Hacettepe Üniversitesi Eğitim Fakültesi Dergisi

Hacettepe University Journal of Education

e-ISSN: 2536-4758

Intergenerational Interdisciplinary Reverse Mentoring: School-University Collaboration*

Zeynep YURTSEVEN AVCI, Esra EREN*****

Article Information

Received: 12.09.2022

Accepted: 24.07.2023

Online First: 26.07.2023

Published: 31.07.2023

ABSTRACT

To meet the educational needs of teachers who need and want to use technology in their classrooms, this study was created as a school-university collaboration application for the professional development of preservice teachers enrolled in the Computer Education and Instructional Technologies (CEIT) department. The study has the characteristics of an intergenerational mentoring practice since mentors and mentees include different age groups and interdisciplinary since the preservice teachers are educated in a technology-oriented department and they worked with teachers from different branches. The aim of the research is to determine the opinions and experiences of preservice teachers regarding the technological training for teachers and the microteaching processes carried out before such training. The research was designed as a case study. Online interview forms, preservice teacher diaries, group reports, microteaching observations and classroom observations were used to collect research data. In the microteaching phase of the study, preservice teachers' prepared lesson plans for the technologies they would teach teachers and conducted lectures to the instructor and their classmates. In the teacher training phase, they provided training to the teachers for the technologies they could use in their classes. After this phase, they observed teacher's classroom applications using technology. The results of the research show that applications in this study contributed to preservice teachers' field and professional knowledge, helped them to improve their effective presentation and communication skills, and to gain teaching experience and to improve their self-confidence towards the profession. For future applications, it is recommended to provide more systematic guidance to preservice teachers during the selection of technology applications and the teaching strategies to be used, and to increase the number of microteaching sessions.

Keywords: School-university collaboration, intergenerational mentoring, reverse mentoring, microteaching, teacher training

doi: 10.16986/HUJE.2023.497 Article Type: Research Article

Citation Information: Yurtseven Avcı, Z., & Eren, E. (2023). Intergenerational interdisciplinary reverse mentoring: School-university collaboration. *Hacettepe University Journal of Education, 38*(3), 411-430. doi: 10.16986/HUJE.2023.497

1. INTRODUCTION

For the increased quality of education in today's changing conditions, in- depth studies have been carried out in Turkey in terms of technology support in learning processes, especially in terms of infrastructure (Ministry of National Education [MEB], 2018). The achievement of the investments made depends on the knowledge and skills of teachers about these technologies and their ability to apply them in educational environments. In this context, it is key to develop teachers' professional knowledge and skills on the use of educational technologies that can be used to make students' learning meaningful. On the other hand, it is worth noting that the importance of teachers' ability to use current technologies for effective teaching is emphasized in many studies (Beauchamp, Burden, & Abbinett, 2015; Hasan, Khan, & Clement, 2015; Jimoyiannis, 2010; Tweed, 2013). It has been demonstrated in different studies that current technologies such as Web 2.0 tools contribute to effective teaching and are necessary and inevitable for high quality teaching (Eren, Avcı, & Kapucu, 2015; Gaytan & McEwen, 2010; Gerard, Varma, Corliss & Linn, 2011; Hew & Cheung, 2013, Meyer, 2010; Tweed, 2013). However, there are many studies which focus on the need to plan the use of technology well and increase teachers' professional development activities in this regard (Bey, 2012; Desantis, 2012; Ertmer & Ottenbreit-Leftwich, 2010; Lawless & Pellegrino, 2007; Rives, 2012; Tweed, 2013).

Although face-to-face and online in-service professional development activities for teachers are carried out in Turkey and around the world, studies posited that these training is not sufficient for teachers to gain the knowledge and abilities required to use technology in the classroom (Çiftçi, Taşkaya, & Alemdar, 2013; Ertmer, Ottenbreit-Leftwich, Sadık, Şendurur & Şendurur,

* Ethical permission of the study was approved (Eskişehir Osmangazi University Institutional Review Board for Humanities and Social Sciences, Date: 13.02.2019, Number: 2019-03)

** Assoc. Prof. Dr., Eskisehir Osmangazi University, Faculty of Education, Department of Computer Education and Instructional Technologies, Eskişehir-TÜRKİYE. e-mail: zyurtse@gmail.com (ORCID: 0000-0001-7740-743X)

*** Assoc. Prof. Dr., Eskisehir Osmangazi University, Faculty of Education, Department of Computer Education and Instructional Technologies, Eskişehir-TÜRKİYE. e-mail: eeren@ogu.edu.tr (ORCID: 0000-0001-5949-0516)

2012; Gök & Yıldırım, 2016; Ilgaz & Usluel, 2011; Özkan & Deniz, 2014). Teachers reported that these training is insufficient to improve their teaching skills and learning outcomes (Budak, 2012). Instead of professional development studies carried out in a single-session seminar style, professional development activities that teachers congregate with their colleagues constantly in order to improve their teaching skills and work collaboratively to solve the problems they encounter in their professional lives would be more effective (Seferoğlu, 2001). Collaboration in terms of professional development can be understood as the collaboration of educators in the same institution, or it can also be expressed as the collaboration of educators working in different educational institutions.

The role of universities in teacher PD is being discussed more and more and steps are taken towards cooperation between schools and universities. The importance of cooperation with different institutions is emphasized by MEB, and it is underlined that teacher professional development activities should be structured mostly with the cooperation of universities (MEB, 2018). In this context, school-university cooperation is gaining more and more importance in Turkey. Professional development models, which are based on school-university cooperation, either in-service or preservice training, provide an environment where teachers will follow new approaches in education and teacher candidates can develop themselves professionally in practice. Collaborations between schools and the faculty of education are mostly carried out within the scope of Teaching Practice courses. Indeed, there is a need to create opportunities for teacher candidates to practice more in schools, apart from observing and explaining lessons.

In this study, in line with the needs described above, it is aimed to increase the proficiency of teachers in schools from different branches, and to transfer the knowledge and skills that preservice teachers have acquired in the field of technology to a different generation through a reverse mentoring application. Traditional mentoring is hierarchical, with the mentor acting as a "expert" with knowledge and power and the mentee as a "novice" learner. On the other hand, in reverse mentoring, senior, long-term employees are mentored by younger, newly hired staff (Morris, 2017). Murphy (2010) lists developing leadership skills as one of the advantages of reverse mentoring for junior employees (mentors), while senior employees (mentees) may gain cultural awareness and technical proficiency. Morris (2017) argues that reverse mentoring may help junior employees developing their academic integration. At the same time, it may support seniors in improvement of their teaching effectiveness as an alternative active learning strategy.

This is an intergenerational mentoring practice since the mentors and the mentees comprise different age groups. At the same time, this is an interdisciplinary mentoring practice because of the fact that the preservice teachers are students of the Department of CEIT and teachers are from different branches. Intergenerational programs are defined as purposeful and continuous exchange of resources and learning tools between different generations for individual and social benefits (Ellis, 2003). In the teacher training part of this study, reverse mentoring was practiced, while preservice teachers were mentoring on educational technologies, teachers were the 'mentees'. At the same time, this investigation was conducted within the Community Service Applications (CSA) course. In Turkey, the term CSA is used for “community service” and “service learning” and CSA course is a compulsory course in Faculty of Education in universities in Turkey. In this course, preservice teachers participate in social responsibility projects in different form. With the use of this study's application, it is hoped to give preservice teachers a setting in which they can put the knowledge and abilities they have acquired to use, gain from instructors' professional experience, and hone their own professional skills.

In educational settings, intergenerational initiatives have been established since the 1970s to allow collaboration of individuals from different generations and to build bridges between generations (Newman, 1997, as cited in Leedahl et al., 2019). Some of the contributions of these programs are, for the older generations, gaining a deeper understanding of the younger generation, a chance to pass on their wisdom, values and life experiences to the younger generations; increase self-esteem and self-confidence for younger generations; higher sense of worth, acceptance, and respect for both generations, improvement of knowledge and skills, and development of a meaningful, trusting intergenerational relationship (Leedahl et al., 2019; Newman & Hatton Yeo, 2008,). Intergenerational practices in educational settings include studies that focus on social needs (Wang & Chonody, 2013), greater openness to the ideas of the younger generation (Young & Janke, 2013), studies that focus on the needs of adults, and so forth. Another dimension of the teacher training carried out in this study is that it is an interdisciplinary reverse mentoring practice. Interdisciplinary programs are practices that encourage interaction, learning and research (Holley, 2009). Reverse mentoring helps young people handle intergenerational leadership disparities while helping older generations develop their leadership skills (Leedahl et al., 2019). As a result, it promotes both the younger generation to educate others and the elder generation to benefit from the knowledge of the latter. (Meister & Willyerd, 2010; Murphy, 2012).

On the other hand, microteaching practices that enable preservice teachers to prepare for teacher training are as important as the teacher training carried out during the study. Preservice teachers who are not ready for teacher education are likely to experience various problems such as anxiety, nervousness and stress. Preliminary practices to be carried out before teacher training allow the training preparations to be carried out in a systematic way and the process to be productive for both the preservice teachers and the teachers. To expand on the topic, microteaching is a method that was first implemented in the 1960s and has applications in teacher education and various fields in order to increase student quality (Saban & Çoklar, 2013). Furthering, it is a short but excellent teaching and evaluation cycle in which the course is conducted in a small classroom by preservice teachers and then their teaching performance is evaluated (Peker, 2009). The method helps to develop skills such as preparing a lesson plan, choosing teaching objectives, organizing teaching activities, as well as speaking in front of a group and

asking refined questions. While preservice teachers acquire multiple skills related to both the planning and presentation of the lesson in a short period of time, their self-confidence develops in a comfortable environment (Kılıç, 2010). Studies emphasize that only theoretical education is not sufficient in teacher training, and that it is important to provide preservice teachers with an environment to transfer their knowledge to practice (Kılıç, 2010; Nilsson, 2008). In addition, the importance of peer learning in the development of teaching skills is also emphasized (Jackson & Bruegmann, 2009). In this context, microteaching applications, in which preservice teachers conduct research on the use of technology in different branches, plan education, and receive feedback from their peers and faculty members, helped preservice teachers become aware of their strengths and aspects that need to be developed, as well as supported their growth by applying a 'learning by doing' strategy.

1.1. Purpose of the Study

The aim of this study is to determine experiences and opinions of preservice teachers about the intergenerational interdisciplinary teacher training activities carried out and microteaching for preparation of teacher training. This research seeks answers to the following questions:

- What is the microteaching and mentoring experience of preservice teachers?
- What are their views on the contribution of microteaching and mentoring processes to them?
- What are the difficulties they face during microteaching and mentoring practices?
- What are their suggestions for the development of microteaching and mentoring practices?
- What are the observations of the preservice teachers about the effects of the lessons taught by the teachers supported by technology on the students?

2. METHODOLOGY

The study was planned to be a case study. A case study is an empirical qualitative study that employs a variety of information sources to provide a thorough description and investigation of a phenomenon in its actual setting (interviews, observations, documents, reports, etc.) (Creswell, 2013; Yin, 2014).

2.1. Participants

Forty-six preservice teachers studying at the Department of CEIT at a public university have participated in this research. Participants were chosen using criterion sampling. Students in their third year of CEIT have studied undergraduate courses on fundamental concepts and procedures in the fields of education and other technological applications; the course material is consistent with the investigation's objectives. On the other hand, choosing the CSA course in the 2018-2019 academic year was determined as the main criterion in the selection of CEIT teacher candidates. The participants were given code names and their names were kept private; these names were used when direct quotes from the data were made.

2.2. Research Process

In the research, first of all, the process of obtaining permission from the Provincial Directorate of National Education for two secondary schools was requested. As a result of the preliminary interviews with the teachers, 29 teachers were determined in one of the schools and 12 teachers in the other; 8 Mathematics, 6 Turkish, 5 Science, 4 English, 3 Information Technologies, 1 Religious Culture and Ethics, 1 Visual Design, 1 Social Studies teacher, and one faculty member. The faculty member involved in the study was from the Department of Primary Education, and they worked with this faculty member who volunteered to receive training on technology applications, since the schedule of two preservice teachers was not suitable for going to the designated schools. In the first week, the preservice teachers formed groups among themselves and made preferences for the school and branch they wanted to work with. Later, some branch teachers working in the same school formed a group whereas some preservice teachers worked with one teacher. Table 1 presents the schools, branches, teachers and preservice teachers with their code names, and group code names of preservice teachers.

Table 1.
Participants and Groups

School	Subject	Teacher	Preservice Teachers	Group
S1	Informatics	T1	PT1, PT2	G1
S2	Informatics	T2, T3	PT3, PT4, PT5	G2
S2	Religion	T4	PT6, PT7, PT8	G3
S1	Science	T5, T6	PT9, PT10, PT11, PT12	G4, G5
S2	Science	T7, T8, T9	PT13, PT14, PT15	G6
S1	Visual Design	T10	PT16, PT17	G7
S1	English	T11	PT18, PT19	G8
S2	English	T12, T13, T14	PT20, PT21, PT22, PT23	G9
S1	Mathematics	T15, T16, T17	PT24, PT25, PT26, PT27	G10, G11
S2	Mathematics	T18, T18, T20, T21, T22	PT28, PT29, PT30, PT31, PT32	G12, G13
S2	Social Science	T23	PT33, PT34, PT35	G14
S1	Turkish	T24, T25, T26, T27	PT36, PT37, PT38, PT39, PT40, PT41	G15, G16, G17, G18

For the duration of the study, preservice teachers met with the researchers once a week for one hour, and the researchers met with the instructors once a week for two hours to provide training. The duties required of the preservice teachers were established in accordance with the work plan set at the beginning of the semester and communicated with them on a weekly basis in order for the process to go forward methodically. The activities performed by the preservice teachers throughout the study are given in Figure 1.

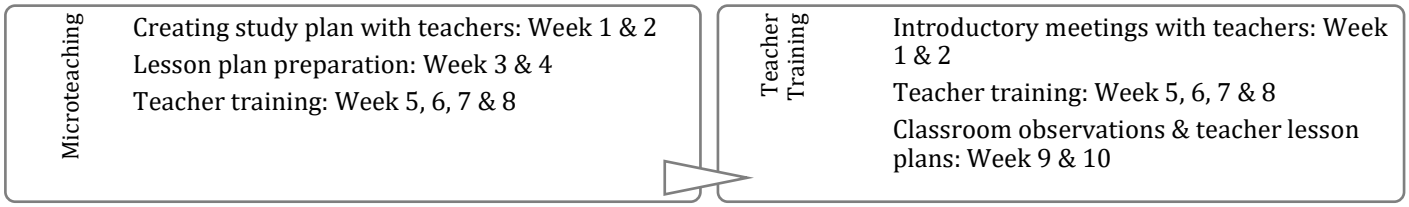

Figure 1. Preservice teacher activities

The planning was facilitated by the preservice teachers' first two meetings with the teachers, and subsequent meetings focused on creating lesson plans and practicing microteaching. They created their own lesson plans for the teacher training on technological applications as part of the microteaching practice process. During the process, feedback was provided on their lesson plans, and microteaching practices were carried out in the following weeks. Simultaneously with the groups who completed their microteaching, teacher training was carried out, and a total of 8 weeks of practice at the school was completed including the planning stage. In this process, technology training was given to the teachers, the process continued with technology applications by the teachers in real classes and preservice teachers' classroom applications.

Preservice teachers implemented their teacher preparation within the parameters of mentorship, following their lesson plans. While one teacher candidate was explaining the topic, her/his peers saw how instruction was carried out. On the other hand, the teachers developed and implemented the lesson plans and materials by discussing the issues that their students had difficulty with and the contributions that technology applications can provide with their colleagues and groups they work with. Then preservice teachers observed the lessons taught by the teachers and evaluated them with the teachers and their peers.

2.3. Data Collection Tools

Data were gathered for the study using an online interview form, preservice teacher journals, a study schedule, group reports, microteaching observations, and classroom observations. The preservice instructors were given templates and instructions for the data collection instruments at the start of the project. In Figure 2, data collection tools are listed.

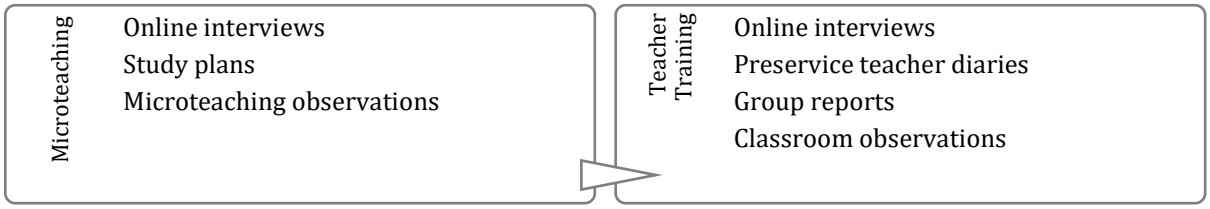

Figure 2. Data collection tools

2.3.1. Online interviews

The eight-question open-ended interview form created by the researchers for the evaluation of microteaching and teacher training practices included questions such as: "What are your thoughts on microteaching? a) Did microteaching improve any of your skills, can you explain? b) Were there any phases that you had difficulty, please explain? c) What are your suggestions for improvement? What are your thoughts on teacher training? a) Did teacher training improve any of your skills, can you explain? b) Were there any phases that you had difficulty with, please explain? c) What are your suggestions for improvement? The online form was applied at the end of the semester.

2.3.2. Study plan

The preservice teachers were instructed to make notes on the topics that would be addressed over the term in the first section of the work plan sheet, the average time interval for the lectures of the related subjects, what technologies can be used during the instruction of those subjects to solve teacher or student problems; in the second part, they were asked to create a work schedule table, an example of which is given in Table 2 in the Findings section.

2.3.3. Microteaching observations

The preservice teachers gave a lecture in the classroom environment where their classmates were present following the lesson plan they prepared before going to their particular school. Lectures were planned to be approximately 20 minutes and were recorded by the researchers. The observations made by the researchers during these narratives were used as a supporting data source.

2.3.4. Preservice teacher diaries

Preservice teachers were asked to write six diaries throughout the term. It is the document in which they write their experiences about the activities they performed throughout the process. Here, they were asked to take detailed notes of their experiences at every stage of the process. The topics discussed in the weekly meetings with the teachers were also recorded in diaries and the teacher training process was ensured to continue more efficiently. Preservice teachers log in their diaries by answering the following questions(a) about the preparations they made before the teacher training (e.g. what research did you do for the branch determined for you, what are the educational technology applications that you plan to recommend to the teachers?), (b) after the preliminary teacher meetings (e.g. which educational technologies did you decide on? which technologies do you plan to use in which units/subjects?), what were your discussions about what it can be used for? c) After the teacher training (e.g. please write down your experiences during teacher training, which questions did you get and what were your answers).

2.3.5. Group reports

Two group reports were prepared throughout the study, for the midterm and at the end of the semester. The tasks undertaken by the group members, the general evaluation of the activities held at the school and notes from the meetings were included in the group reports.

2.3.6. Classroom observation forms

Researchers prepared a form for the observation of student engagement and learning. The preservice teachers used the form for the classroom observations. It included information of the observed course and grade level, the learning outcomes of the course, the difficulties experienced by the students, observations on student learning, interest and motivation.

2.4. Data Analysis

The data analyzed by content analysis technique. Prior to being themed within the context of the research's sub-objectives, the data obtained from the online interviews were first classified and collected under specific categories in accordance with the codes that emerged. While reporting the interview data, direct quotations were used to reflect preservice teachers' genuine experience and thoughts. It was also supported by data obtained from other data tools. While presenting the citations, the participants were shown with code names such as PT1 (Preservice Teacher 1), PT2 (Preservice Teacher 2), etc. Data triangulation was ensured by using multiple data collection tools.

2.4.1. Validity and reliability

The study process was thoroughly described and the results were provided in an understandable manner to assure the research's validity. Diagrams were used to ensure comprehension by allowing readers to see the process as a whole. The topics were further discussed with direct quotations from the participants to strengthen the validity of the analyses. Data variety was

created, the collected data were independently examined by the two researchers, the emergent themes and sub-themes were compared, and this process proceeded until a consensus on the themes was established.

3. FINDINGS

In this section, firstly, the findings related to the planning of teacher training, then microteaching, and finally teacher training are presented.

3.1. Planning for Teacher Training

The planning of teacher preparation is the initial phase of the study. The preservice teachers created a work schedule for weekly training and classroom observations for the use of the technology applications in the classroom after identifying the technologies that instructors needed in the teaching-learning process during the planning phase. The preservice teachers created the "Study Plan" paper following the first two sessions with the teacher and submitted it together with the second-week diary. In the planning document, the subjects that are planned to be instructed with technology applications throughout the term, the average time interval for the subjects, and the technologies that are planned to be used are determined. While determining the topics on which technology applications will be used, the difficulties faced by the students during the teaching of the relevant subject, the contributions that the use of technology can provide, and learning goals were discussed with the teacher. The planning example that teacher candidates and teachers made in the first meeting is given in Table 2.

Table 2.
Sample Study Plan (G13, Study Plan)

Subjects	**Technologies that can be used**
- Problems	- Plotagon
- Ratio - Proportion	- Integral 2.0 https://testhazirla.net/
- Fraction Problems	- Math Editor
- Natural number problems	- Math Editor Online https://www.mathcha.io/
	- Geogebra
	- Cabri II Plus
	- Socratic (Mobile application that allows to see question solutions)
Dates	**Weekly activities**
18 February	- Introductory meeting
25 February	- Planning
4 March	- Introduction of Plotagon ve Integral 2.0 applications
11 March	- Introduction of www.testhazirla.net
18 March	- No class
25 March	- Introduction of Math Editor software, https://www.mathcha.io/
	- Preparation of first teacher lesson plan
1 April	- No class
8 April	- Math Editor application
15 April	- Watching Plotagon animation prepared by the teacher
	- Classroom observation
22 April	- Teacher lesson plan preparation

The preservice teachers held the first interview in order to determine their teacher needs and to plan the technology training that will continue throughout the term. A preservice teacher described this process as follows: *"After we decide the group members, we were present at the school at the times communicated to us. We met our teachers. In the conversation, we had in the teachers' room, we listened to the requests of teachers, and then we explained what we could do"* (PT11, Diary 1). Preservice teachers stated that teachers accepted to use technology in teaching-learning processes for different purposes. Preservice teachers made the following statements regarding the needs analysis they conducted after the first meeting with the teacher: *"Teachers would like to use more colorful things that would attract students' attention, ensure participation of all students and enable more effective learning"* (PT9, Diary 1). *"Teacher 6 said that he would like to do something visual with his students, and he would like to convey the content in a more fun way, such as animation and caricature"* (PT12, Diary 1). *"Our teacher said that he would like to use software that would make students' exams effective and that assessment software would also attract students' attention"* (PT40, Diary 1). As seen in their comments, preservice teachers stated that teachers preferred to use technologies that will help to attract students' attention more, make the content more interesting for the students, and that will lead to higher interaction with students. In addition to these demands by teachers, preservice teachers elaborated on choosing tools that teachers can learn and use easily and that students can access more easily. While some teachers expressed the applications that they need more clearly, such as an animation tool or an evaluation tool, some teachers made more general comments : *"Our teacher stated that we should take into account the financial situation and competencies of the school and the students, taking everyone into account. Teacher didn't have any software in mind. However, the software he asked should help for concretization of abstract subjects" (PT22, Diary1).*

Some groups working with more than one teacher stated that the technologies planned to be used could not be determined in the first meeting due to the differences in the demands of the teachers, therefore the technologies to be used were determined in the second meeting held in the following week. Before the second interview, the preservice teachers made preliminary preparations by taking into account the components such as the teachers' branch, the structure of the subject they will teach, the purpose of using the technology (presentation, evaluation, etc.), and they decided on the specific applications that will be taught after the interview. PT18 shared his opinion on the preliminary preparation they made as follows:

> *In order to determine the programs to be recommended to the teacher, we took notes reviewing the textbooks for the secondary school 5, 6, 7 and 8th grade English classes. According to the notes we took, we thought that there might be problems in grammar and vocabulary. Among the sample applications shared with us, we thought 5th graders can use Animatron and Toondoo applications to explain grammar topics such as Present Continuous Tense, Can, Lets; 6th graders can use StoryBoardThat for was/were grammar topics, and Canva application in 7th and 8th grades. We've compiled a list of applications that we plan to use for different grade levels. We have added Edmodo, Quiziz, Plickers and Aurasma applications to this list and where they can be used in order to go to the teacher with different alternatives (Diary 1).*

Groups decided on technology applications during the second meeting with the teachers. While some teachers longed to be trained in preparing content for lectures, some teachers needed to prepare assessment applications, and some teachers would like to benefit from educational technologies that would make their work easier. While the technologies to be taught are mostly the technologies requested by the teacher, it was also taken into account that the preservice teachers can provide training on the relevant technologies in the determination of these technologies. A teacher's request for students' learning needs was expressed by G9, PT20, in Diary 5: "*…They said that it is important to improve the speaking and pronouncing skills of the students in English classes, and they requested for a program that would help both listening and speaking skills of students as they make recording".* The subjects that teachers requested to receive training on are given in Figure 3.

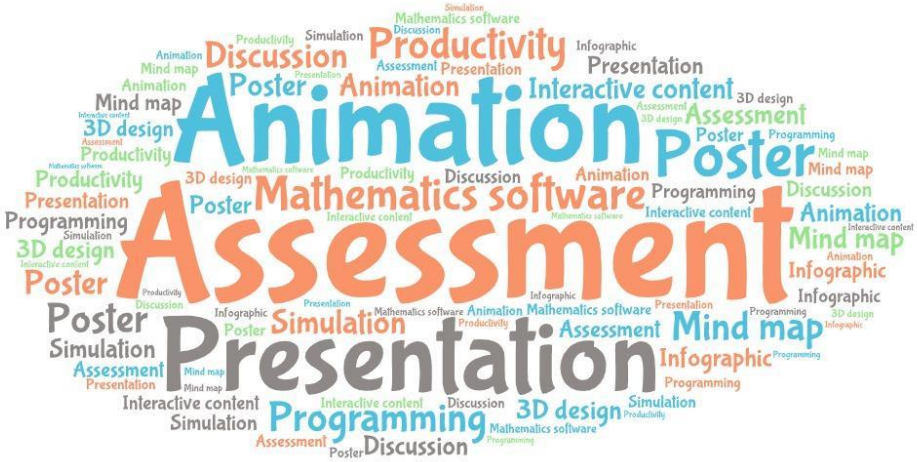

Figure 3. Types of technology applications taught by preservice teachers to teachers

One of the most demanded subjects by teachers is assessment applications. Gamification applications such as Plickers in competition style, applications such as LearningApps, which enable to increase the participation of students and include different types of questions such as matching, short answer and puzzle, have been preferred by most branch teachers. In addition, animation preparation applications, which is another of the most preferred content types, were requested by Turkish, Science, Information Technologies teachers, especially the English branch, and animated video preparation programs such as Vyond, Animatron and Plotagon and Voki were explained to these teachers. Presentation tools such as Prezi, Nearpod were preferred in the branches of Religious Culture and Moral Knowledge, Turkish and Social Studies. Programming tools such as Ardunio and mBlock in the Information Technologies branch, Dynamic mathematics software such as Geogebra and Math Editor in the Mathematics branch were prepared. In the science branch, training was given on field-specific applications such as Algodoo and HP Reveal (simulation, augmented reality). While poster design applications such as Canva were preferred in the Visual Design branch, in addition to other applications in Turkish, Science and English branches, concept map (e.g. Mindmeister) and infographic (e.g. Photoshop) preparation tools were preferred for concept teaching and displaying the relationship between concepts.

3.2. Microteaching Process

Preservice teachers' views on the microteaching process were grouped under three headings: skills gained by microteaching practice, difficulties in microteaching practice and recommendations for the improvement of microteaching practice. Themes and sub-themes were created according to the data obtained from the online interview form, the frequency of expressions was calculated, quotations were made, and the findings were supported by data obtained from microteaching observations and preservice teachers' diaries.

3.2.1. Skills gained by preservice teachers during microteaching application

In the context of this title, the skills that microteaching practice brings to preservice teachers are grouped under two themes pre-lesson preparation and lesson presentation. Under these themes, notably the prominent skills and the frequency of their expression are included.

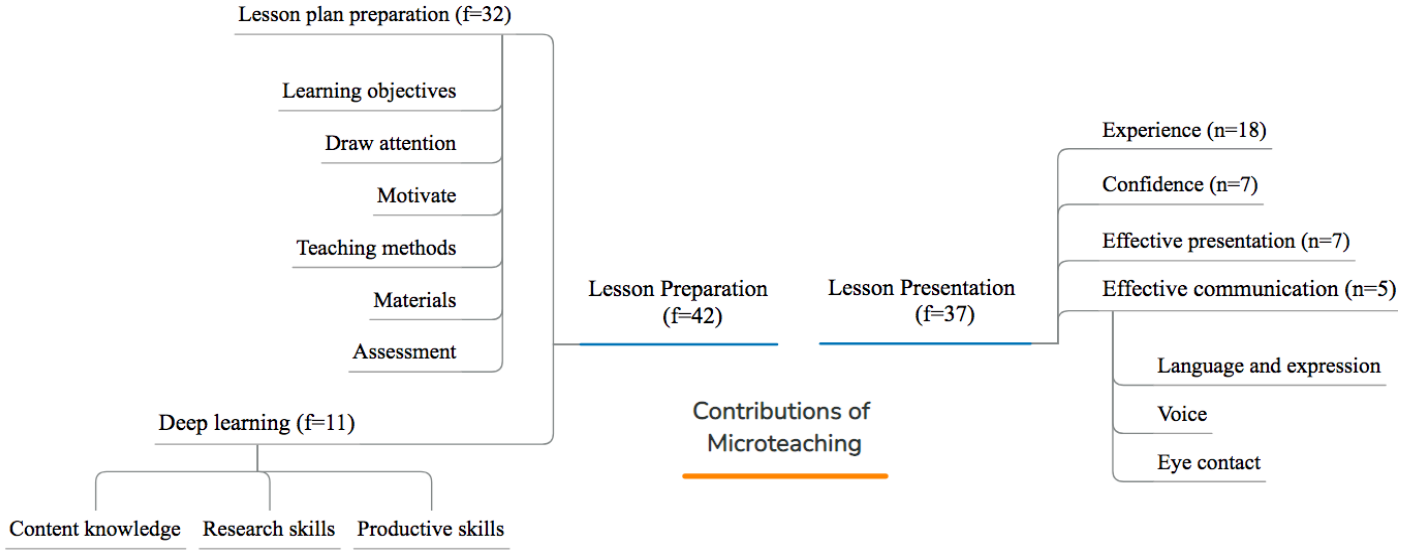

Figure 4. Contributions of microteaching to preservice teachers

In Figure 4, under the theme of pre-lesson preparation, it is seen that it helps to acquire knowledge and skills of lesson plans preparation is the most mentioned contribution of microteaching to preservice teachers, particularly for the participants who do not have experience in preparing lesson plans (etc. PT25). PT39 said that *"I learned what to pay attention to while preparing the lesson plan"*. Some of the participants who had lesson plan preparation experience also reported this experience helped them to improve their knowledge and skills: *"I had prepared lesson plans in my other lessons before. But this time, I have prepared the lesson plan in a more comprehensive and reinforced way"* (PT8), "*... thanks to this application, I think we are now at a level where we can prepare a lesson plan in accordance with the norms"* (PT45).

Some participants evaluated the contribution of the application to preparing the lesson plan within the framework of the stages that make up the lesson plan preparation. One of the participants, PT38 said that *"... I can say that I have completely learned the concepts related to the lesson plan*", PT41 and PT44 *posited "I learned about how to write learning outcomes (in a lesson plan)*", and *"I learned the details in determining the learning goals"* PT9 and PT44 additionally reported that emphasized the teaching methods *"I learned how and how to reach our goal".* They emphasized the contribution of this experience in learning about teaching methods saying: *"I learned how and in which ways to reach our goal", "... At the same time, I found answers to questions such as how the lesson is taught, what are the methods and techniques while teaching the subject*". Some of the participants mentioned that they gained knowledge and skills about the teaching-learning activities included in the lesson plan. Regarding the stage of drawing attention in the teaching-learning process, PT13 expressed his opinion by saying *"I think I learned well where and how to draw attention to the subject..."* When it comes to the motivation phase another participant said: "*...I couldn't write the motivation part in the lesson plan, now I can."* (PT9) PT44 added that *"I learned the things that need to be considered in the selection of materials suitable for the subject and the evaluation part...".* When the first versions of the lesson plans are evaluated in general, it is seen that the participants have difficulties in writing the learning outcomes, attention and motivation, and the processing of the subject. Lesson plan examples and feedback provided by the researchers are effective in the development of preservice teachers' performances.

Another emerging theme within the scope of the pre-lesson preparation phase of microteaching includes the participants' in-depth knowledge of the content they teach. Before the microteaching application, the participants carried out some research for both obtaining information and teaching the content effectively. *"We improved ourselves more... I got to know the software better"* (PT43), *"Even research before teaching contributed a lot to me. I learned some Web-2.0 tools that I didn't know"* (PT6). While PT44, one of the participants, referred to the contribution of microteaching to research skills with the statement: *"I learned in detail the research stages that need to be carried out in order to make a presentation",* PT3 talked about the contribution of the research process to the productivity of the participants*: "I excogitated and researched on How can I explain more clearly what I am missing? in order to make applications in which teachers could be involved without getting bored".* Accordingly, it can be said that the application contributes to the professional and field knowledge of teacher candidates.

In Figure 4, under the theme of lecture presentation, the most reported contribution to preservice teachers in gaining experience on teaching. PT33, one of the participants, explained gaining lecture experience as follows: "*I learned how to teach a lesson... what preparations to make before teaching the lesson, such as preparing a lesson plan, and most importantly, how the lesson should be taught, how the students should be actively involved, and how students should pay attention to the subject in the lesson.* Some

participants mentioned the contribution of microteaching to reduce the nervousness caused by public speaking, to relax psychologically and to gain self-confidence. One participant expressed his experience as follows:

> *It was exciting to present in front of the public and the camera. Thanks to this rehearsal we did, I think my first lecture was successful. If it hadn't been done and our advisor didn't approve, we might have experienced anxiety at the school we went to... It gave me psychological relief rather than a theoretical contribution.* (PT18)

Some of the participants stated that the lecture presentations helped them gain effective presentation and effective communication skills. *"Microteaching helped me develop expression and language skills and getting used to the teaching environment."* (PT40), *"Microteaching helped me develop skills such as mastering the subject, choosing appropriate material, making eye contact, paying attention to my tone of voice during the presentation."* (PT9)

3.2.2. Difficulties experienced during microteaching

While most of the participants (25 people) stated that they did not experience any difficulties in the microteaching process and even enjoyed it, three of them did not answer the question. The difficulties experienced by the other participants are given in Figure 5 under two themes: Preparation for the lesson and presentation of the lesson.

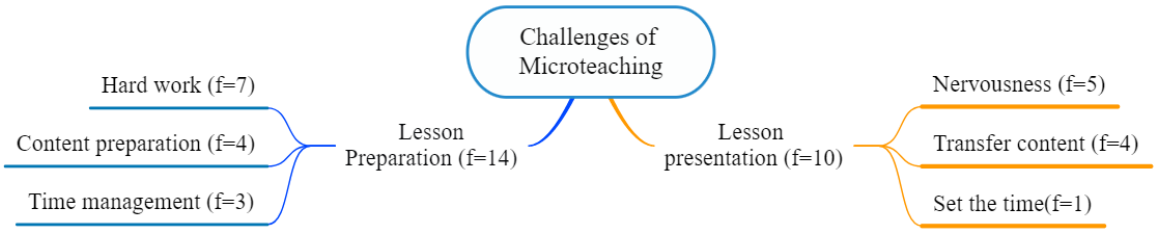

Figure 5. Difficulties experienced by preservice teachers in the microteaching process

According to Figure 5, the participants stated that working at the preparation stage for the lesson requires effort and time; they complained that they had to work hard to fulfill their responsibilities; and that they had difficulties in time management when they had other coursework. PT45 explained this situation *as "I had some difficulties in terms of time planning due to the intensive preparation phase and the materials to be prepared for microteaching applications, and my busy school and daily life".* PT20 said *"I had problems researching some subjects and finding technologies that are suitable for teachers"* and PT2 mentioned he had difficulty while preparing the content*: "It was a bit difficult to try to translate the code block into the mBlock program that I have never used before".*

During the presentation of the course, the most reported difficulty is nervousness. The opinion of PT25 from the participants: *"The most difficult stage for me was the application of microteaching and the process of teaching the lesson. The nervousness created here made me speak faster during the practice process and as a result, I swallowed some words".* In the words of PT16, *"The only thing I had difficulty with during microteaching was that I was generally nervous while presenting in my own class. Other than that, I had no problems".* Another participant said "*...I had a hard time deciding where to start in my presentation. But I learned that I had to start from the simple to the difficult"* (PT9) stated that he had difficulty in transferring the content with his words. PT18 explained time management was hard during the microteaching*: "I had trouble using the time effectively during microteaching... It was difficult to lecture, while thinking about if I exceeded the given time".*

3.2.3. Recommendations for the development of microteaching

The suggestions of the participants for the development of microteaching are presented in Figure 6 under three themes: Preparation for the lesson, presentation of the lesson and video material.

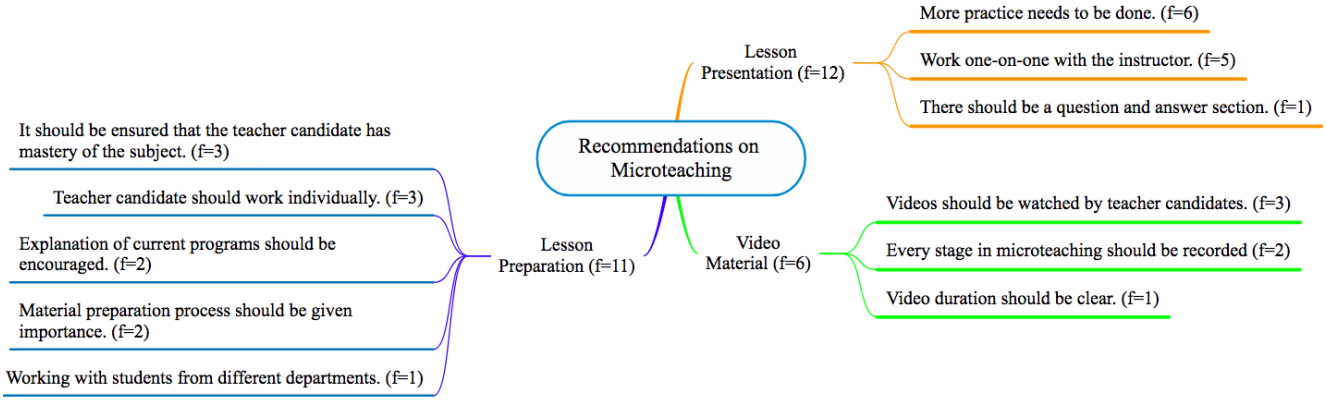

Figure 6. Suggestions of the participants for the improvement of microteaching

According to Figure 6, some participants emphasized that microteaching practice should be structured in a way that enables preservice teachers to master the subject that they would teach. While deciding on the educational technologies to be taught, brainstorming in the classroom environment and guiding the preservice teachers about the presentation of current and effective programs, giving importance to the materials to be used in microteaching, and working with students from different departments from the field of the teacher they work with are among the other suggestions of the participants.

During the presentation of the course, the participants suggested that more than one presentation should be made within the scope of microteaching practice. In addition, one participant stated that adding a question-answer section to the lecture would help create a more realistic environment. Finally, regarding the video material, the participants stated that it would be beneficial to watch the recorded lectures and make self-criticism by themselves.

3.3. Teacher Training Sessions

The preservice teachers, who prepared a lesson plan for the training and conducted microteaching following this plan, started their weekly teacher training after making the necessary arrangements in their plans with the feedback they received from the instructor. In this section, based on the data sources related to teacher training, the findings related to this process are gathered under three main headings: The contributions of the teacher training to preservice teachers, the difficulties experienced during teacher training, suggestions for improving teacher training.

3.3.1. Contributions of teacher training

In this section, while frequencies in Figure 7 are given based on online interviews, exemplar comments are also given from preservice teacher dairies and group reports. Additionally, findings from the other data sources support these results. For example, researcher observations during microteaching sessions reveal the improvement on communication and planning skills of preservice teachers. Additionally, improvement on their lesson plans, teaching strategies and material development were supported by microteaching, lesson plans and teaching materials they have submitted. When the first and second lesson plans were compared during microteaching sessions and during the evaluation of the submitted plans, the improvement in lesson plan preparation skills were observed.

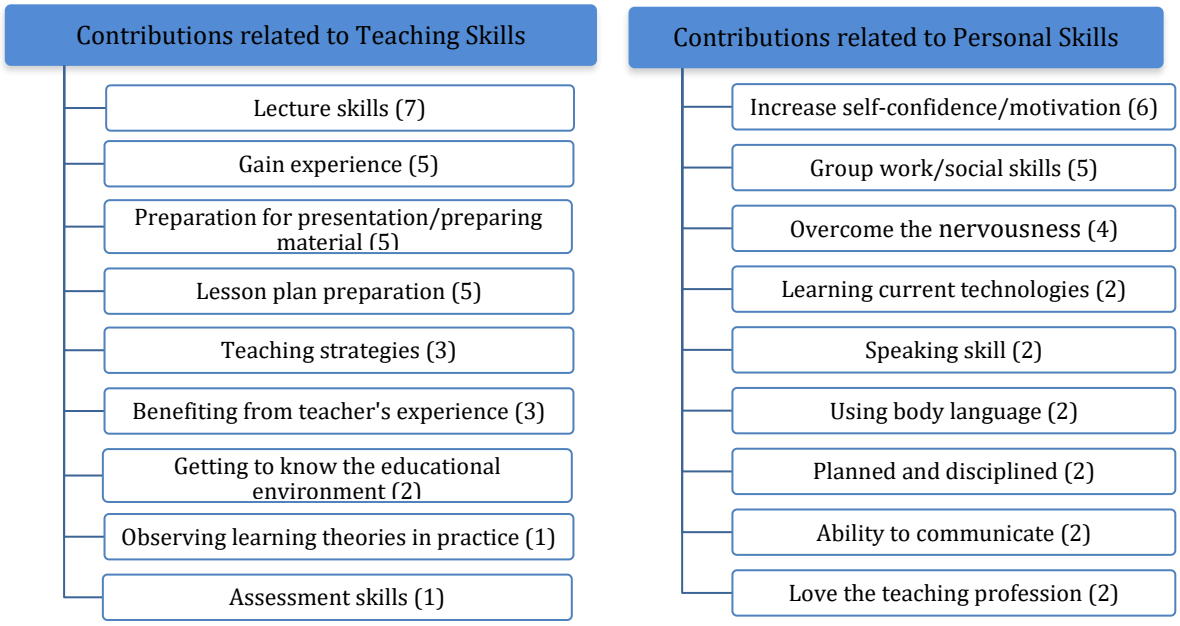

Figure 7. Contributions of teacher training activities to preservice teachers

As seen in Figure7, teacher candidates benefited from the teacher training sessions in many ways. They reported contributions of this process in their communication skills, making connections between the theoretical education they received during their undergraduate experience with practice, in addition to many presentation and lecturing skills. PT21 explained their nervousness and his overall evaluation and thoughts of the teacher training process as follows:

> *"This application attracted the attention of our teachers. Of course, we were very interested and excited. Both that we were going to go to the schools for the first time, and that we were going to teach the teachers had an effect on our nervousness. It has been an effective application for me. I learned some Web-2.0 tools that I didn't know".*

In their research diaries, preservice teachers explained that they have applied several teaching strategies to ensure teacher learning. They repeated as needed and required teachers to make applications after their explanations: *I tried to explain the*

parts that I did not understand by going back. Because I thought it would be more efficient if I did it like this. I think our training process was good and effective (G17, PT40, Diary4).

> *"Afterwards, we asked our teachers to make practical examples. It was observed that our teachers were able to perform the desired applications. Due to the interest of our teachers in computers, our lessons were fast and fun. He had to show some features that were not in the lesson plan"* (G10, PT25, Diary4).

> *"By entering the Create section, I showed step by step how to make an example quiz. We discussed how we could use the contest I created in the classroom, then I asked them to participate in the contest I created together…Later, I asked our teacher to prepare this quiz, we supported him on the points where the teacher got stuck while preparing the questions"* (G3, PT7).

> *"We generally taught it in long ways, but because we thought it was more permanent this way. We also stepped in where the teacher lost while he was working. Then, after making some arrangements with the teacher, we designed a very nice invitation card. Thus, we have successfully completed our cours" (*G7, PT17).

In the group reports, preservice teachers also talked about how they applied active learning strategies during teacher training sessions. Group reports additionally present positive findings about preservice teachers' motivation, group work, planning and social skills. For example, PT3 from G2 and several other participants talked about division of work both for the presentations and during the training sessions.

> *"The attention of our teachers was on us throughout the training. We continue our training by observing our teachers simultaneously without boring our teachers. As evaluation criteria, we ask our teachers to make the same or similar applications after the training. We do this for all training. In cases where our teachers have difficulties in practice, I or my other friends intervene immediately and complete our education by making practice from scratch if necessary. As important as the training is, the post-training outcomes are just as important to us"* (G2, PT4).

> *"I think it's a really nice experience since it's like a small internship. I think that every member of the group has done their part. My group mate and I did our best in this regard. In fact, we made progress in the training sessions without conflict with the teacher, just as we planned before the lesson without conflict within ourselves. We had a good experience, I think we got through it successfully"* (G7, PT16).

> *"Throughout the process, we tried to assume an equal role with our group mate"* (G10, PT24).

> *"I tried to help my group mate as much as I could during the narration. Next week, my group mate will explain the continuation of the program"* (G15, PT36).

PT24 (Diary3) explained his thoughts about teacher training and its effect on him as teacher candidate saying:

> *"We are very lucky to have the experience of teaching as teacher candidates. This early experience of teaching enabled us to anticipate the problems we may encounter in our future teaching life. The fact that the teaching process was effective at times gave hope and gained self-confidence, and sometimes because of being too excited, it made me question whether this job is for me or not before becoming a teacher".*

PT8 added that the overall experience of teaching was advantageous in terms of their professional development: "*It was very nice that a teacher candidate gave training specific to his field to a teacher. We have improved ourselves and teachers learned Web 2.0 tools that they did not know. Teaching someone else outside of the faculty took ourselves a step further".* According to PT29, explaining the same subject to each individual teacher in different ways improved her perspective and ability on the subject she taught. PT13's this comment shows that teacher training additionally helped teacher candidates to improve their self-confidence skills: "*If I can add something to the teachers, I think I can add something to the students too".* Teacher training experience and observing how teachers apply what they have learned in the real classroom also helped some of the teacher candidates make inferences for their future teaching. For example, PT6 said that:" *In my future career, I learned that I have to go to every lesson prepared".*

3.3.2. Difficulties experienced during teacher training

Preservice teachers were asked about the difficulties they experienced during their teacher training in the online interviews. While five of the participants said that they had no difficulties, one participant did not comment on this question. The answers given to this question were grouped under three main headings as seen in Figure9.

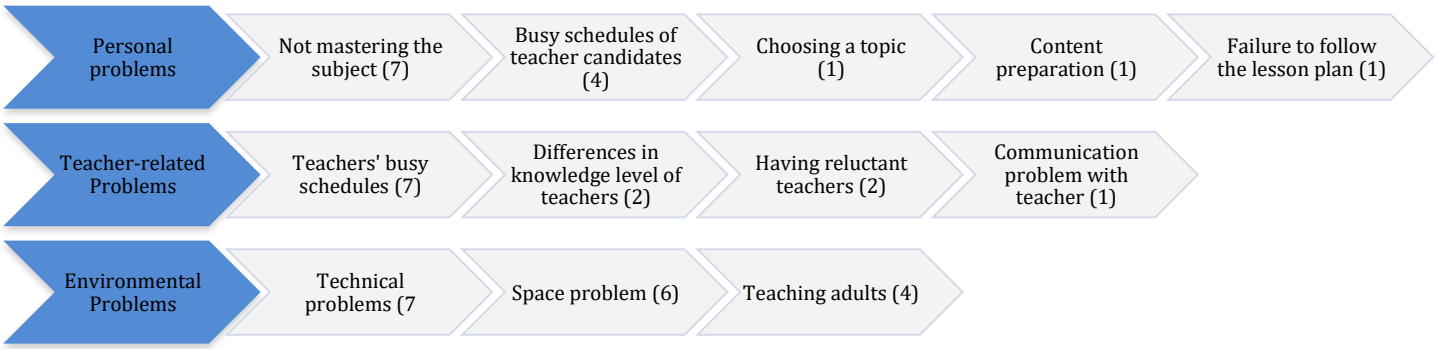

Figure 8. Difficulties experienced during teacher training

The most frequently mentioned problems by the participants are finding common time or keeping the training session short due to the teachers' busy schedules, getting excited for teaching adults for the first time, technical impossibilities such as not being able to provide the necessary space at the school for the training and not having an internet connection. In addition, some preservice teachers found the activities carried out very intense and tiring, while some preservice teachers stated that they did not have a good grasp of some technologies or that they made a significant effort to learn because the technologies to be explained were chosen by the teachers.

In the diaries, they prepared about their weekly work, the preservice teachers mentioned that when they could not find a suitable classroom or laboratory, they made the lectures in the teachers' room and this situation distracted them and the teacher (etc. G8, G17). They also stated that they had problems with internet connection from time to time (etc. G17). There were also groups that stated that they and their teachers brought their personal computers during the training because there was not always suitable equipment in the environment they worked in or because the existing equipment was running very slowly (etc. G8, PT18). A similar comment is: "*Both applications required an internet connection…We tried internet connection in the teachers' room and the officer's room, but we could not connect. When we were in a position to cancel the session, we took care of the problem"* (G6, PT13). Some exemplar comments from the online preservice teacher interviews are given below:

> *"While I was teaching adults, I was hesitant, even though I had a good command of the subject. Being in the teachers' room increased my tension a little more. At first I had a hard time choosing a topic. There were a lot of resources and it was really hard to choose from at first, but seeing the teachers' shortcomings, this selection circle got narrower and easier to choose from there than if I did it at first"* (PT32).

> *"The stage I had difficulty was only nervousness, I overcame it with the understanding and sincerity of the teachers. We had some spatial problems during the training, we did our first lesson in the laboratory, but we did the others in the teachers' room. It was a bit loud, but on the other hand, we had the chance to help more teachers. Overall it was nice and fun"* (PT30).

> *"Since there were four different teachers and four different levels of knowledge, we used different instructional strategies for each of them, and we explained with different examples. It was a difficult stage for all of us"* (PT29).

> *"I did not have much difficulty during the applications, in fact, I had no difficulty in teaching because our teachers were very interested and curious… Our teachers did not have any difficulties in learning the subjects. This was also an advantage for us. It was also very good that we worked with an English teacher, since English is a field intertwined with technology"* (PT21).

3.3.3. Suggestions for improvement of teacher training and general comments

Preservice teachers were asked about their suggestions to improve the experience they gained during this study. Some of the participants argue that teachers were not well-informed about the whole process. Indeed, *raising awareness among teachers* (4) is the most reported suggestion. Secondly, groups mostly mentioned they had a hard time finding a convenient place for teacher training. Thus, the second most reported suggestion is *providing the working environment* (3). Some other suggestions were *to increase the time devoted to training* (3), *more systematic planning* (3), *classroom applications by preservice teachers* (1), and *conducting a holistic training for instructional technologies instead of specifying* (1).

3.4. Classroom Observations

The groups who completed their teacher training asked the teachers to prepare a lesson plan in which at least one of the technologies they were trained was used, and to apply it in their classroom. During that class, preservice teachers were present in the classrooms and made observations. In online interviews and observation forms, participants were asked about their

observations about the use of technology in the classroom. These questions are: *Did students experience difficulties while using technology in the classroom, what are your observations? What did you observe about student behavior/learning? Do you think the technology used contributes to students' learning? What did you observe about students' interest, motivation and class participation? Do you think that the technology used contributes to the student in terms of interest, motivation and course participation?*

In this section, firstly, brief information about the classroom environment in which technology is used is given, then the difficulties experienced by the students during the use of technology, the contributions to their learning, findings about student interest and motivation are given. Group6 could not make classroom observations due to some special situations in the school, as for G20 could not make classroom observations since the technologies were not actively used in the class during the study period. PT40 from G17 explained the discussions with the teacher about the classroom observations in Diary 6 saying:

> *"After our friend finished his lecture, we talked about the application part. First, we chose one of the programs described and suitable for the class. Then, we asked our teacher to prepare a material to be applied using the program we chose, and we talked about how the application would be fun for the students. We told our teacher that he could contact us if he has any questions during the material preparation process".*

3.4.1. Learning environment

Classroom applications were carried out sometimes in classrooms and sometimes in computer laboratories. For example, G3 states that every student had a computer, keyboard, mouse, and monitor in the learning environment they observed, while G8 stated that the teaching they observed took place in a classroom environment where everyone sat in pairs with one-person benches placed side by side.

In general, the preservice teachers stated that the classroom environment was quieter and the students listened more carefully due to the use of technology. G12 explained the excitement of the students by saying *"Even though the learning environment was a bit hectic, the students tried not to make too much noise. We almost had to start the lesson early as students learned that we were going to do activities during their recess".* While G9 described a similar classroom environment with the following statements on the observation forms, they also stated that the students were more involved in class with the use of technology:

> *Everyone seemed to be listening because the classroom environment was quiet. More effective learning environment was created engaging students more in class. The biggest factor in this is definitely e-book preparation. Because technology caught their attention, they tried to decipher the prepared material.*

G2, on the other hand, explained in detail how they made a lecture in a difficult-to-manage classroom, but how they made the classroom environment ready for learning with the use of technology:

> *We had a lot of difficulties during the classroom observation, since we observed a class that the management was very difficult. Some students were getting up from their seats and talking to their friends. We helped the students to ease the teacher's work. In order to calm the class, the teacher gathered the students in a circle in the middle of the class and played the attention game. After doing this, the classroom was better and quieter than before. Then I showed them the "obstacle avoiding robot" game I made with Arduino at the teacher's desk. Before showing it, I explained how bats communicate. Bats send a sound, if the sent sound comes back, it means there is an obstacle. Arduino sends the "Trig" pin sound wave. The "echo" pin detects if the sound wave comes back and accordingly our robot goes "right", "left", "forward" and "backward".*

3.4.2. Cognitive and Affective Contributions

In this section, first of all, the views of the preservice teachers about the contributions of technology applications to the students are given based on the expressions they used in the interviews, together with their frequencies. Then based on the expressions in the observation forms are presented with the direct quotations from the participants. *Making the lesson easier to understand* (5)*, stimulating curiosity* (5)*, persistence of knowledge* (4), *increased student motivation* (3) and *increased student participation* (2) are the most reported contributions to students.

When asked about the contributions of technology applications, the most mentioned feature by preservice teachers was visualization of the content (e.g. G4, G5, G18). G4 expressed the cognitive aspect of technology use with the following statements: "*Computer, infographic and video in CS6 program were used in this course. The contributions of the technology used are to reinforce the subject with many visuals, to obtain more information with many sources, to be remembered immediately and to have a high permanence".* Similarly, G5 stated that the use of interesting visuals is important for the effectiveness of technology applications: "*Most of the students have visual memory and visual intelligence. Especially in lessons such as science and mathematics, they are more affected when they go beyond verbal and numerical education and become animation and visual".* G8, who also practiced in the English branch, emphasized the visualization feature of technology in the educational game they prepared, and stated that this situation allowed students to internalize the content and permanence in learning. In addition, they stated that the students

sometimes moved away from the main content due to the competition between the students during the applications. On the other hand, G7, which practices in the Visual Design branch, emphasized that accessibility is high because they work with programs that do not require technical knowledge in technology applications where they have students design t-shirts, and they receive positive feedback because the applications are practical and time-saving.

G11 applied in the branch of Mathematics and used geometry software. Among the learning outcomes of the course, there are gains such as explaining the relationship between the cube and the point, explaining the cube part and the ray and showing it with a symbol, constructing a line segment equal to a cube part. They expressed the contribution of the software used in the transfer of this content to the students with the following statements:

> *"Students make changes in the direction they want by relocating objects or using the slider. When they move independent objects, they can observe how dependent objects are affected. These achievements, obtained in a dynamic environment, offer students the opportunity to solve problems".*

G13, who also practiced in the field of Mathematics, underlined their observations that the visualization provided by the use of technology facilitates learning. They stated that the content is presented in more detail by showing the figures in three dimensions, and that the success scores of the students in the quizzes increased as a result of these applications. G15, who practiced in the Turkish branch, emphasized that they observed that time was saved in the classroom with the use of technology, and that difficult subjects were easier to understand with the use of technology.

G8, who practiced in the English branch, stated that the visuals used in technology applications provided permanence in learning, but sometimes students distracted from the content by paying more attention to these elements. In addition, they argued that the students could not do enough practice in writing skills, since the practices they used were mainly speaking and listening.

In general, since gamification, competition and visual use are predominant in technology applications, almost all groups emphasized that students' interest and motivation were very high during the applications. G3 explained the general atmosphere in the classroom they observed with the following expressions: "*The teacher said that he would enter the classroom and hold an award-winning quiz. The students were excited when the award-winning quiz show was mentioned… The students answered the questions with enthusiasm and enthusiasm throughout the competition… The students said that they had a lot of fun in the competition and they would like to compete again".* G2, which makes applications in the field of informatics, expressed the effect of the animation they prepared on attracting the attention of the students with the following statements: "*The students had difficulty focusing at the beginning of the lesson. However, when we got to the narration and showed the animation we had prepared before, we saw that everyone was watching in silence. I honestly did not think that animation would work so well".* Another group working with the informatics branch teacher, G1 included the following statements in the observation forms: "*Arduino circuit elements draw the attention of the students, so they perform their examples in a fun way in the application part. Seeing that the circuit they made at the end of the practice works makes them more motivated for the lesson".*

G5 admits that the common use of tablets and smartphones in their daily lives is effective in their positive attitudes towards the use of technology in the classroom. G8, on the other hand, stated that the use of technology by saving time and making the lesson fluent was effective in ensuring the continuity of student interest and preventing distraction. G11, G12 and G13 emphasized that the students who remained silent during the lecture also observed that their participation in the lesson increased during these practices. While G14 and G15 confessed, that students had fun while learning during the applications, G11 stated that with technology applications, student-content communication increased, the content was easier to understand and in-depth learning took place. The fact that the applications are interactive and the use of interactive whiteboards during the applications are also sharply focused as other factors that positively affect student participation and motivation:

> *"Since the students were going to make applications on the interactive board one by one, they listened to their teachers with great care. They were always actively participating in the class. At the time of the assessment, I could see that almost all the students had raised hands. The students were interested in the class and their motivation towards the lesson was good"* (G14).

> *"The teacher also seems more motivated while teaching with technology. It was a different experience for the students. With the course material that was prepared with technology, we saw how understandable and simple the subject of Mathematics is. In the conversation, we had with the teacher after the lesson was over, he mentioned that he received different types of questions about the subject from the students after the technology application"* (G11).

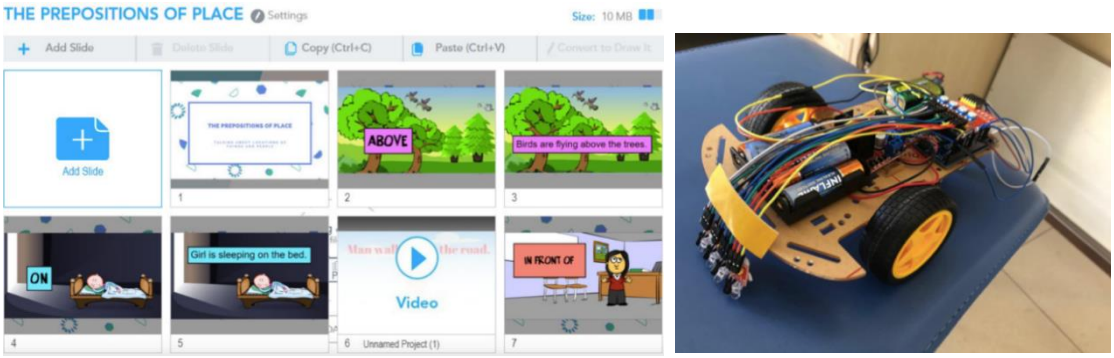

Figure 9. Exemplar technology materials

3.4.3. Difficulties experienced by students

While the groups mostly identified, the difficulties experienced by the students during the use of technology, G2, G4 and G12 mentioned the difficulties experienced by the students before the use of technology, that is expected to be solved with the use of technology. G2 stated that the most important problems were focusing on the lesson and comprehending abstract events. G4, on the other hand, associated the problem of understanding the subject with the visualization of the content and included the following statements in the classroom observation form: "*When there was no visualization, they could not grasp the subject well, and those who understood had problems of forgetting immediately. Lack of attention or immediate distraction from students in the absence of attention-grabbing material".*

While the groups generally acknowledged that the students did not experience any difficulties, the most reported difficulty was the comprehension of the content or getting used to in the first stage of technology applications, especially in classrooms that do not use technology applications very often. It was stated that such difficulties were not experienced after a while with the efficient instruction of the teachers and the follow-up of the students. G16 stated that they had matchmaking in the technology application they used, and that some students had difficulties with the interactive whiteboard. G3 noticed that since the technology application was carried out through the projection during the classroom observations, the students had difficulty in reading the questions reflected in the projection and raising the answer.

While G8 stated that in general, students do not have difficulties in technology applications due to their close relationship with technology, they admitted that difficulties experienced due to different reasons and technology applications can cause students to distance themselves from the content from time to time, and that their presence in the classroom as a researcher can cause distraction for some students: "*Students talked a lot among themselves. They got too caught up in the app. They made unnecessary comments on the images. They were distracted because we were strangers in the classroom".* G9 stated that some students had difficulties due to the fact that the materials were completely in English as they practiced in the English branch. Some groups using assessment tools as a technology application opinionated that some students had difficulty remembering the content due to the time elapsed between the instruction of the subject and the use of assessment materials. G19 expressed the reduction of the difficulties experienced by the teachers' efforts to involve students in the lesson as follows:

> *"Students who did not use technology before, thinking that they could not do it, remained silent, came to the blackboard at the teacher's request and solved the question as we showed. Apart from that, the students did not experience any difficulties".*

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

This study was designed as a school-university collaboration application. During this study, preservice teachers met with school teachers and made plans for the technologies that teachers needed in their classes, then carried out microteaching, and gave technology training at schools, finally made observations of the technology-supported classes. The views and experiences of preservice teachers regarding the microteaching and teacher training were evaluated under four main headings: planning of technology training, microteaching, teacher training and classroom observations.

Findings related to the planning phase of teacher training on technology applications show that teachers aim to attract students' attention, facilitate learning, and increase motivation and participation through educational technologies. Teachers benefit from educational technologies for reasons such as providing visualization, higher student attention, concretizing learning, making learning permanent and fun, increasing classroom interaction and increasing the efficiency of the class (Boz & Özerbaş, 2020; Kolburan Geçer & Bakar Çörez, 2020; Sarı & Altun, 2015). When the technology applications demanded by teachers were examined, the most demanded ones are the measurement and assessment tools in terms of both ensuring active participation of students and determining their learning levels and deficiencies. Accordingly, teachers especially need the use of technologies where students can take an active role in the course and interact with each other. Today, there are many instant feedback systems such as Quizizz, Kahoot, Nearpod, Wooclap, Mentimeter, where teachers can both teach their classes interactively and

manage their assessment and evaluation processes. It is foreseen that the popularity of these technologies will increase with the widespread use of current learning approaches such as the flipped learning model, which require students' pre-class preparation and emphasizes students' active participation in the learning process.

Animated video and presentation applications that teachers can use during the transfer of course content are the second most demanded applications. In the literature on the subject, presentation tools are at the top of the sources that teachers use most in the teaching-learning process (Kolburan Geçer & Bakar Çörez, 2020; Sarı & Altun, 2015). It is preferred by teachers because of the advantages such as conveying the message to the target audience in a concrete and simple way in a short time, being consistent during the teaching of the same subject in different classes, and being able to be used repeatedly (Eryılmaz Toksoy, 2020). In addition, teachers notably demanded video applications where they can convey the learning content through stories and animated characters instead of classical presentation programs, make the content dynamic with operations such as adding music and effects, and use them both as presentations and videos.

In addition to assessment and presentation, when it comes to the teachers in the branches of Information Technologies, Science and Mathematics desired more field-specific software. Block-based coding in the Information Technologies classes, simulation software in the Science classes and geometry applications in the Mathematics are among the technology applications that are in demand in concretizing abstract concepts and facilitating the students' conceptualization of knowledge. Finally, visual applications such as concept maps, infographics and posters, which are used more and more every day, are interactive content preparation applications that provide the opportunity to add questions, provide information and give feedback during the presentation of the subject are among the most demanded applications.

The microteaching process and the findings, which constitute the second stage of the research, are discussed under three headings: the skills gained by the microteaching application, the difficulties experienced in the microteaching application, and the suggestions for the development of the microteaching application. While the skills that the application gained to the preservice teachers and the difficulties experienced during the process were grouped under two themes as pre-lesson preparation and the presentation of the lesson, there was an additional video material theme in the suggestions about microteaching.

It has been concluded that microteaching contributed the most to preservice teachers in preparing lesson plans, especially writing the learning outcomes, teaching-learning activities, and measurement and evaluation in a lesson plan. In addition, it has been determined that the preparatory studies carried out before the application of microteaching contribute to the development of productivity skills, which include determination of the teaching strategies to convey the content, as well as conducting detailed research about the subject. Akkuş and Üner (2017) emphasize that microteaching especially the planning phase contributes to teacher candidates. In addition to its contribution in terms of lesson plan preparation (Güler, 2020; Özçelik, 2017; Sevim, 2013) in the studies, microteaching increases the content knowledge, pedagogical knowledge, and pedagogical content knowledge (Canbazoğlu Bilici & Yamak, 2014; Güler, 2020; Karataş, Cengiz & Uludüz, 2020; Kılıç, 2010; Peker, 2009) are in line with the findings of this study.

'Gaining lecture experience' is the most reported contribution of microteaching under the theme of lecture presentation. In addition, it has contributed to the preservice teachers in reducing the nervousness caused by public speaking, overcoming the anxiety experienced before teacher training, and thus gaining self-confidence. Effective presentation and effective communication are among the other skills that preservice teachers emphasize under the theme of course presentation. In the literature, the fact that microteaching provides experience in terms of teaching experience stands out as a common finding of many researches (Akkuş & Üner 2017; Canbazoğlu Bilici & Yamak, 2014; Güler, 2020; Kılıç, 2010; Özçelik, 2017; Peker, 2009). In addition to gaining experience, other positive aspects that stand out in other research include improving their presentation and communication skills (Akkuş & Üner, 2017; Kılıç, 2010; Sevim, 2013) and supporting their self-confidence (Karataş et al., 2020; Özçelik, 2017; Peker, 2009; Sevim, 2013) are similar to the results of this study.

In the study, the majority of the preservice teachers did not experience any difficulties in the microteaching process and even enjoyed it. The opinions of the participants who encountered any difficulties during the process were discussed under two themes: preparation for the lesson and presentation of the lesson. It was found that the participants struggled with time management since they had to work hard to complete their duties related to the theme of lesson preparation in addition to other course obligations. Other difficulties faced by preservice instructors during the course preparation include choosing the technological application to be taught and developing the course material. Beginning with the problems preservice instructors have when presenting the course, they start to feel anxious. The most noticeable drawback of microteaching is the uneasy feeling that results from videotaping or the classroom setting where their peers are present (Canbazoğlu Bilici & Yamak, 2014; Güler, 2020; Özçelik, 2017; Peker, 2009; Sevim, 2013). On the other hand, not knowing the way to follow during the transfer of the content and not being able to adjust the time are among the other difficulties experienced by the participants. The inability to adjust the time during microteaching is another weakness of the method, which is also included in other studies (Güler, 2020; Peker, 2009).

Preservice teachers' suggestions for the development of microteaching were grouped under three themes: preparation for the lesson, presentation of the lesson and video material. Suggestions of the participants under the preparation for the lesson theme

are structuring the microteaching practice in a way that enables preservice teachers to master the subject, working individually instead of in a group, brainstorming in the classroom when deciding on educational technologies and guiding preservice teachers about presenting current and effective programs, giving importance to the materials to be used in education, and students from collaboration with preservice teachers that are studying the same subject with the teacher. In the theme of the presentation of the course, making more than one presentation within the scope of microteaching practice and setting a comfortable environment suitable for one-on-one working with the instructor are among the prominent suggestions. Making more presentations within the scope of microteaching is among the suggestions that come up frequently in other researches (Akkuş & Üner, 2017; Özçelik, 2017). Additionally, participants suggested that the entire lecture could not be recorded and a self-criticism could be made by watching the recordings. In the scope of the research, due to the large class sizes and limited lecture hours, and the video recordings could only be watched by the faculty members.

For the teacher training part of the study, the most reported contributions of teacher training activities related to proficiency to the preservice teachers are improvement of lecture skills and gaining experience. Preservice teachers conducted training activities at least for four weeks and initially they prepared lesson plans and performed microteaching at least once before their teaching. Thus, improvement of lecture skills and gaining experience should be a natural provision of the training activities and also, teaching activities that were completed during microteaching should have contributed to the preservice teachers' lecture skills and helped in gaining experience. The other two most reported contributions are preparation for presentation/preparing material and lesson plan preparation. These were also reported among the stipulations of microteaching with higher frequency, so in some ways these two skills are mostly related to the microteaching activities. At the same time, there are contributions like learning strategies, benefiting from the teacher's experience, getting to know the educational environment, observing learning theories in practice, and assessment skills. These findings present that while preservice teachers provided training teachers on technology applications, they also gained rich experience related to teaching proficiency and learned from teachers in a significant way. This finding is consistent with research that suggests reverse mentoring improves on participants' abilities (Murphy, 2012) and that interdisciplinary intergenerational training gives students the chance to supplement their classroom instruction with real-world experience (Leedahl et al., 2019). Newman and Hatton Yeo (2008) added that older people contribute to the community by serving like learning resources.

In terms of personal skills, contributions such as self-confidence, social skills, overcoming the nervousness, communication skills such as speaking skills, using body language were reported. Newman and Hatton Yeo (2008) claim that one of the positive outcomes of intergenerational training is older people being learning resources and contributing to raising students' self-esteem. Additionally, according to Satterly, Cullen and Dyson (2018) reverse mentoring approaches for intergenerational training promote information sharing, each generation adds unique abilities to the academic setting, and everyone benefits from one another's experience. Similarly, Meister and Willyerd (2010) suggest that training activities providing mutual benefits for both mentors and mentees, benefit to the younger generation to accelerate their career track and Newman and Hatton Yeo (2008) argue presence of older people in communities have a fundamental role as educators, leaders and role models in empowering the young through intergenerational learning.

Based on the classroom observations in terms of contributions to student learning, making the lesson easier to understand, stimulating curiosity, persistence of knowledge, increased motivation and participation are the predominant findings. Several studies recognize the positive effects of technology use on students' learning and engagement (Hew & Cheung, 2013; Karataş, Bozkurt, & Hava, 2016; Tweed, 2013; Vockley, 2008). It is key to support preservice teachers in terms of effective integration of contemporary technology in the classroom (Beauchamp et al., 2015; Hasan et al., 2015; Jimoyiannis, 2010).

In order to reduce the nervousness of teacher preservice teachers in microteaching method, it can be recommended to work one-on-one with the lecturer before the presentation, to provide more guidance during the selection of technology applications and the teaching strategies to be used, to create a classroom atmosphere where they will feel comfortable during the course presentation process, and to increase the number of microteaching. In general, it is thought that employing models that include theory and practice in teacher training and integrating the practices with the real work environment will contribute to the professional, field and personal skills of preservice teachers.

Research and Publication Ethics Statement

This research has been reviewed and approved by the Eskişehir Osmangazi University Institutional Review Board for Humanities and Social Sciences with the date and meeting number 13.02.2019, 2019-03

Contribution Rates of Authors to the Article

The authors contributed equally to the article.

Statement of Interest

There is no conflict of interest between the authors or with any institution or organization.

5. REFERENCES

Akkuş, H., & Üner, S. (2017). The effect of microteaching on preservice chemistry teachers' teaching experiences. *Çukurova University Faculty of Education Journal, 46*(1), 202-230. https://doi.org/10.14812/cuefd.309459

Beauchamp, G., Burden, K., & Abbinett, E. (2015). Teachers learning to use the iPad in Scotland and Wales: A new model of professional development. *Journal of Education for Teaching, 41*(2), 161-179. https://doi.org/10.1080/02607476.2015.1013370

Bey, M. A. (2012). *The negative and positive characteristics of teacher technology professional development programs in relation to efficient classroom integration and knowledge of interactive whiteboards* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database.

Boz, İ., & Özerbaş, M. A. (2020). Sınıf öğretmenlerinin matematik dersinde teknoloji kullanımlarına ilişkin görüşleri. *Bilim, Eğitim, Sanat ve Teknoloji Dergisi, 4*(2), 56-66.

Budak, A. (2012). Mathematics teachers engaging in a lesson study at virtual settings. *Educational Research and Reviews, 7*(15), 338-343. https://doi.org/10.5897/ERR12.018

Canbazoğlu Bilici, S., & Yamak, H. (2014). Teknolojik pedagojik alan bilgisi temelli bir araştırmada öğretmen adaylarının mikroöğretim hakkındaki görüşleri. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi, 32,* 40-61.

Creswell, J. W. (2013). Research design: Qualitative, quantitative, and mixed methods approaches. Thousand Oaks, CA: Sage.

Çiftçi, S., Taşkaya, S.M., & Alemdar, M. (2013). The opinions of classroom teachers about FATIH Project. *Ilkogretim Online, 12*(1).

DeSantis, J. (2012). Getting the most from your interactive whiteboard investment: Three guiding principles for designing effective professional development. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 85*(2), 51-55. https://doi.org/10.1080/00098655.2011.607867

Ellis, S. W. (2003). Changing the lives of children and older people: Intergenerational mentoring in secondary schools. *Intergenerational Mentoring Project: Phase 3 Evaluation Report.* The Beth Johnson Foundation.

Eren, E., Avcı, Z. Y., & Kapucu, M. S. (2015). Preservice teachers' competencies and perceptions of necessity about practical tools for content development. *international Journal of Instruction, 8(*1), 91-104.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education, 42*(3), 255-284. https://doi.org/10.1080/15391523.2010.10782551

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadık, O., Şendurur, E., & Şendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423-435. https://doi.org/10.1016/j.compedu.2012.02.001

Eryılmaz Toksoy, S. (2020). Dijital yeterlik: Dijital çağda dönüşüm yolculuğu. In A. Çebi (Ed*.). Dijital içerik geliştirme: Sunu uygulamaları (119-142)*. Ankara: Pegem Akademi.

Gaytan, J. A., & McEwen, B. C. (2010). Instructional technology professional development evaluation: developing a high-quality model. *Delta Pi Epsilon Journal, 52*(2), 77–94.

Gerard, L. F., Varma, K., Corliss, S. B., & Linn, M. C. (2011). Professional development for technology-enhanced inquiry science. *Review of Educational Research, 81*(3), 408- 448. https://doi.org/10.3102/00346543114151

Gök, A., & Yıldırım, Z. (2016). FATİH Projesi kapsamındaki hizmetiçi eğitimler hakkında öğretmenlerin görüşleri ve ihtiyaçları, *Kastamonu Education Journal 24*(3), 1453-1468.

Güler, E. (2020). Görsel sanatlar eğitimi özel öğretim yöntemleri dersinde mikro öğretim uygulaması: Fenomenografik araştırma. *Bayburt Eğitim Fakültesi Dergisi, 15*(30), 482-507. https://doi.org/10.35675/befdergi.655697.

Hasan, M., Khan, S. H., & Clement, C. K. (2015). Emerging trends of using open source technology for sustainable teacher training programme in Bangladesh. *Procedia-Social and Behavioral Sciences, 195*, 862-871. https://doi.org/10.1016/j.sbspro.2015.06.365

Hew, K. F., & Cheung, W. S. (2013). Use of Web 2.0 technologies in K-12 and higher education: The search for evidence-based practice. *Educational Research Review, 9*, 47-64. https://doi.org/10.1016/j.edurev.2012.08.001

Holley, K. A. (2009). Interdisciplinary strategies as transformative change in higher education. *Innovative Higher Education, 34*(5), 331.

Ilgaz, H., & Usluel, Y. (2011). Öğretim sürecinde BİT entegrasyonu açısından öğretmen yeterlikleri ve mesleki gelişim, *Eğitim Bilimleri ve Uygulama, 10*(19), 87-106.

Jackson, C. K., & Bruegmann, E. (2009). Teaching students and teaching each other: The importance of peer learning for teachers. *American Economic Journal: Applied Economics, 1*(4), 85-108.

Jimoyiannis, A. (2010). Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers' professional development. *Computers & Education, 55*(3), 1259-1269. https://doi.org/10.1016/j.compedu.2010.05.022

Karataş, F. Ö., Cengiz, C., & Uludüz, Ş. M. (2020). Re-designing micro-teaching to lessen anxiety in the process: the preservice teachers' views. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, 14*(1), 30-56.

Karataş, S., Bozkurt, S. B., & Hava, K. (2016). Tarih öğretmeni adaylarının öğretim ortamlarında dijital hikâye anlatımı etkinliğinin kullanımına yönelik görüşleri. *International Journal of Human Sciences, 13*(1), 500–509. doi: 10.14687/ijhs.v13i1.3167

Kolburan Geçer, A. & Bakar Çörez, A. (2020). Ortaöğretim öğretmenlerinin BİT kaynaklarından yararlanma durumları ve yaşadıkları sorunlar: Kocaeli örneği. *Eğitim Teknolojisi Kuram ve Uygulama, 10*(1), 1-24.

Kılıç, A. (2010). Learner-centered microteaching in teacher education. *International Journal of Instruction, 3*(1), 77-100.

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research, 77*(4), 575-614. https://doi.org/10.3102/0034654307309

Leedahl, S. N., Brasher, M. S., Estus, E., Breck, B. M., Dennis, C. B., & Clark, S. C. (2019). Implementing an interdisciplinary intergenerational program using the Cyber Seniors® reverse mentoring model within higher education. *Gerontology & geriatrics education, 40*(1), 71-89. https://doi.org/10.1080/02701960.2018.1428574

MEB (2018). *Milli Eğitim Bakanlığı 2023 Eğitim Vizyonu.* Retrieved from http://2023vizyonu.meb.gov.tr/

Meyer, K. A. (2010). A comparison of Web 2.0 tools in a doctoral course. *The Internet and Higher Education, 13*(4), 226-232. https://doi.org/10.1016/j.iheduc.2010.02.002

Meister, J. C., & Willyerd, K. (2010). Mentoring millennials. *Harvard Business Review, 88*(5), 67–72.

Murphy, W. (2012). Reverse mentoring at work: Fostering cross-generational learning and developing millennial leaders. *Human Resource Management, 51,* 549–574. https://doi.org/10.1002/hrm.21489

Newman, S., & Hatton Yeo, A. (2008). Intergenerational learning and the contributions of older people. *Ageing Horizons, 8*(10), 31–39.

Nilsson, P. (2008). Teaching for understanding: The complex nature of pedagogical content knowledge in pre-service education. *International Journal of Science Education, 30*(10), 1281-1299. https://doi.org/10.1080/09500690802186993

Özçelik, N. (2017). Fransızca okuma becerisi öğretiminde mikro-öğretim uygulamalarına ilişkin öğretmen adaylarının görüşleri. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 32*(1), 99-110. doi: 10.16986/HUJE.2016022819

Özkan, A., & Deniz, D. (2014). Orta öğretimde görev yapan öğretmenlerin FATİH projesi'ne ilişkin görüşleri, *Ege Eğitim Dergisi, 15*(1), 161-175. https://doi.org/10.12984/eed.03604

Rives, M. B. (2012). *Effectiveness of technology professional development in elementary classrooms* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database.

Peker, M. (2009). Preservice mathematics teacher perspectives about the expanded microteaching experiences. *Journal of Turkish Educational Science, 7*(2), 353-376.

Saban, A., & Çoklar, A. N. (2013). Preservice teachers' opinions about the micro-teaching method in teaching practise classes. *Turkish Online Journal of Educational Technology-TOJET, 12*(2), 234-240.

Sarı, M. H., & Akbaba Altun, S. (2015). Sınıf öğretmenlerinin matematik öğretiminde teknoloji kullanımı üzerine nitel bir araştırma. *International Journal of Eurasia Social Sciences, 6*(19), 24-49

Satterly, B. A., Cullen, J., & Dyson, D. A. (2018). The intergenerational mentoring model: an alternative to traditional and reverse models of mentoring. *Mentoring & Tutoring: Partnership in Learning, 26*(4), 441-454. https://doi.org/10.1080/13611267.2018.1530172

Seferoglu, S.S. (2001). Sınıf öğretmenlerinin kendi mesleki gelişimleriyle ilgili görüşleri, beklentileri ve önerileri. *Milli Eğitim Dergisi, 149,* 12-18.

Sevim, S. (2013). Mikro-öğretim uygulamasinin öğretmen adaylari gözüyle değerlendirilmesi. *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi, 21*, 303-313.

Tweed, S. (2013). *Technology implementation: Teacher age, experience, self- efficacy, and professional development as related to classroom technology integration* (Doctoral dissertation), Dissertation Abstracts International Section A, 74.

Vockley, (2007). Maximizing the impact: The pivotal role of technology in a 21st century education system. Retrieved from https://files.eric.ed.gov/fulltext/ED519463.pdf on 01.08.2022

Young, T. L., & Janke, M. C. (2013). Perceived benefits and concerns of older adults in a community intergenerational program: Does race matter? *Activities, Adaptation & Aging, 37*(2), 121–140. https://doi.org/10.1080/01924788.2013.784852

Yin, R. B. (2014). *Case study research: design and methods* (5th ed.). Sage Publications.

Wang, D., & Chonody, J. (2013). Social workers' attitudes toward older adults: A review of the literature. *Journal of Social Work Education, 49*(1), 150–172. https://doi.org/10.1080/10437797.2013.755104