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Published in the Slovak Republic

European Journal of Contemporary Education

ISSN 2304-9650

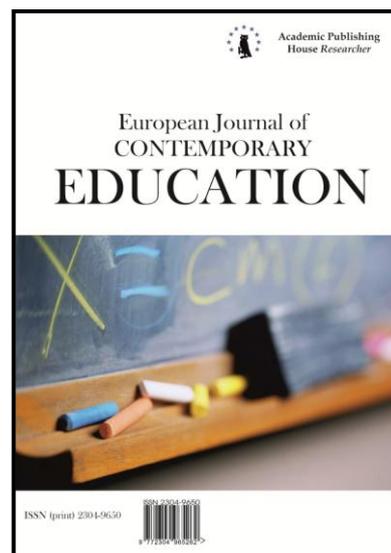
E-ISSN 2305-6746

2017, 6(2): 196-209

DOI: 10.13187/ejced.2017.2.196

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## Turkish Jewelry Technology Pre-Service Teachers' TPCK Integration Through Ob-Video Materials: A Pedagogical Action Research

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### Abstract

The utilization of educational technologies in class applications and their reflections on the education have not reached to desired levels today; in other words, there are problems in the integration of technology into teaching and using technology in conjunction with the knowledge of subject field and pedagogy. The aim of this research is to facilitate the jewelry technology pre-service teachers' integration of technology with pedagogy and content through video materials. The study was designed in a qualitative dimension and a pedagogical action research model was used. An open-ended questions form was developed as a qualitative data collection tool to be used in the process of action research. The study group consisted of 77 jewelry technology pre-service teachers of the classroom where the researcher lectured *Instructional Technologies* course in a state university. The following conclusions were reached after the application according to the pre-service teachers, the use of ob-videos; may have a positive effect on pedagogical applications in the process of teaching-learning, may make pedagogical applications more entertaining and interesting in the process of teaching-learning and may help technology integration into the knowledge of content and pedagogy in the process of teaching-learning.

**Keywords:** ob-videos, action research, TPCK.

### 1. Introduction

In today's world, another professional characteristic that is burdened on teachers is the skill of designing. As if they are true designers, teachers are expected to design educational activities inside and outside the classroom, to structure every aspect of this design to keep the students engaged. In designing these effective teaching-learning processes, there are subject areas that a teacher must be knowledgeable about. These are the knowledge of the subject field (content) and

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the knowledge of pedagogy. Nevertheless, the subject knowledge and pedagogical knowledge have been supported by technological knowledge for a long time. Whichever instructional design method is used for designing teaching-learning medium, the use of technology has been a desired element to be used effectively in conjunction with the subject knowledge and pedagogical knowledge. This conjunction is known as Technological Pedagogical Content Knowledge (TPCK). However, the aim of this study is neither to create nor to re-structure the literature. There are already a number of researches, compilations, surveys, scale developments etc. in that scope. Examining the literature so far; it is seen that investigations were generally focused on the TPCK sufficiency of teachers and pre-service teachers (Scrabis-Fletcher, 2016; Abbitt, 2011; Hsu, 2016; Sancar Tokmak et al., 2013; Jang and Tsai, 2013); studies were aimed at enhancing the TPCK literature (Valanides and Angeli, 2009; Cox, 2008; Mishra and Koehler, 2008; Archambault and Barnett, 2010; Hofer & Harris, 2011; Koehler & Shin, 2009; Graham, 2011); scale development studies were conducted on TPCK (Kiray, 2016; Tseng, 2016; Şahin, 2015; Sang et al., 2016; Koehler & Mishra, 2005; Yurdakul et al., 2012; Baser et al., 2015); and the effectiveness of applications for TPCK during the learning process were investigated (Koh and Chai, 2016; Niess, 2015; Kramarski and Michalsky, 2010; Baran and Uygun, 2016; So and Kim, 2009; Boering, 2009; Haris and Hofer, 2009; Chai et al, 2011; Marino et al., 2009; Koh and Divaran, 2011; Lee and Hollebrands, 2008). However; although the problems in the implementation of the TPCK were discussed in the literature, the lack of studies that intend to reveal teacher's or pre-service teacher's problems about the integration of technological knowledge into their knowledge of the subject field and pedagogy in the framework of TPCK, and of researches that are based on their solutions, compared to the other studies mentioned above, is noteworthy. The aim of this study – in the light of the motto about knowing how to do something rather than knowing what it is, is to try to find an answer to the following questions; how can we integrate technology with the knowledge of subject field and pedagogy in classroom environment, how can we involve technology in this process, rather than to answer what TPCK is. Within this scope, the problems that pre-service teachers experience are as much important as the challenges that teachers, as the subjects of TPCK applications, face during the process because how pre-service teachers integrate technology with education is considered important when they start teaching both in terms of designing teaching-learning processes and ensuring their students' adaptation to educational technologies. In addition, technology remains to be a supporting and enabling phenomenon in facilitating education of digital native new-generation students.

According to Misra ve Koehler (2006), TPCK is an emerging form of knowledge that goes beyond all three components (content, pedagogy, and technology). TPCK is the basis for teaching with the help of technology, and requires an understanding of pedagogical techniques: knowing how technology can help in solving some of the problems faced by students, some knowledge on how to use technologies to build on existing knowledge and knowing how to develop new epistemologies or improve the old ones. However, it is expressed by researchers that the utilization of educational technologies in in-class applications, and their reflections on the education have not reached to desired levels today; in other words, there are problems in the integration of technology into teaching, let alone using technology in conjunction with the knowledge of subject field and pedagogy; (Kim et al., 2013; Ertmer et al., 2012; Tsai and Chai, 2012; Keengwe, 2008; Earle, 2002; Christensen, 2002; Jhurree, 2005; Vannatta & Beyerbach, 2000; Pierson, 2001). According to Parker (1996), with the objective of preparing teachers for the next century, college faculty are increasingly being expected to utilize the use of technology; facilitate its use by their students; and integrate technology into teaching. Unfortunately, the literature reveals that technology is not methodically integrated into many preparation programs and that the opportunities for both faculty and students are often limited owing to a lack of proper equipment, training and time.

As reported by Topp et al. (2006), preparing teachers to use computer technology in classrooms is an exciting challenge for the educational community and specifically for teacher preparation institutions. Teacher education is often criticized for the inadequate preparation of education majors concerning using educational technology in the learning-teaching process. For Brinkerhoff (2006), leaders in the field of educational technology agree that there are various barriers affecting technology integration. These barriers may be classified in four main categories: resources, institutional and administrative support, training and experience, and attitude or personality factors. In addition to the aforementioned problems, some of the problems confronted

during technology integration are resistance to change, teachers' habits, inadequate technological infrastructure, and the growing difference between the teacher and the student in the capacity of using technology. Ersanlı (2016) explained this situation as teachers' inadequacy in using technology as well as their lack of knowledge about how to incorporate technology in pedagogical applications. In addition, according to Misra and Koehler (2006), the rapid rate of technological advances, inappropriate software design, the established nature of teaching and learning, and an emphasis on what rather than how are some of the factors that make technology integration difficult.

One of the most important problems concerning the effective application of TPCK may be the failure of integration of technology into teaching by teachers. The effectiveness of the designing stage on learning-teaching processes by the teacher may be supported by the education they receive concerning with this subject during their professional education. Another solution may be the use of professional development programs and in-service training programs; however, sorting out these complications during the educational process before the graduation of teachers shall be more effective in countries like Turkey, where the total number of teachers is above 800,000. The reason to this is that many teachers use predominantly the professional knowledge and experience they gained throughout their education for many years in their professional life, and they fail to adapt quickly to changes. For this reason, it is very important to make teachers gain TPCK skills during their education. In fact, courses like *educational technology and material design, computer-assisted education* etc. are given throughout teacher training in this context. In these courses, subjects such as how to use different educational technologies, how education technologies are used in conjunction with the knowledge of subject field and pedagogy, and the use of digital materials are studied. Nevertheless, these courses alone are not enough to provide TPCK knowledge to teachers and pre-service teachers. In fact, various technological agents may be used to make teachers use educational technologies effectively for their TPCK integration. One of these tools is the video technology.

According to the report by Pappas et al. (2016), the implementation of learning videos as an educational tool has been increasing rapidly for the past years. In addition, for Kuimova et al. (2016), the use of the video tool promotes the development of students' psychic activity, attention and memory. During viewing a video, a shared cognitive activity atmosphere is created in the classroom. In such an environment, even a negligent student becomes interested in understanding the content of the video. According to Bajrami and Ismaili (2016), continued technological advancements present new opportunities for teachers to incorporate online materials and videos into traditional classroom environment, allowing both learning and teaching to become more interesting and meaningful. Furthermore Shanshan (2016) states that, in addition to authentic videos which are an engaging type of multimedia, entertaining and real-life-language content that is relevant to popular culture attracts students' attention the most. Wong, D., Mishra, P., Koehler, M. J., & Siebenthal, S. (2007) introduced the concept of i-Video by offering a new perspective in the field. "i-Videos" – short, two-minute, digital videos designed to evoke powerful experiences about educative ideas. For example, an i-Video might enable viewers to experience the vastness of space, the interconnection between people and their environment, the timeless themes in great literature, and other compelling subject-matter ideas. In fact, the aim of the vast majority of studies on the use of video can be considered to help teachers using these tools in facilitating TPCK integration. Inspired by the i-Video by Mishra and Koehler in technology integration, objective-based videos (ob-videos) were put to work in this research, since the pre-service teachers were asked to make videos based on the objectives stated in the curriculum, rather than i-Videos. In the ob-video employment, individuals develop their videos in accordance with the objectives of the curriculum and present them in the classroom. Today when the success of a learning-teaching process is measured by the extent to which students reach the objectives, the fact that videos are objective-oriented is contributive in terms of educational perspective. Videos offer teachers the opportunity to ensure integration of technology into their knowledge of content and pedagogy, as well as to make it easy for their students to reach their objectives. While preparing their ob-videos, the pre-service teachers followed the scheme developed by the researcher. For the effectiveness of the action plan that was carried out in the scope of action research, the research question was produced in the light of TPCK principles as follows: How ob-video materials affect the technology integration in teaching practices of pre-service teachers in the classroom?

Sub-problems are as follows:

1. What are the pre-service teachers' ideas about the use of ob-video materials concerning pedagogical process?
2. What are the pre-service teachers' ideas about the use of ob-video materials concerning the content knowledge?
3. What are the pre-service teachers' ideas about the use of ob-video materials concerning the integration of technology into the knowledge of content and pedagogy?

## **2. Method**

The study was designed in a qualitative dimension. The qualitative researches use systematic observations to reach an understanding; the researcher discovers the world instead of trying to change the conditions to isolate variables (Johnson, 2015: 6). At the same time, a quantitative research is an approach for exploring and understanding the meaning individuals ascribe to a problem and the process involves emerging questions, data typically collected in the participants' settings and the researcher making interpretations of the meaning of the data (Creswell, 2014: 4). The grounded theory, phenomenology, ethnographic studies and action research are types of qualitative research. This research was conducted in the form of an action research, which is one of the qualitative research techniques, since it involved developing a solution offer to a problem encountered in the lecturing process of a researcher, implementing the solution offer and measuring its effectiveness within a plan.

Axle (2003) argues that the main purpose of an action research is to improve a practice. Secondly, an action research provides to learn first-hand and thus to apply voluntarily what is learned by allowing individuals executing the application to directly participate in the research process. Thirdly, since the research is conducted in the real world, it is aimed at directly solving the existing problems. Fourthly, it provides empowerment of individuals through direct participation, and ensures co-operation and social change. Finally, it also removes resistance in the process of transferring the solutions that are reached at the end of direct participation to the research to application. And according to Artvinli (2010), today a "teacher researchers" profile has regained importance with a constructivist approach. In parallel to this, the need for action research is felt more day by day. Because, a teacher now has to know how to plan a lesson, how to develop student-centered activities, how to design materials and organize them visually, and test them in the classroom. Moreover Baskerville (1999) states that, this strategy involves the formulation of a theory, intervention and action-taking in order to introduce change into the study subject, and analysis of the ensuing change behavior of the study subject. Finally, action research is a process where practitioners are involved in the process to understand and solve the problems that arise during the practice. The proximity of the researcher to the data, their ability to learn and experience the process closely, their participatory role and being the person who collects data are important factors to prefer this approach (Yıldırım and Şimşek, 2006: 78) and it is a work in progress (Miller et al., 2003). According to Creswell (2012, 577), educators aim to improve the practice of education by studying issues or problems they face. Similar to mixed methods research, action research uses data collection based on either quantitative or qualitative methods or both. In addition, action researches are carried out in two ways; practical and participating.

In this action research application, the practical action research method was used. In this method; teachers seek to research problems in their own classrooms so that they can improve their students' learning and their own professional performance. Practical action research involves a small-scale research project, narrowly focuses on a specific problem or issue, and is undertaken by individual teachers or teams within a school or school district. In this context, academicians with questions about how to motivate their students, how to encourage their students to be more analytical or to engage the students in class discussions can use their research skills by using pedagogical action research to test new approaches in the classroom (Tunon, 2009). For this research; the action research method was preferred and a practical approach was used due to the factors such as that the researcher begins to carry out the research on problems he faces in the classroom, the researcher is also the executer of the tasks, he takes part in the action plan, he is close to the data and directly experiences the process.

### 2.1 Procedure of the research

In this study, the pedagogical action research model by Norton (2009, 70) was used and this model includes action researches conducted for teaching and learning process. The reason to choose this model is that the problem whose action plan is developed arises in the education environment, in other words includes the intervention for teaching-learning process.

Norton (2009, 70) built his pedagogical action research model on a 5-step procedure and used the abbreviation of ITDEM.

Step 1 Identifying a problem/paradox/ issue/difficulty

Step 2 Thinking of ways to tackle the problem

Step 3 Doing it

Step 4 Evaluating it (actual research findings)

Step 5 Modifying future practice

This research was also carried out taking into account the five steps stated above.

*Step 1 Identifying a problem/paradox/ issue/difficulty*

The researcher is a teacher who has been lecturing the course “*instructional technologies and material design*” for about 5 years in an institution providing teacher training. In the said course, the researcher primarily covered the topics of educational technology, instructional technology, design of learning-teaching processes, instructional design models, TPCK, material design principles, material types. When the theoretical part of the course was completed, the researcher asked the pre-service teachers to develop teaching materials in accordance with the goals of the branch of the program they will be assigned to and present them as a 20-minute teaching practice in the classroom to improve their skills of developing materials. The researcher saw that most of the pre-service teachers preferred to develop and use 2-dimensional and three-dimensional materials in the classroom. In other words, the researcher noticed that the pre-service teachers did not prefer to use instructional technologies in their 20-minute teaching performance but focused mostly on hands-on materials and their TPCK competence was not at a desired level and he analyzed this situation as a problem. The researcher conducted interviews with the students why they did not use technology. In literature review, he also obtained the information that in parallel to this situation, there were problems in the integration of technology into teaching and learning processes. As a result, the researcher thought that in order to integrate technology into teaching processes and support their knowledge of content with technology, pre-service teachers should acquire these skills during their professional education. Then he started an action research, based on the problems he experienced in the classroom, to ensure that pre-service teachers can use their knowledge of technology in conjunction with their knowledge of content and pedagogy.

*Step 2 Thinking of ways to tackle the problem*

The researcher reviewed the literature on the experienced problem in more detail to carry out an action plan to fight with this problem. He interviewed the pre-service teachers. He developed various suggestions to facilitate the TPCK integration for the pre-service teachers. Inspired by the “i-Video” material, which was developed by Wong, D. Mishra, P. Koehler, MJ, & Siebenthal, S. (2007), he decided to use the material called ob-videos while developing various suggestions. In this context, in accordance with the pedagogic action research, he discussed with other experts in the field, got their opinions, interviewed the students and decided to use a video material.

*Step 3 Doing it*

Within the scope of this course, the pre-service teachers performed two teaching activities. The researcher divided the class into groups for the second teaching practice in the classroom and asked all the teacher candidates to practice with video material. The groups consisted of 3–4 students. The researcher gave a lecture to the pre-service teachers on how to develop ob-video materials, the principles of design and preparation. In addition, he intended to provide contribution of mobile phones in the teaching-learning process and asked the pre-service teachers to use their mobile phones in filming their videos. He thought that the students’ filming their videos by their mobile phones as an effective way of using their mobiles will positively affect their TPCK attitude. The pre-service teachers studied the syllabuses of the branches they will be assigned to, issued by the Minister of Education, and determined the topic and objectives of the ob-videos they will produce. After the objectives were determined, appropriate video scenarios were created for the objectives. Within the scope of the scenarios, they took in-class and out-of-class video footage. They added to their videos features such as voice-over, subtitle, caption etc. and completed

their task. In the second presentation, each group presented their video footage lasting 3–10 minutes with the help of a projector and computer in the classroom. Before the presentations, all the class was informed about the topic and objectives, the viewers in the classroom were asked for their opinions about how affective the ob-videos were in achieving the objectives, discussions were made and feedbacks were received.

#### *Step 4 Evaluating it (actual research findings)*

The researcher developed and applied a form of open-ended questions in order to collect qualitative data to measure the effectiveness of ob-video materials on the TPCK knowledge of the pre-service teachers in accordance with the action plan he developed.

#### *Step 5 Modifying future practice*

The groups modified their videos with the feedback received during the presentation of the ob-videos that were produced in accordance with the action plan.

### *2.2 Data Collection Tool*

An open-ended questions form was developed as a qualitative data collection tool to be used in the process of action research. In development of a qualitative data form, the use of qualitative data collection tools is the main focus in data collection. The action research primarily remains within the borders of a qualitative research (Johnson, 2015: 79). A form consisting of three open-ended questions was developed to be used in the research. In the process of developing the questions, firstly a literature review was performed, video materials and TPCK technology integration were examined and 7 questions were prepared. In the scope of TPCK, the use of video technology was considered as a technology use and it was aimed to develop questions to collect data for the effects of the use of video technology on presentation of the knowledge of content and implementation of pedagogical information. In addition, the researcher made observations within classroom. For the validity of the questions, five experts from *Curriculum and Instruction Department* were consulted for their opinions and four questions which were not considered suitable by the experts were excluded from the research. It was come to the conclusion that it would be sufficient to include 3 questions in the form. The pilot application of the open-ended questionnaire was performed on 4 students and the questions were put into final form by examining factors such as the time required to fill in the form and intelligibility of the questions.

### *2.3 Research Group*

Since the researcher made an action plan for the problems he encountered during learning-teaching process, due to the very nature of a pedagogical action research, the study group consisted of 79 jewelry technology pre-service teachers of the classroom where he lectured *Instructional Technologies* course. However the forms of two participants were not found suitable and excluded from the study and the forms of 77 pre-service teachers were analyzed. Since the researcher did not have generalization concerns, no sampling was made in the universe.

### *2.4 Data Analysis*

The data obtained in the research were subjected to content analysis, which is one of qualitative data analyses. The main objective in the content analysis is to reach concepts and relationships that could explain the collected data and the data are subjected to a deeper processing. The data are analyzed in 4 stages: 1. Encoding data, 2. Finding themes, 3. Arranging codes and themes, 4. Identifying and interpreting results (Yıldırım and Şimşek, 2006, 227).

### *2.5 Validity and Reliability*

In terms of validity and reliability, the research was based on the methods, developed by Yıldırım and Şimşek (2006, 265), who were inspired by Erlandson, Harris, Skipper and Allen (1993), and used for generally accepted concepts in qualitative research. In qualitative researches, methods such as long term interaction, depth-oriented data collection, expert inspection, participant's validation, are used to achieve internal validity (credibility). In long-term interaction, a researcher is expected to be in a long-term interaction with data sources. The researcher was in interaction with the pre-service teachers who were included in the research throughout an academic year. The fact that the course where the research took place was a second semester course also helped extend the duration of the interaction. The researcher developed a qualitative data collection tool to collect depth-oriented data and could gather more comprehensive data with the questions he prepared. For expert examination, three faculty members from *Curriculum and Instruction Department*, who were specialized in qualitative research methods and had a general

knowledge about the research subject, were consulted for their opinions. At the same time, all three faculty members lecture the same course that is used in the study.

For external validity (transferability), the researcher is expected to use detailed description and purposeful sampling methods. Direct citations are often used in a detailed description. A detailed description of qualitative data is also important. In this study, direct quotes were submitted from the participants and content analysis was conducted to describe detailed descriptions of their views. Internal reliability (consistency) is revealed during development of data collection tools by researchers, and in the process of data collection and analysis. In this context, the researcher received expert opinions, generated the questions after a detailed literature review, modified them according to the feedbacks and personally got involved in the process of data collection. In order to achieve external reliability (verifiability), Miles Huberman inter-coder reliability score was calculated for coder consistency in the process of analyses.

**Table 1.** Miles Huberman Reliability Scores Table

Questions	Miles Huberman Reliability Score
1 <sup>st</sup> Question	0,89
2 <sup>nd</sup> Question	0,83
3 <sup>rd</sup> Question	0,88

Two experts from the Curriculum and Instruction department analyzed the codings. As shown in the [Table 1](#), the scores of the three questions for coder consistency are > .70, which indicates that the coding of the two experts are reliable.

### 3. Results

In this section, the results of the content analysis of the data obtained from the answers given to the three sub-problems of the research and the direct quotations are given.

#### 3.1 The findings of the first sub-problem

The content analysis of the statements about the effects of development and use of ob-video materials on pedagogical applications, which is the first sub-problem of the research, are given in [Table 2](#).

**Table 2.** Summary of the qualitative results related to Technological Pedagogical Knowledge (TPK) (N=77)

Theme	Codes	Sub-Codes	f	%
Ob-video Materials Supporting Technological Pedagogical Knowledge (TPK)	Pedagogical Process (Instruction)	Positive Support For Instruction	41	35.3
		Entertaining Instruction	29	25
		Attractive Instruction	23	19.9
		Motivating Instruction	9	7.8
		Economic	8	6.9
		Support concretisation	6	5.1
		<b>Total</b>	<b>116</b>	<b>100</b>
Pedagogical Knowledge (TPK)	Pedagogical Process (Learning)	Facilitating learning	29	43.4
		Support retention	23	34.3
		Activating learners	8	11.9
		Improving imaginative skills	4	5.9
		Improving creativity	3	4.5
		<b>Total</b>	<b>67</b>	<b>100</b>

The answers given by pre-service teachers are gathered under two different codes in the process of teaching and learning. The most emphasized three elements in the pre-service teachers' views for the effects of ob-videos on teaching are that ob-videos will have a positive influence on teaching, they are amusing and engaging, and will provide motivation. The expressions of some teachers on this question are given below.

...Video materials will enable us to perform learning-teaching activities in an active way in the classroom and allow students to be sociable and effective during the class. They will allow us to teach the students desired goals and objectives in a more pleasant and active manner. Beside their contribution to students, video materials also may help us learn and use the internet and technology in education...

...Ob-videos constitute an effective learning-teaching process. I think their use will be very successful in attracting students' attention to the lesson. Because these videos involve many sense organs. They first attract students' attention, motivate and increase eagerness to learn...

...Certainly they will have a positive effect. Permanent learning may be realized by making the learning-teaching process more effective with visuals and sounds....

...The visuals always attract students' attention in the classroom. I realized it more clearly in the course presentation we made at the school where we served our internship. The children listened more carefully and attentively the lesson presented with visual materials. The visuals presented after teaching the subject topics increase the efficiency of the lesson....

Two other important factors on which the pre-service teachers talked about are that ob-video materials transformed pedagogic applications into an entertaining format and attract students' attention. In this context, the pre-service teachers expressed the following opinions.

...I think videos can attract students' attention more as they appeal visually. I believe video materials are among the best teaching methods for students who forget what they read or hear...

...I think they are more understandable in a shorter time; they are effective in learning while having fun and in increasing memorability...

...They offer a more entertaining learning environment for students. They make it easier to understand the lesson. They improve the sense of investigation and the ability to imagine...

The most emphasized three elements in the pre-service teachers' views for the effects of ob-videos on learning are that ob-videos will facilitate learning, contribute to persistence of learning and activate learners. The expressions of the pre-service teachers are as follows.

....I think students learn by watching with this method. I also saw that this method ensures memorability of the information while transforming learning into fun...

...Video materials may increase the desire of students to learn. And they will allow them to learn a lot in a short time...

...Video materials may offer permanent learning for students visually...

...Video materials may allow students to learn, even learn by having fun, and make it more permanent without forgetting what they have learned in the learning-teaching process...

### 3.2 The findings of the second sub-problem

The content analysis of the statements about the effects of development and use of ob-video materials on presenting the knowledge of content, which is the second sub-problem of the research, are given in [Table 3](#).

**Table 3.** Summary of the qualitative results related to Technological Content Knowledge (TCK) (N=77)

Theme	Codes	Sub-Codes	f	%	
Ob-video Materials Supporting Technological Content Knowledge (TCK)	Preparing the content for ob-video use	self-evaluation regarding the content	19	57.6	
		accession to the contemporary content	9	27.3	
		development of content knowledge	5	15.1	
			<b>Total</b>	<b>33</b>	<b>100</b>
	Presenting the Content with ob-video		Positive effect on presentation of the content	21	42.8
			Support concretization of the content	9	18.4
			Enhancing to create attractive content	7	14.3
			Promoting retention of the content	5	10.3
			Visualizing the content	4	8.1
			Clarifying the issues in the content	3	6.1
			<b>Total</b>	<b>49</b>	<b>100</b>

The answers given by the pre-service teachers were grouped under two different codes as making the content suitable for ob-video materials and delivering the content through ob-videos. The most emphasized two elements in the pre-service teachers' views for making the content suitable for ob-video materials are the need for making self-assessment for the possessed knowledge of content and the requirement to access to current information. The expressions of some pre-service teachers for this question are given below.

*...The process of delivering the knowledge of content through video materials allowed me to test my knowledge, made me realize that I should get to know general characteristics of students, what kind of a path I should follow in making students reach the objectives, and that I should provide my knowledge of content according to the level of students...*

*...At first, video materials made me feel insufficient and helpless in presenting my knowledge of content to the students. Then it took a fun turn. They helped me test my knowledge and expand my research process...*

*...I consulted experts to obtain the necessary information in the video that I prepared; I wanted to convey more accurate information by doing research from the books. In doing so, I improved myself with current and accurate information by eliminating my shortcomings...*

The most emphasized three elements in the pre-service teachers' views with regard to presenting content through ob-video materials are that ob-videos have positive effects on presenting content, and they contribute to concretization of the content and to creation of interesting content. The expressions of some pre-service teachers for this question are given below.

*...Ob-videos allowed us to present the theoretical knowledge more effectively and explain it better. Technology supported education is more effective in delivering our knowledge...*

*...In the field of jewelry, size and quantities are very important. The theoretical knowledge that students cannot visualize in their head become more understandable with this method...*

*...Considering especially old jewelry and applied techniques, the use of videos will help students in an area with high visually, such as jewelry...*

*...The use of video material extremely helped me concentrate in presenting my content knowledge. I could not introduce the formation process of the diamond without the support of video technology...*

### 3.3 The findings of the third sub-problem

The analysis of the answers given by the pre-service teachers to the how ob-video materials may affect the integration of technology into the knowledge of content and pedagogy question, which is the third sub-problem of the research, are given in [Table 4](#).

**Table 4.** Summary of the results related to the question of whether or not ob-video materials helped integration of technology into your knowledge of content and pedagogy (N=77)

Theme	Code	Sub-Codes	f	%
Ob-video Materials Supporting Technological Pedagogical Content Knowledge (TPCK)	Interaction of technology with pedagogy and content knowledge	Effective on interacting the three components	72	66.7
		Providing audio-visual support	13	12
		Facilitating the interaction	12	11.1
		Enabling teaching and learning	11	10.2
		<b>Total</b>	<b>108</b>	<b>100</b>

The answers given by the pre-service teachers were grouped under a single code as technology integration into knowledge of content and pedagogy through the use of ob-videos. The most emphasized sub-codes under this code are that ob-videos may help this interaction, provide audio-visual support, facilitate the interaction and the process of learning-teaching. The expressions of some pre-service teachers for this question are given below.

*...Video materials opened the way for integrating technology into the knowledge of content and pedagogy. They may allow us to present the content to the students more easily by combining information with education sciences...*

*... I believe all of these concepts complement each other. And in a video material, technology, content knowledge and pedagogical applications complement each other...*

*...The use of videos makes more sense by integrating technology into our knowledge of content and pedagogical practices...*

#### **4. Conclusion and discussions**

In line with the action plan, the pre-service teachers were asked to produce ob-videos with the purpose of integrating their technology knowledge into their knowledge of content and pedagogy and were asked to use them. The following conclusions were reached after the application:

According to the pre-service teachers, the use of ob-videos may;

- Have a positive effect on pedagogical applications in the process of teaching-learning,
- Make pedagogical applications more entertaining and interesting in the process of teaching-learning,
  - Motive learners in pedagogical applications in the process of teaching-learning,
  - Be effective in presenting the content knowledge in the process of teaching-learning,
  - Contribute the retention of what is thought in presentation of content knowledge in the process of teaching-learning,
- Make pre-service teachers realize that it is necessary to make self-evaluation on their content knowledge while developing ob-video materials to present content knowledge in the process of teaching-learning,
  - Make pre-service teachers realize that it is necessary to access to current content knowledge while developing o-video materials to present content knowledge in the process of teaching-learning,
  - Support concretization of the content knowledge and creation of interesting content in presenting content knowledge in the process of teaching-learning,
  - Help technology integration into the knowledge of content and pedagogy in the process of teaching-learning.

The fact that teachers cannot integrate technology into the knowledge of content and pedagogy at desired levels in classroom environment was demonstrated with the help of literature review presented in introduction of this study. Today, both K12 students and students of higher education use technology actively not only in certain processes but at every stage of life and integrate technology into their lives. In today's education system where this type of a learning group exists, it is not acceptable for teachers not to be able to use technology effectively nor integrate technology into their knowledge of content and pedagogy. For these reasons, teachers are expected to acquire such technological knowledge and skills and put them into practice when they are pre-service teachers. Here, one of the important responsibilities lies with the lecturers giving lecture on instructional technologies in education institutions. According to Girod et al. (2017), video is a powerful medium for communication and learning. With increased accessibility to digital video production equipment, an important question is what role teacher production of video might have in teacher education.

There are many digital learning and teaching agents that can be integrated into the knowledge of content and pedagogy. However, taking into account factors such as teacher education program, technology knowledge and skills of pre-service teachers and the technological infrastructure of the institution, lecturers can organize training activities at least to facilitate TPCK integration of pre-service teachers with the help of such digital tools. In this study, the pre-service teachers were asked to produce videos and in doing so they were expected to focus on the targets and objectives of the content. In this context, the pre-service teachers filmed ob-videos and used them in the classroom. Some pre-service teachers lectured in the classes where they served their internship using ob-videos they made. In general, the pre-service teachers expressed that ob-videos may have a positive effect on presenting content knowledge and pedagogic applications. This can be associated to the facts that the pre-service teachers were able to give a lecture on subjects

requiring a long time and a detailed description in a shorter time with the help of ob-videos and they were interesting because of their audio-visual nature. In addition, the pre-service teachers stated that the use of ob-video materials made it easier for them to lecture those subjects they experienced difficulty in lecturing, concretized the concepts and helped clarifying the subjects. According to Turro et al. (2016), video-supported courses get better overall results in the appreciation and engagement from the students. In general, it was come to the conclusion that ob-video is a digital tool that can be used by pre-service teachers in integrating technology into their knowledge of content and pedagogy. As a result of the research conducted in accordance with this action plan, it can be said that ob-videos made a contribution to technology integration of the content knowledge and pedagogical knowledge of this group. The following is recommended for future researches:

- In order to assess the effectiveness of an action plan, a quantitative data collection tool can be developed and used as well as with a qualitative data collection tool.
- The effectiveness of different digital tools that can be used in technology integration of pre-service teachers into their knowledge of content and pedagogy can be assessed.
- Educational activities can be organized within the scope of professional development programs for technology integration of teachers on duty.
- In accordance with longitudinal studies, after being appointed for the first time, analyses can be performed on the processes of technology integration of teachers, who were previously implemented an action plan, into the knowledge of content and pedagogy.

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