Survey questionnaire)
>
> "*As the benefits of FATİH Project, it saves much time and it provides students with permanent learning because of the chance of showing them more materials*". (After training, PT3, Survey questionnaire)
>
> "*The teacher will not lose time by writing*". (After training, PT7, Survey questionnaire)
>
> "*I believe that it would be beneficial for education and teaching. More efficient lessons will be provided by providing economy in lessons*". (After training, PT9, Survey questionnaire)

Investigating the findings related to the category of belief/interest, the focus was on enhancement of students' interests to lessons and lessons being enjoyable before and after the training. In addition, pre-service teachers stated that the project contributes to the enhancement of students' motivation to lessons (f=4, 27%) and the decrease of their prejudgments to the lessons (f=2, 13%) after the training. Moreover, two pre-service teachers (13%) did not give any responses before the training. On the other hand, all pre-service teachers give responses about the benefits of the project after training.

Pre-service mathematics teachers' opinions about the unfavorable aspects of the FATİH Project were presented in the Table 4. The categories and codes under this theme formed from their opinions before and after trainings were as follows.

Table 4.

Pre-service Mathematics Teachers' Opinions about the Unfavorable Aspects of FATİH Project.

Categories	Codes	Before the Training		After the Training	
		f	%	f	%
Technical Deficiencies	Possibility of power cut during lesson	1*	7	4	27
	Interactive boards or tablet-computers may be broken.	1	7	3	20
	Touch-sense of interactive board may be broken	-	-	3	20
	Internet may be cut during the lesson	-	-	2	13
Teacher-Induced Deficiencies	Teacher may not use the software in interactive board (Being lack of software knowledge)	4	27	10	67
	Teacher may not know the properties of interactive board (Being lack of hardware knowledge)	-	-	5	33
	Teacher may lose control of the classroom management while using interactive board.	1	7	4	27
	Teacher may lack of experience in using technology.	2	13	4	27
	Teacher-induced time lost may happen	2	13	3	20
	Teacher may fail in planning the lesson (Not adding the necessary materials or uploading software)	-	-	2	13
Student-Induced Deficiencies	Students may consider the interactive board and tablet computer as a gaming tool.	1	7	6	40
	Students' attentions may be distracted.	2	13	5	33
	Students may not know how to use them	2	13	5	33
	Interactive board and tablet-computers may be used out of purpose.	1	7	3	20
	They may prevent persistent learning.	-	-	3	20
	Students may become passive listeners	-	-	2	13
	Students' writing skills may be reduced.	1	7	1	7
	Students' note taking habit may diminish	1	7	1	7
Miscellaneous	They may not be appropriate for all lessons.	2	13	5	33
	There may be security problems.	-	-	1	7
	No idea	2	13	-	-

*Each pre-service teacher may state more than one response.

When the Table 4 was investigated, pre-service teachers' opinions about the unfavorable aspects of FATİH Project were concentrated in three categories. These categories were *technical deficiencies, teacher induced and student induced deficiencies* arising from technologies (interactive board, tablet-

computer, internet, etc…) introduced in FATİH Project. Although pre-service teachers' opinions about the possible deficiencies of FATİH Project were limited before the training, it was observed after the training that their opinions were differed in both diversity and depth.

Before the training, one pre-service teacher (7%) mentioned about the power cut during the lesson, while another pre-service teacher (7%) stated that interactive board or tablet-computer distributed might be broken while using them. In addition to the possibility of power cut (f=4, 27%) and breakdown of interactive boards and tablet-computers (f=3, 20%), on the other hand, they stated the possibility that touch sense of interactive board may make trouble for teacher (f=3, 13%) and that the internet may be cut during the lesson (f=2, 13%), so, there may happen disruption in the lessons in which the internet is required. Therefore, pre-service teachers indicated that if the lesson planned were prepared with the necessity of intensive use of technology, the teacher may encounter problems during the instruction of the lessons with possible technical deficiencies. In pre-service teachers' applications, they experienced difficulties especially in using some interactive boards due to very sensitive touch screens. Even the slightest touches were perceived, they faced problems such as page shifts, undesired segment selection on the screen and deletion of the operations being performed.

After applying the survey questionnaire and interviews conducted, teacher induced deficiencies were determined as second category among the possible unfavorable aspects related to FATİH Project. Pre-service teachers had predictions about this issue before the training provided. Pre-service teachers indicated that teachers may not know how to use software in interactive board and tablet-computer (f=4, 27%), teachers may encounter problems due to lack of experience in using technology (f=2, 13%), there may technology use related time-loss during lesson (f=2, 13%), and teachers may lose classroom management during using technology (f=1, 7%). In this context, some of pre-service teachers stated the followings.

> "*Many teachers still do not know how to use computer and upload software. I guess the instruction was done on some software in interactive boards. I mean a teacher who does not know how to use computer may have trouble using a smart board*". (Before the training, PT14, Interview).
>
> "*During instructing the lesson, teacher who use smart board may lose time while dealing with smart board. Students are already tend to disrupt the lesson*." (Before the training, PT12, Interview)

In addition to further deepening of these opinions, two additional codes were added under this category after the training provided. According to pre-service teachers' opinions, teachers may encounter with problems in using software (f=10, 67%) and lack of hardware knowledge (f=5, 33%). Pre-service teachers were not able to do some things that they wanted to because they did not have all the features of the interactive boards in their practices. For example, they experienced difficulties such as that they

had to perform some operations again after a wrong section is touched on the screen. They also faced problems during enlarging or reducing the desired section on the screen or opening two or three dimensional shapes in Antropi. In addition, teachers' unplanned entry to the classroom, which means that teacher does not make the necessary software and documents available before the lesson, (f=2, 13%) was also considered to be one of the unfavorable aspects that could be encountered. Related to this issue, pre-service teachers indicated the following statements.

> "*I think teachers should know how to use smart boards in terms of both software and physical things. In addition to not knowing mathematical software such as Geogebra and Derive, not knowing how to use the applications like Anthropi or e-book and problems that can be encountered related to integrated parts of smart board may also disrupt the flow of the lesson. Such things, I think, may hinder the effective uses during lessons*". (After training, PT10, Interview)
>
> "*Teacher should prepare everything and upload to the smart board before the lesson begins. If s/he tries to do it during lesson, s/he lose time both during uploading the software and opening it*". (After training, PT6, Interview)

In the applications performed, one of the problems that pre-service teachers experienced was that students tried to intervene the pre-service teachers in the slightest problem because they establish similarity between the uses of tablet-computers and interactive boards. Therefore, it was observed that they lost the control of classroom management. For this reason, they lost time during the instruction. According to the findings gathered from pre-service teachers, student-induced deficiencies were also found among the possible unfavorable aspects of FATİH Project. Before the training provided, pre-service teachers' opinions were focused on that students may consider interactive board and tablet-computer as a gaming tool (f=1, 7%), these technologies may result in distraction in students' attention (f=2, 13%), students do not know how to use these technologies (f=2, 13%), students use these technologies out of their purposes (f=1, 7%), that students' writing abilities may be reduced (f=1, 7%) and their note taking habit may diminish (f=1, 7%). According to pre-service teachers' opinions, on the other hand, two new codes were added in addition to the increase in the frequencies of these codes. Pre-service teachers emphasized that the possibility of decrease in students' permanent learning (f=3, 30%) may appear and students may become passive listeners (f=2, 13%), therefore, what was expected from students and what was the purpose of the project may contradict if such technologies are not effectively used. Particularly, pre-service teachers expressed the students' consideration of interactive boards and tablet-computers as a gaming tool and using them out of purpose in the following way.

> "*As far as I can see, the students are formatting the tablet-computers and upload games*". (After the training, PT9, Survey questionnaire)
>
> "*I heard students use smart boards to watch movies and something*". (After the training, PT10, Survey questionnaire)
>
> "*When I went to the school for school practice, I saw that students generally used the smart boards for watching movies and listening to music*". (After the training, PT11, Interview)

Related to this category, it was observed that students were prone to use the interactive boards out of purpose during the applications that pre-service teachers performed. It was observed that students expected to use the board for listening to the music and watching videos. Since they were affected from the other lessons, it was seen that they wanted to use interactive boards for a gaming tool.

Pre-service mathematics teachers' opinions about the applicability of FATİH Project was presented in the Table 5. Pre-service teachers were asked to answer which factors were effective for achieving the success of the project. According to their responses, the categories of *the training provided, the teacher's effect and school condition* appeared. In addition, six pre-service (40%) did not give any response for the applicability of the project before the training. After the project, on the other hand, both there was no pre-service teacher without response and the deepness of the data increased.

Table 5

Pre-service Mathematics Teachers' Opinions about the Applicability of FATİH Project

Categories	Codes	Before the Training		After the Training	
		f	%	f	%
Related to Training Provided	In-service training should be provided	2*	13	7	47
	The effectiveness of the in-service training provided should be monitored	-	-	4	27
	In-service training particular to mathematics domain should be provided	-	-	4	27
	The training provided should be practical	-	-	3	20
	There should be audit towards teacher's implementations	2	13	5	33
	Teachers should plan the lesson before the instruction	-	-	4	27
Related to Teachers Effect	Teachers should use technologies that fit the purpose	2	13	4	27
	Teachers should be equipped in technology use and in the implementation of the project (equipped with necessary knowledge in using interactive board and tablet computers, etc…)	1	7	3	20
	Teachers should monitor students	-	-	3	20

Categories		Codes	Before the Training		After the Training	
			f	%	f	%
Related to School Condition		It cannot be used in all schools	1	7	-	-
		The class size should not exceed a particular number	1	7	5	33
		Widespread use among teachers should be encouraged	2	13	6	40
		No idea	6	40	-	-

*Each pre-service teacher may state more than one response.

National Ministry of Education provides trainings for the applicability of the FATİH Project. According to pre-service teachers' opinions, the first category appeared was about these trainings. Before the participatory training to pre-service teachers for this project, they gave superficial responses related to this category. Two pre-service teachers (13%) indicated that there should be in-service training for this project. After the preparatory training provided, there were various ideas given by pre-service teachers. In addition to pre-service teachers' opinions advocating necessity of providing in-service training (f=7, 47%), some pre-service teachers advocated some ideas that there should be in-service training particular to mathematics domain (particular to each domain) (f=3, 20%), these trainings should be practical (f=3, 20%), and their effectiveness should be monitored (f=4, 27%). Some pre-service teachers stated the followings for this category.

> "*I know in-service trainings are provided in schools. However, these are for general use. The training should be provided. However, the trainings should be given particular to mathematics domain as similar to the training provided for us*". (After the training, PT10, Interview)
>
> "*As far as I can see in my school practices, those who took training were even not using smart board. In addition, there is no one to check*". (After the training, PT6, Survey questionnaire)
>
> "*When I talked to the teachers, they said that the training provided was theoretical*". (After the training, PT7, Survey questionnaire)

Pre-service teachers have taken the teacher's effect into consideration for the actively and effectively applying the project. Before the preparatory training provided, pre-service teachers mentioned about the necessities such as that there should be audits for the teacher's implementations (f=2, 13%), the technologies used should be appropriately used by teachers for their own purpose (f=2, 13%) and teachers should be equipped for using technologies (f=1, 7%). According to pre-service teachers' statements, for example, it was a contrary situation that the interactive boards were used only for watching movies. On the other hand, the project insists that FATİH Project technologies should be used appropriately. According to pre-service teachers' opinions after the training provided, on the other

hand, pre-service teachers mentioned the necessities that teachers should plan the lesson before doing instruction (f=4, 27%) and teachers should monitor students in such issues (f=3, 20%), in addition to the situations mentioned for the purpose of reaching the projects' aims.

According to the data gathered from pre-service teachers, one pre-service teacher (7%) stated that the project cannot be applied in all schools before the training. However, there was no pre-service teacher who had this thought after the training. In addition, five pre-service teachers (33%) considered the classroom size as one of the important factors for effectively applying the project. Moreover, six pre-service teachers (40%) emphasized the necessity of implementing applications for encouraging the use of technologies provided in schools in order to achieve the projects' goals.

Pre-Service Mathematics Teachers' Opinions about the Technology Use in Teaching Mathematics

Pre-service teachers were asked about their opinions on using technologies in their mathematics lessons. Under the lights of data gathered from survey questionnaires and interviews, the findings were summarized in Table 6.

Table 6.

Pre-Service Mathematics Teachers' Opinions about Technology Use in Mathematics Lessons

Codes	Before the Training		After the Training	
	f	%	f	%
Content can be created with dynamic geometry software	4*	27	9	60
Visualization is provided in the lessons	5	33	8	53
The comprehension of the concepts in the lessons can be facilitated.	3	20	6	40
It provides concretization of the concepts.	1	7	5	33
Simple and memorable mathematical examples can be given	-	-	5	33
Students' interests to mathematics increases	3	20	3	20
A link between mathematics and daily-life can be provided.	-	-	3	20
The spatial thinking can be supported.	-	-	3	20
It allows the use of educational games.	-	-	2	13
Classroom environment that appeals to different sense can be provided	1	7	2	13
Many questions can be solved in lessons.	4	27	2	13
Students' active participation can be ensured.	3	20	2	13

Codes	Before the Training		After the Training	
	f	%	f	%
The interdisciplinary studies can be supported.	-		1	7
Mathematical misconceptions can be avoided.	-		1	7

*Each pre-service teacher may state more than one response.

As seen in the Table 6, pre-service teachers stated before the training that FATİH Project may contributed to the situations in mathematics course such as adding visualization to lessons (f=5, 33%), facilitating the comprehension of the concepts (f=3, 20%), increase in students' interests to the mathematics (f=3, 20%) and solving many questions in classroom (f=4, 27%). The benefits such as adding visualization to the lesson, solving many questions and increase in students' interests have emerged as the opinions about using technologies for presentation purposes. In addition to the stated benefits of the projects, in-depth opinions particular to mathematics lesson appeared after the preparatory training provided. In addition to the benefits that pre-service teachers stated before the training, they indicated positive aspects such as that teachers can present mathematical examples which are easy and memorable (f=5, 33%) and related to daily-life (f=3, 20%). Moreover, they mentioned ideas about improving students' spatial abilities (f=3, 20%) by integrating different mathematical software and educational games (f=2, 13%) into lessons. In addition to this, some pre-service teachers stated that project supports the interdisciplinary studies (f=1, 7%) and is beneficial in preventing mathematical misconceptions (f=1, %7). It was observed that pre-service teachers' opinions towards project became deeper with the training provided. Some pre-service teachers' opinions about FATİH Project in context of mathematics lessons were presented below.

> "*For example, I can show the expansions of three dimensional object and their appearances from different angles to students by uploading mathematical software such as Geogebra to smart board. Therefore, I can both ensure students to better understand these subjects and improve students' abilities of three dimensional* (spatial) *thinking*". (After the training, PT5, Interview)
>
> "*As the technological tools are found in any points of our lives, they became an integral part of daily-life. I can attract students' attention and give various examples from daily-life by using these technologies in mathematics lessons*". (After the training, PT13, Interview)
>
> "*EBA and e-books help me to solve many question without loss of time*". (After the training, PT6, Survey questionnaire)

Before and after the preparatory training provided, pre-service teachers were asked which technologies should be used in mathematics lessons and how. Under the findings, three categories appeared. Pre-service teachers mentioned about *the technological tools, software and educational portals* in general terms when indicating about the technologies they can use. These themes were summarized in the Table 7.

Table 7.

The Technologies that Pre-Service Mathematics Teachers can Use in Mathematics Lessons

Categories	Codes	Before the Training		After the Training	
		f	%	F	%
Technological Tools	Interactive board	9*	60	15	100
	Computer	10	67	14	93
	Tablet-computer	2	13	11	73
	Smart phones	1	7	7	47
	Projector	4	27	1	7
	Antropi Teach	-	-	15	100
Software	Dynamic geometry software (Sketchpad, Geogebra)	5	33	13	87
	Enriched e-book (e-book)	-	-	13	87
	Office software (Word, Excel, Powerpoint)	3	20	12	80
	Video processing software (movie-maker)	-	-	7	47
Educational Portals	Educational information network (EBA)	-	-	11	73
	Special portals such as Vitamin, Morpa	-	-	9	60
	Other (Educational documents and internet sites providing educational games)	3	20	9	60

*Each pre-service teacher may state more than one response.

Considering the Table 7, pre-service teachers stated that they often use traditional technologies before the training. They mentioned that they could use computer (f=10, 67%) and projector (f=4, 27%) in the lessons. They also mentioned that the interactive boards (f=10, 67%), which was the best known point about the FATİH Project, could be used in the lessons. As software, they said that they could use dynamic geometry software (f=5, 33%) and Office software (f=3, 20%) such as Word and Excel. In addition, they indicated that they could benefit from different sources on the internet. When asked about how to use these technologies, they indicated that they could present readily available sources and transfer to the students by means of computers and projectors. Similarly, they stated that they could use dynamic geometry software documents that can be found in different portals on the internet in the lessons. From their statement, the perception of that they would often use readily available contents appeared.

After the training provided, on the other hand, it was observed that there were various sources they would use in each category. Pre-service teachers who stated opinion about only using the readily available content before the training indicated that they would use technologies particular to aims of teaching mathematics after the training. They firstly indicated that they would actively use interactive board (f=15, 100%), tablet-computer (f=11, 73%), computer (f=14, 93%) and smart phones (f=7, 47%) when considering the technologies. Pre-service teachers stated that they would use interactive boards instead of projectors since the FATİH Project is encompassing all schools. As an interesting finding,

they mentioned the tablet-computers and smart phones as technologies to use in mathematics education. PT10 used the following statement below.

> "*I know that the smart boards work similar to computers do. Namely, I think I can do instructions more effectively by uploading mathematical software. Similarly, this software can also be uploaded to tablet-computers and smart phones. For example, I can do various applications with Geogebra (dynamic geometry software). Especially in geometry lessons*". (After the training, PT10, Interview)

As software, teachers stated that they would use dynamic geometry (f=13, 87%) and Office software (f=12, 80%) in mathematics lessons. In addition, it was observed that teachers were aware of the e-books particularly prepared for lessons encompassed in FATİH Project and of Antropi Teach software (f=15, 100%) readily uploaded to interactive boards. Pre-service teachers were asked how to use the software in mathematics teaching. They gave the following responses.

> "*I can use Excel to do algebraic operations and PowerPoint to show three dimensional shapes*". (After the training, PT4, Survey questionnaire)
>
> "*e-books are useful while solving questions. I can solve many questions within a short time interval*". (After the training, PT6, Survey questionnaire)
>
> "*I can do many activities with Geogebra. Especially in geometry lessons*". (After the training, PT10, Interview)
>
> "*For example, by merging videos that I found on the internet related to mathematics with Movie-maker, I can motivate my students at the beginning of the lesson I instructed*". (After the training, PT14, Survey questionnaire)

Before the training, pre-service teachers were not aware of the Educational Information Network (EBA) presented within the scope of FATİH Project and the social education platforms providing readily available content such as Vitamin and Morpa offered by private companies through these portals. After the training provided, on the other hand, most of the pre-service teachers stated that they would actively use these platforms. They stated that they consider this platform (EBA) very useful in terms of both downloading readily available content and seeing other mathematics' teachers' applications.

Discussion and Conclusion

After investigating the findings related to definition of FATİH Project, it was observed that the level of pre-service mathematics teachers' awareness about the FATİH Project was not adequate. As similar to most people around, pre-service mathematics teachers, who are the teachers of the future and are first degree addressee of the FATİH Project, have about the same level of knowledge about the FATİH Project. It was seen in pre-service teachers' definition that there were similar perceptions of society such as the distribution of tablet-computers and the use of interactive boards (Pamuk et al., 2013). It

has also been observed that some pre-service teachers did not have any idea about the project. Despite the fact that they would meet with this project in the school environment where they would begin to work as teachers in the near future, their lack of knowledge about the content of the project is a shortcoming that needs to be addressed (Kayaduman et al., 2011). After the preparatory training, it was observed that their definitions were deeper and appropriate for the aims of the project. In this context, Usta and Korkmaz (2010) and Wachira and Keengwe (2011) emphasized the necessity of providing training to teachers for technology use so that the use of technology in education is more effective.

Pre-service mathematics teachers expressed that the training provided for the applicability of the project was practical and necessary for teachers. They also stated that it has great influence for teachers who were its practitioners to reach the goals of the project. Banoğlu et al. (2014) indicated that the in-service trainings for teachers were insufficient when taking this issue into account. Similar findings were also found in Yıldız, Sarıtepeci and Seferoğlu's (2013) studies. Considering the findings about the applicability of the project, it was revealed that these trainings should be given during university education and they should be practical. Some pre-service teachers' statements about the necessity of the training provided to be mathematics domain specific coincided with the Aktaş et al.'s (2014) recommendations about the necessity of in-service trainings for FATİH Project to be domain specific for each domain. It was known that the in-service trainings provided by National Ministry of Education for FATİH Project were given to teachers from different branches together and were theoretical. Therefore, it was a heated debate about how much the trainings were effective for teachers (Kayaduman, et al., 2011). Considering teachers' old habits and fears, some situations such as use of technology that teachers were not interested at all (Wachira & Keengwe, 2011) make the effect of training provided controversial. In addition, the relation between pre-service teachers' experience in using technology and their sufficiencies and self-efficacies in using technologies of FATİH Project was indicated in Topal and Akgün's (2015) study. Theoretically provided trainings are not expected to make much contribution to the development of teachers' perceptions about these issues.

If the mathematics education was considered specifically, the need for visualization and concretization of the concepts (Zengin et al., 2013) appears in mathematical activities due to the abstract nature of mathematical concepts (Olkun & Uçar, 2003). Although visualization and concretization of the mathematical concepts were merely found in studies related to FATİH Project (Daşdemir et al., 2012; Gürol, Donmuş, & Arslan, 2012), it was interesting that pre-service mathematics teachers emphasized these points in their opinions regarding the positive aspects of FATİH Project. For example, considering the findings related to the software that pre-service mathematics teachers would use, the importance of dynamic geometry software emerged. This is because this software helps to visualize and concretize the abstract mathematical concepts (Zengin et al., 2013). Although this software is not important for

other branches, it a useful tool that makes the lessons more effective for mathematics teachers and students (Baki, 2015; Kabaca & Tarhan, 2013; Zengin et al., 2013).

It was observed that pre-service mathematics teachers focused on the positive aspects of FATİH Project related to course content, the effectiveness of the lessons and students' interests to the lessons. On the other hand, pre-service mathematics teachers focused on technical deficiencies, teacher and student induced deficiencies when considering its possible unfavorable aspects. Taking particularly the teacher induced deficiencies into account, pre-service teachers indicated that they were lack of software knowledge, which brought the discussion of necessity for mathematics domain specific training (Yıldız, Sarıtepeci, & Seferoğlu, 2013). This is because special software for mathematics lesson (e.g., dynamic geometry or computer algebra software) was not in the content of in-service training provided. In pre-service teachers' opinions about the technologies and software that can be used in mathematics lessons, they stated that they would prefer to use Excel in algebraic operations, PowerPoint in presenting three dimensional objects and dynamic geometry software in geometry subjects. Therefore, it was revealed that the use of technology diversifies according to the branches and it was necessary that the trainings in this area should be special to the branches (Aktaş et al., 2014).

It was observed in the application done by pre-service teachers that they experienced some of the unfavorable situations that they indicated in the interviews. For example, the difficulties in using the software on the interactive board, the sensitivity in touch screen and students' intervention to the technologies used during the lesson were among these situations. Although their applications were done in limited time interval, it was observed that pre-service teachers gained experience and indicated their opinions accordingly. From this point, these findings were coinciding with the findings of Topal and Akgün's (2015) study. The training provided should include practical applications. Therefore, teachers or pre-service teachers would gain experience in using these technologies and see themselves better using technologies of FATİH Project.

In pre-service mathematics teachers' opinions towards FATİH Project regarding mathematics lessons, the possible benefits of using e-books such as increasing visualization in mathematics education, solving abundant questions and reducing teachers' burden have emerged when considering the pre-service teachers' opinions about the technologies and software that can be used in mathematics lessons. In Eren and Yurtseven-Avcı's (2016) study, it was stated that the preparation of e-content takes too much time, teachers need readily available content and there was need for knowledge of higher level of technology usage. At this point, e-books would be helpful and useful for teachers in the way of providing teachers with readily available content and being easy to use.

Before the training, pre-service teachers indicated the benefits of using technology in the lessons regarding the mathematics course such as concretization of mathematical concepts, providing visualization, solving many questions in the lessons. These statements emerged as superficial reflections of the possible benefits of using technology. After the training, it was observed that the pre-service teachers made more in-depth reflections particularly for mathematics lessons. Among them, they indicated that technology would be useful for improving students' spatial abilities and developing their problem solving abilities by using mathematical software and by presenting easier questions from daily-life in classroom environment. These findings also coincide with Özen and Yavuzsoy-Köse's (2013) findings. Development of these abilities is also found among the basic skills for students to be developed in secondary school mathematics education curriculum (MoNE, 2013). In addition, pre-service teachers indicated that using these technologies in the lessons would play positive role in supporting interdisciplinary studies and in preventing mathematical misconceptions. Baki (2008) mentioned that similar benefits were observed in the efficient use of technologies in mathematics lessons.

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