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TPACK in practice: A qualitative study on technology integrated lesson planning and implementation of Turkish pre-service teachers of English

Gökçe Kurt¹

Marmara University

Ayşe Akyel²

Yeditepe University

Zeynep Koçoğlu³

Yeditepe University

Punya Mishra⁴

Michigan State University

Abstract

The issue of what teachers need to know about technology for effective teaching has been the centre of intense debate in the recent past. Technological Pedagogical Content Knowledge (TPACK) has been proposed as a conceptual framework to describe the knowledge base teachers need for effective technology integration. The present study aimed to investigate whether and/or how Turkish pre-service teachers of English reflected their TPACK, as developed in a design study integrating coursework and field experiences, on their lesson plans and implementation. Analysis of the data coming from the lesson plans and classroom observations of three cases revealed that pre-service teachers considered the relationship among content, pedagogy and technology while planning and implementing their lessons.

Keywords: *TPACK, technology integration, pre-service teacher education, teacher knowledge, case study*

¹ Instructor Dr., ELT Department, Marmara University, Turkey. **Email:** gokcekurt@hotmail.com

² Professor Dr., ELT Department, Yeditepe University, Turkey. **E-mail:** aakyel@yeditepe.edu.tr

³ Assistant Professor Dr., ELT Department, Yeditepe University, Turkey. **E-mail:** zbkocoglu@yeditepe.edu.tr

⁴ Professor Dr., Michigan State University, USA. **E-mail:** punya@msu.edu

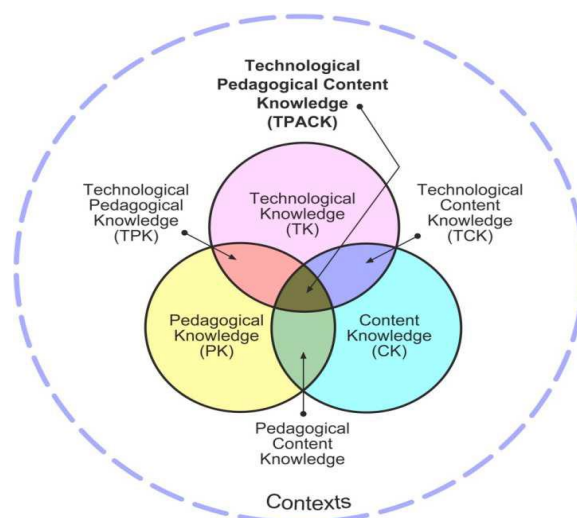
Introduction

As new advanced technologies have arrived to the classroom in the first decade of the 21st century, teacher education programs have been challenged to prepare teachers equipped with the necessary knowledge and skills to integrate technology into their teaching. However, research has shown that teachers are not adequately equipped with the knowledge required for successful technology integration and “their attempts tend to be limited in scope” (Koehler, Mishra, Kereluik, Shin, & Graham, 2013, p. 101). Thus, pre-service teacher education plays an essential role in determining the effectiveness of technology in education. Mishra and Koehler (2006) have advocated a conceptual framework, Technological Pedagogical Content Knowledge (TPACK), in teacher education to describe the knowledge base teachers need for effective technology integration. Since then, the TPACK framework has had subsequent impacts on teacher education and professional development and influenced related theory, research and practice.

The TPACK framework builds on Shulman’s construct of pedagogical content knowledge (PCK) referring to “the most powerful analogies, illustrations, examples, and demonstrations – in a word, the ways of representing and formulating the subject that makes it comprehensible to others” (1986, p. 9). The TPACK framework consists of three main components of knowledge, i.e., content (CK), pedagogy (PK) and technology (TK) and their intersections represented as PCK, technological content knowledge (TCK), technological pedagogical knowledge (TPK) and TPACK (see Figure 1). Koehler et al. (2013) emphasize the ‘transactional relationship’ between content, pedagogy and technology and state that “teachers need to have deep understandings of each of the above components of knowledge in order to orchestrate and coordinate technology, pedagogy and content into teaching (p. 102). The TPACK is a model that integrates technology (computers, internet, digital video, etc.), pedagogy (teaching and learning methods and strategies) and content (subject matter) (Harris, Mishra, & Koehler, 2009). This model provides a theoretical basis for using instructional technologies in teacher education programs (Angeli & Valanides, 2009).

Figure 1

TPACK Framework (taken from <http://tpack.org>)



Developing TPACK in teachers: Learning technology by design

Koehler and Mishra (2005a, 2005b) proposed learning-by-design approach for the development of TPACK and argued that, for teachers, one of the best ways to learn about educational technology is to design educational technology. Learning-by-design allows teachers to work in design teams with individuals of varying levels in expertise in content, pedagogy and technology, and develop solutions to authentic pedagogical problems by using technology (Peruski, Mishra, & Koehler, 2007). During this process, teachers “constantly work at the nexus of content (what to teach), pedagogy (how to teach), and technology (using what tools)” (Koehler et al. 2011, p. 151).

Mishra and Koehler (2006) argue that the design of educational technology provides teachers with an authentic context to learn about educational technology. The design experience helps teachers “build something that is sensitive to the subject matter (instead of learning the technology in general) and the specific instructional goals (instead of general ones)” (Mishra, Koehler, & Zhao, 2007, p. 9).

A number of studies were carried out to investigate the development of TPACK among teachers and pre-service teachers (PTs hereafter) of various subject matters using learning technology by design approach. For example, in their study, Koehler, Mishra, and Yahya (2007) aimed to investigate whether learning by design approach leads to the development of TPACK. For the study, faculty members and graduate students worked collaboratively in design teams to develop an online course. The findings showed that each design team moved from considering technology, pedagogy and content as being independent constructs towards a more transactional and co-dependent construction that indicated a sensitivity to the nuances of technology integration. Koh and Divaharan’s (2011) ten-week study with 74 PTs found that they approached the integration of a new ICT tool (interactive whiteboards) as a user, focusing predominantly on its technological features, that is, TK at the beginning of their training. However, as they designed their own lesson activities and used the tool, they began to build their confidence in integrating interactive whiteboards (IWBs) into their teaching and their high level of positive attitude toward IWBs stayed high throughout the study. Graham, Borup, and Smith (2012) found significantly more considerations of TPK and TPACK at the end of ICT training for 133 PTs, as well as an improvement in the quality of these reflections. On the other hand, Pamuk (2012) found that PTs’ lack of pedagogical experience limited their ability to exploit their TK for more innovative forms of instruction. In a more recent study, Koh and Chai (2014) categorized PTs into groups based on their self-reported TPACK through cluster analysis. All participating PTs reported that they deepened their connections among TPK, TCK and TPACK after ICT lesson design but the effects were more pronounced for those who were more confident in their pre-course TPACK.

Findings of these studies reveal the importance of field experiences in providing PTs with the opportunity to ‘design’ their own lessons so that they are engaged “in ‘deep’ conversations about their practice;” is provided “with opportunities to experiment and ‘play’ with ideas, tools and subject matter” and offered “contexts to reflect on their learning”

(Koehler, et al. 2011, p. 151). In other words, field experiences help PTs develop TPACK by understanding the importance of planning and preparation, and comprehending the complexities regarding technology integration (Niess, 2008). Therefore, PTs should be given the opportunity to apply their learned knowledge from the coursework into real teaching experiences (Bullock, 2004).

The present study aims to investigate whether and/or how pre-service teachers of English reflect their TPACK, as developed in a design study integrating coursework and field experiences, on their lesson plans and implementation.

Methodology

The results reported here are part of a larger study that was conducted to investigate the TPACK development of Turkish PTs of English and to explore whether and/or how their TPACK was reflected in their teaching practice. The larger study employed a mixed methods approach: quantitative data were gathered to study the TPACK development of 22 PTs while the qualitative data focused on the knowledge construction of six cases, purposefully chosen among 22 PTs, and their teaching to decide whether TPACK was evident in their practice. This paper will be presenting three cases to describe, in detail, whether and/or how their TPACK was evident in their lesson planning and presentation processes. A full account of the study can be found in Kurt (2012).

The setting

The present study was conducted in an English Language Teacher (ELT) Education program at a state university in Istanbul, Turkey. The four-year ELT Program has approximately 800 undergraduate students. The components of the undergraduate program consist of professional courses including methodological and pedagogical approaches to foreign language teaching as well as courses raising students' awareness of the English language system. The program also offers courses on first and second language acquisition and organizes practice teaching in selected schools.

Related to technology, PTs receive two courses: Computer (I and II) and Technology and Materials Design. The Computer course, which is a standalone technology course received in the first and second semesters of the freshman year, focuses on the development of basic computer skills such as learning how to use office programs and selected softwares and how to use the Internet effectively. Technology and Materials Design course, offered in the second semester of the sophomore year, in general, aims to teach PTs how to teach English using technology.

The participants

At the time of the study, in the senior year of the ELT program, 217 pre-service teachers were enrolled. During the planning process of the present study, all PTs were informed of the research project and that participation was strictly voluntary. Fifty-four PTs volunteered but due the limited capacity of the computer laboratory, 22 PTs (17 female, 5

male) were chosen by random sampling to represent the sample. What was common to all participating PTs was their lack of training on the educational uses of technology. Although such a course is offered in the program, this particular group of PTs did not receive it due to the lack of trained teaching staff in the department. The Survey of Pre-service Teachers' Knowledge of Teaching and Technology survey (Schmidt, et. al. 2009) was used to understand PTs' self-perceptions of their TPACK at the beginning of the study. The findings of this quantitative phase of the study were discussed in Kurt, Mishra and Kocoglu (2013). From the results of the TPACK survey analysis, for the qualitative phase of the study, six PTs among these volunteering 22 PTs were purposefully selected as the cases based on their perceived level of TPACK at the beginning of the study: two PTs with a low TPACK level, two PTs with a medium level of TPACK and two PTs with a high level of TPACK. Qualitative data were collected and analysed to describe, in detail, the stages of TPACK development of these cases and the findings revealed that PTs' TPACK developed as they participated into the study. In other words, as the study progressed, PTs began to consider technology in relation to content and pedagogy.

For the present paper, only three cases, due to the limited space, using pseudonyms, Pınar (low level of TPACK), Zeynep (medium level of TPACK) and Hande (high level of TPACK), will be explored to see whether and/or how PTs reflected their TPACK in practice.

All PTs, as the requirement of "School Experience I/II" courses in the senior year of the program, are placed to the schools organized by the department to do their practicum. School Experience I course, offered in the first semester of senior year, requires pre-service teachers to do structured observation tasks followed by discussions related to theoretical and experiential considerations in EFL. The School Experience II course, in the second semester, is based on observation and supervision of carefully prepared student teaching followed by critical appraisal. PTs are supposed to carry out five micro-teachings and two macro-teachings during their practicum. For both courses, PTs spend six hours a week in the school site.

The treatment

For the present study, a specific course was designed and implemented as a treatment. The TPACK framework was applied and the Learning by Design theory was adapted to design the course with four principles in mind: (1) design tasks were problem-centred (Merrill, 2002); (2) skills were developed via learning technology by design approach (Mishra & Koehler, 2006); (3) PTs worked collaboratively (socio-cultural theory); and (4) PTs engaged in reflective practice (Schön, 1983).

The study lasted 12 weeks and was conducted as follows: The study began with pre-data collection and general introduction to the study (Week 1). During the Weeks 2 and 3, there were classroom discussions on the importance of technology integration in the 21st century, on meaning and different uses of technology, and on TPACK and technology integration. In Week 4, PTs were assigned two articles on TPACK and expected to initiate a classroom discussion. During Weeks 5 and 6, PTs had 5-10 minute collaborative

presentations on various technological tools such as blogs, podcasts, or wikis. During their presentations, PTs demonstrated how to use the tool, shared example uses of the tools for language teaching purposes and began a classroom discussion on other possible uses in the language classroom. For Weeks 7 and 8, PTs were supposed to prepare a technology integrated lesson plan for their practicum, peer teach it, receive feedback from their peers and the instructor, modify it, and follow the final version of the plan for macro-teaching at their practicum schools. In Weeks 7 and 8, PTs did peer teaching of their lesson plans and received feedback both from their peers and the instructor. During Weeks 9 and 10, PTs did macro teaching of the modified version of their lesson plans at their practicum schools and shared their experiences with their peers and the instructor in the following week (Week 11). The study ended with the collection of the post data in Week 12.

Data collection and analysis

In order to see whether and how PTs reflected their TPACK on their lesson plans and presentations, their lesson plans were collected and their lessons were observed.

As the requirement of the treatment (as described above), PTs designed a lesson, modified it based on the feedback from their peers and the instructor, one of the researchers of the present study, and taught it at their practice schools. Before planning, PTs were provided with a lesson plan format and final versions of their lesson plans were collected for analysis.

The researcher observed 40-minute period of instruction for each pre-service teacher and the observations focused on the ways in which the PTs integrated technology in their instruction and reflected their TPACK. The lessons undertaken by PTs were also video recorded for further analysis.

Data were analyzed using the Technology Integration Observation Instrument, which focuses on ‘the use of technology integration’ in the lesson. The instrument was developed by Harris, Grandgenett, and Hofer (2010) and its aim was stated as assessing “the quality technology integration in an observed lesson”. In the instrument, there are six categories rated using a 4 point-scale each point having specific explanations. The categories are as follows: (1) Curriculum goals and technologies; (2) instructional strategies and technologies; (3) technology selection(s); (4) fit; (5) instructional use; and (6) technology logistics (p. 3840). Each category receives a score from 1 to 4, with specific explanations. For example, a lesson receiving the rating of 4 for the category of “curriculum goals and technologies” means that “technologies used in the lesson are strongly aligned with one or more curriculum goals” (p. 3840). Harris, Grandgenett, and Hofer (2010) state that the first four categories in the instrument address plans for instruction while the last two categories address the implementation of that plan. Thus, in the present study, the first four categories were used to assess PTs’ lesson plans while the last two categories were used to evaluate the implementation of those plans during PTs’ fieldwork.

Findings

In this section, an overview of each case's lesson plan is provided and the analysis of their lesson plan and its implementation according the Technology Integration Observation Instrument is presented.

Pınar

Pınar's placement school was a state high school. She attended the lessons of 9th grade students. The classrooms at school were equipped with a computer and a projector. For her macro-teaching, Pınar was assigned a coursebook unit about Natural Disasters. The unit was based on a reading text about the outcomes of the possible eruption of the volcano on Canary Islands. The class she participated at her practice school consisted of 26 students, though on her teaching day only 16 of them were present in the lesson. Pınar stated her lesson goal as follows: "Students will be able to understand a written text about a natural disaster and they will be able to talk about a disaster and its outcomes by using the related words and structures". During the lesson, the digital technologies Pınar used were a video, projector, laptop, and camera.

The first category of the Technology Integration Observation Instrument focused on the match between technology and curriculum in the lesson plan. As mentioned above, Pınar wanted her students to be able to comprehend a text about natural disasters and talk about their outcomes by using relevant vocabulary and structure. In her plan, she used a video as a pre-reading activity to build background knowledge of the students on volcanic eruptions. Her stated aim was to familiarize students with the topic as volcanic eruptions are not experienced in Turkey. For the speaking part of her goal, Pınar planned to ask students to prepare a short video about an imaginary eruption. They would report the eruption and warn people against it. Considering these, it can be said that Pınar's lesson plan receives 4 (technologies used in the lesson are strongly aligned with one or more curriculum goals) as she uses the technologies effectively to achieve her goals during the lesson.

The second category of the instrument was about the match between instructional strategies and technologies. Pınar's lesson plan was based on Task Based Language Teaching. Students worked in groups to carry out a communicative task in which they used English for some real purposes. In other words, the instructional strategies she chose were based on the active participation of the students. Asking students to record a video in which they reported the outcomes of an imaginary volcanic eruption supported her pedagogy as she wanted the students to work in groups and to be active users of the language. Considering these, Pınar's score in the second category was 4, i.e., technology use optimally supports instructional strategies.

The third category referred to the technology selection(s) of the teacher. In other words, it focused on matching technology to both curriculum and instructional strategies. Considering the content of the lesson and the pedagogy Pınar planned to use in her lesson, technology selections of her was considered as exemplary (receiving 4). Her aim of using a video at the beginning of the lesson was to build background knowledge of the students. She

wanted her students to create their own videos to talk about the eruption; so that they would use what they learned from the video they watched at the beginning of the lesson and the reading passage to create their own content. Thus, the technologies she chose could be considered appropriate for the content and pedagogy she planned for her lesson.

The fourth category was about the ‘fit’ among the three knowledge components: content, pedagogy and technology. As explained above, the content Pinar planned to teach, the pedagogy she chose for her lesson and the technologies she included in her plan were all in harmony, supported each other and resulted in a complete and effective lesson plan (4, curriculum, instructional strategies and technology fit together strongly within the lesson).

When Pinar’s lesson was evaluated according to the final two categories of the instrument, it was seen that her instructional use of technology was maximally effective. When Pinar used the video at the beginning of the lesson, as a pre-reading activity, she seemed in control. She introduced the video and gave students a reason to watch it. Students were supposed to watch it and note down some factual information presented in the video. After introducing the task, near to the end of the lesson, she described, in detail, how students should prepare their 2-minute-videos. She explicitly instructed them to include details such as when the volcano is going to erupt, what might happen, etc. in their videos. In the classroom, students began to write the text of their video in groups. Students who could complete their script started recording using their mobile phones. Others would do it after the class. Considering these, her instructional use of technology received 4, i.e., ‘instructional use of technologies is maximally effective in the observed lesson’.

The final category in the instrument was about operating technologies effectively. When the teacher used the technology herself, she was very confident and had no problems. Some students in the class began recording themselves for the task using their mobile phones. They were observed not to have any problems technically. Thus, both the teacher and the students operated technologies very well in the observed lesson (receiving 4).

Zeynep

Zeynep did her practicum at a private primary school and the class she participated throughout the year was a 4th grade class with 18 students. Zeynep prepared her lesson plan on a unit called ‘Underwater Life’ from the coursebook used at the practice school. Her lesson plan focused on the achievement of the following goals:

1. Students will learn new words about aquatic life and some sea animals.
2. Students will be able to talk about the characteristics of some sea animals using the “Present Tense.”

Zeynep’s lesson proceeded as follows: She started the lesson by asking students some questions related to sea life such as ‘What is fresh water? What is salt water? Which animals live in salt water? etc.’ Then, she taught new words about the aquatic life by using flashcards. Following the practice of the words, students, in groups, did a quiz on their coursebook page. The quiz preceded a reading text. Students, then, read the text and checked their answers on the quiz. Listening followed reading. Students listened to the descriptions of

two fish and circled the ones described among seven pictures of other fish. Following that, Zeynep told students that a new aquarium was going to be opened at a shopping mall in Istanbul and the authorities wanted each school to suggest a fish to bring. Thus, students were supposed to prepare a catalogue for the fish of their choice. Zeynep showed her own catalogue as an example. For the task, students were asked to work in pairs, choose a fish, and prepare a catalogue for it with text and pictures. Students used Wikipedia for gathering information and pictures. When the catalogues were ready, students presented them in front of the class. Then, as a whole class, they chose the fish to be in the aquarium by voting.

For the first category of the instrument, Zeynep received 4, i.e., ‘technologies used in the lesson are strongly aligned with one or more curriculum goals’. The curriculum goals stated that students would talk about fish in the present time by using the vocabulary they had learned. Here, the choice of Wikipedia as the technological tool matches these goals as students need some information and pictures to be able to describe a fish. Wikipedia provides them with the information they need for the catalogues.

Zeynep’s lesson plan received 4 for the second category of instructional strategies and technologies. In the plan, it is stated that students would work in groups and prepare a catalogue. Then they would present it to their peers. This means that students would be actively involved in the learning process. Using the Wikipedia to gather information for their catalogue would support the active role of the students and give them the responsibility of their own learning.

The third category focused on matching technology to both curriculum and instructional strategies. Considering her lesson plan, Zeynep’s score for this category was 4. The use of Wikipedia (technology) provided students with the necessary input for their catalogues (curriculum goal) and gave them the responsibility of their own learning (instructional strategy).

In terms of the fit among curriculum, pedagogy and technology, Zeynep’s score was 4. These three components in her lesson plan worked altogether to improve the quality of the lesson. The curriculum goals implied that students would use English for real purposes. Working in groups supported the authentic use of the language and the use of Wikipedia made it possible for learners to use the technology themselves, gather the necessary information and then present it to their peers in English.

For both the fourth and fifth categories about the implementation of the lesson plan Zeynep scores were 4. In terms of the instructional use of technologies, Zeynep’s use of technology in the classroom was ‘maximally effective’. Her technology use was transparent and it was integrated into the lesson smoothly. Students were very motivated to prepare a brochure and they wanted their fish to be the most voted, so their attention was not on the technology itself. Plus, Zeynep directed them to the simple English version of Wikipedia which supported their understanding and improved the quality of their catalogues.

Finally, in terms of operating technologies during the lesson, Zeynep and the students operated technologies very well in the observed lesson (receiving 4). Zeynep was

very good at directing the students to Wikipedia, helping them to find information about fish, monitoring them while working in groups and helping them when they needed. Some students had difficulty in finding the entry for their fish. She helped them with the search part and then left them for the group work. Students wrote some information they got from the Wikipedia on their catalogues and drew the picture of their fish by looking at the pictures on the page. On Wikipedia, some pages of the fish did not contain any pictures. In that case, Zeynep helped them to go to Google and search for the pictures of their fish.

Hande

Hande's class at her practicum school, a private primary school, was a third grade class with 24 students. Hande used a chant about different professions from the students' coursebook. The chant was about professions. The lesson proceeded as follows: Students listened to the chant about the professions. Then, the teacher gave students a handout on which there were statements like 'I will/won't be a soccer star' and 'I will/won't make a cinema film'. Students ticked the sentences that suited them and then asked their partners for their opinions. Following that, students created their own chants consisting of four lines and stated what they wanted to do in the future. When they were ready, each student came to the board and sang their chant to the teacher who recorded them. The teacher played the recordings one by one. The others listened to the chants and tried to find the most popular profession in the classroom. Hande used a computer and an MP3 player as technological devices. Her stated goals for her lesson were as follows:

1. Students will be able to talk about future plans.
2. Students will be able to use different forms of "will" to talk about future.
3. Students will be able to comprehend what they listen to.

Hande received 4 from the first category of the observation instrument (the match between technology and curriculum). As a curriculum goal, she aimed to get students to talk about future using 'will' and to improve their listening skills. Playing a chant which provides a model for language use, recording students' own chants, asking students to listen to each other's chants all contribute to the achievement of these goals.

For the second category, Hande received 4 too, which means 'technology use optimally supports instructional strategies'. Hande wanted the students to talk about their future plans so that they could be active in using the language. She planned to ask them to create their own chants and sing it. Creating and singing a song would attract young learners very much. This way, they would be motivated to talk about their future professions, learn how "will" is used to express future and improve their listening skills by being involved in the process.

The third category focused on matching technology to both curriculum and instructional strategies. Hande's score was 4 considering her technology choice. As discussed above, her choice of technology matched her curriculum goals and supported her pedagogy of communicative teaching in which students were active users of the language.

Considering the fit among content, pedagogy and technology, Hande's lesson could be considered as a good example and receive a score of 4 out of 4. These three components supported each other throughout the lesson. Recording the students would motivate them and increase their participation. They would use English for communicative purposes and practice talking about the future.

The fourth and fifth categories are about the implementation of the lesson plan. In practice, Hande's use of technology was very effective (receiving 4). Her integration of the technology was very smooth and in a good harmony with her general teaching. Seeing an example chant at the beginning of the lesson prepared students for the next task, recording their chants gave them a reason to produce language and sharing their chants with the rest of the class provided students with authentic listening materials. Thus, Hande's instructional use of technologies can be considered as maximally effective.

Finally, in terms of operating technologies during the lesson, Hande would receive 3, 'teachers and/or students operate technologies very well in the observed lesson'. At the beginning of the lesson, she could not play the CD so she had to read the chant herself. There were some times she felt uncomfortable about using the technologies, as she later explained, because of not being used to. For the implementation of her plan, it can be said that Hande tried to be transparent in terms of her technology use. She used the technologies herself because of the age of the students and the nature of the content. Students were young learners, so she did the recording herself. Plus, the task required students to produce their own content and then get recorded. Thus, it can be said that, her pedagogy was in harmony with the content and technology.

Conclusion and Discussion

The present study focused on understanding whether and/or how TPACK of Turkish PTs of English was reflected on their lesson planning and presentations. Data coming from the lesson plans and classroom observations of three cases were analysed using the Technology Integration Observation Instrument and the findings revealed that both during the planning and implementation processes, PTs considered the relationship among content, pedagogy and technology and worked hard to improve the quality of their lessons by integrating technology effectively.

The findings of the present study are in parallel to the findings of similar studies conducted by Suharwoto (2006), Harrington (2008), Cavin (2007). In these studies PTs had the opportunity to apply what they learned from coursework to practice during their field experiences. It was found out that PTs developed an understanding of the interrelationship of the three components and began to adjust technology, content and pedagogy to fit each other.

Niess (2008) discusses that "no matter how marvellous the coursework is in providing them with knowledge about teaching with technology, they must have opportunities to apply this knowledge" (p. 246). Field experiences help PTs to understand the importance of planning and preparation, the value of specific instructional strategies and comprehend the complexities involved in teaching with technology, thus developing their TPACK. Therefore,

this study suggests, for teacher education programs, that the courses offered to PTs for technology integration should combine coursework with fieldwork. Without the experience and expertise needed to effectively engage with technology, PTs, if they use technology at all, tend to use it in superficial, low-level ways (Doering & Veletsianos, 2008). The resultant absence of meaningful technology integration in classrooms lead to a deep disconnect between the current generation of students who have spent their formative years immersed in technology (digital natives), and their teachers (digital immigrants) whose experience with and knowledge of the digitized world may be underdeveloped (Prensky, 2001). Thus, PTs should be given the opportunity to apply the theoretical knowledge they gain in the coursework to their practicum practice.

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