www.ijte.net

One-On-One Technology Mentoring for In-Service Teachers: The Experiences of Future ICT Coordinators

Ercan Top
Bolu Abant Izzet Baysal University, Turkey

Melih Derya Gurer
Bolu Abant Izzet Baysal University, Turkey

Derya Baser
Bolu Abant Izzet Baysal University, Turkey

Sedat Akayoglu
Bolu Abant Izzet Baysal University, Turkey

Recai Akkus
Bolu Abant Izzet Baysal University, Turkey

To cite this article:

Top, E., Gurer, M. D., Baser, D., Akayoglu, S., & Akkus, R. (2021). One-on-one technology mentoring for in-service teachers: The experiences of future ICT coordinators. *International Journal of Technology in Education (IJTE), 4*(4), 847-869. https://doi.org/10.46328/ijte.104

IJTE
International Journal of Technology in Education
2021, Vol. 4, No. 4, 847-869 https://doi.org/10.46328/ijte.104

One-On-One Technology Mentoring for In-Service Teachers: The Experiences of Future ICT Coordinators

Ercan Top, Melih Derya Gurer, Derya Baser, Sedat Akayoglu, Recai Akkus

Article Info

Article History

Received:
02 February 2021
Accepted:
15 September 2021

Keywords

Teacher professional development
secondary education
improving classroom teaching
one-on-one technology mentoring

Abstract

With the increasing demands of technology integration by the institutions, educators felt the need to develop themselves professionally. In this study, as a way of professional development, we focused on one-on-one technology mentoring for in-service teachers because the experiences of mentors would shed light on professional development programs in the context of both mentors' progress and mentoring in-service teachers. Mentors for teachers were assigned to facilitate teachers' ICT usage and ICT integration skills. The mentorship implementation lasted two semesters with 42 mentors' participation. The determination of the content of the mentoring process was completely based on the needs and interests of the teachers. After the implementation, the perceptions and experiences of the mentors were asked and coded through content analysis. According to the analysis, the responses of the mentors were grouped into five main categories; (a) affordances of the technology mentoring process, (b) the contribution of the project to the teachers, (c) the contribution of the project to the mentors, (d) the challenges experienced by the mentors, and (e) the weaknesses of and the suggestions for the mentoring process. The findings of this study indicated that future ICT coordinators believed that one-on-one technology mentoring in real school settings is an effective way not only for training in-service teachers but also for creating awareness of being an ICT coordinator and developing ICT mentoring skills.

Introduction

Adopting information and communication technology (ICT) has long been debated among educators, educational leaders, and researchers (Liu et al., 2019). At the same time, technology integration is one of the key challenges of 21st-century teaching and learning environments and is a complex process in terms of educational change. Despite the huge potentials of ICT for learning, teachers use ICT for paperwork, designing instructional materials, or transmitting knowledge, and they do not integrate technology into teaching and learning environments at the desired level (Gorder, 2008; Hill & Uribe-Florez, 2020; Tondeur et al., 2016). According to Ertmer (1999), there are two types of barriers to effective technology integration by teachers: first-order barriers refer to external factors not directly related to teachers, such as lack of access to technology, limited support, and insufficient teacher training; and second-order barriers refer to internal factors, related to teachers, such as

confidence in the use of technology and perceived values of technology in teaching and learning.

Both teachers' ICT skills and the instructional uses of these skills in technology-enriched learning environments are crucial for teachers' technology integration (Bergeson & Beschorner, 2020; Hill & Uribe-Florez, 2020; Kaur, 2020; Paje et al., 2021). Lack of professional development in these areas negatively impacts ICT integration. Providing professional development can enhance not only teachers' attitudes and beliefs towards ICT but also their knowledge and skills in ICT (Baran, 2016a; Hew & Brush, 2007; Kaur, 2020).

Long-term professional support had positive effects on teachers' skills, confidence, and comfort in technology use for teaching (Alemdag & Erdem, 2017; Blocher et al., 2011; Hilton & Canciello, 2018). Hill and Uribe-Florez (2020) mentioned that this support should be "continuous support for teachers throughout the school year and during the school day to address needs that may arise in the classroom" (p. 10). They also reported that technology use of the participating teachers' students for learning purposes increased. Sullivan et al. (2018) created a peer-learning community to support faculty in technology-enhanced pedagogy for a research project. After two years of professional development, they reported that the participant faculty learned from the experiences of their colleagues, their knowledge in instructional technologies increased, and they integrated technology into their classrooms.

ICT Supports at Schools in Different Countries

Teachers are generally supported by ICT experts, namely ICT coordinators, on a school basis to accomplish teachers' professional development for successful technology integration. An ICT coordinator is a person who is responsible for the technological infrastructure of the school, supports the school's ICT policy, and coordinates ICT tasks among stakeholders of the school (Tondeur et al., 2009). They are assigned to provide technical support, plan school-based change for ICT integration, and promote ICT-integrated education (Devolder et al., 2010). The support in teachers' own context is a crucial incentive to increase technology integration at schools (European Commission 2013). Furthermore, the European Commission (2019) report revealed that the higher the availability of ICT coordinators and teacher training at schools, the higher the frequency of ICT-based activities. Therefore, supporting and training teachers by ICT coordinators are of great importance in using technology in the teaching and learning process successfully at schools (Akbaba-Altun, 2006; Avidov-Ungar & Shamir-Inbal, 2017).

Support of ICT coordinators around the world shows a variation in practice. For example, in the United States (Ronnkvist et al., 2000), around the 2000s, 87% of schools had ICT coordinators; but only 19% of them were working full-time. Besides, most of the coordinators had additional jobs, such as classroom teachers, network coordinators, or media specialists. A more recent study (Hill & Valdez-Garcia, 2020) conducted with 201 physical education teachers in the U.S. indicated that most of the teachers were satisfied with the technological support provided by ICT coordinators. According to the results of that study, 77% of the teachers got technical support from the district ICT coordinator and 70% of them from the in-school ICT coordinator. In addition to technical support, 65% of the teachers received instructional support from the district ICT coordinator and 59%

from the in-school ICT coordinator. Besides, teachers are also supported during the integration of technology through grants and projects in the US. For example, in the Technology Infusion Project conducted by Davis (2003), pre-service teachers were paired with practicing teachers to mutually support each other's development in integrating technology in an appropriate way.

ICT coordinators are committed to implementing ICT integration at schools, selected among teachers who are good at technology, technology-driven pedagogical issues, technology integration into curricular subjects, and teachers' training. For instance, Avidov-Ungar and Shamir-Inbal (2017) mentioned that in Israel, ICT coordinators, most of whom were not computer teachers, were to complete a 60-hour in-service course on innovative Web tools and ICT-related pedagogy and lead an organizational change for ICT integration. In their previous study in Israel, they also found that the ICT coordinators who showed higher performance in terms of technological and pedagogical aspects led to a transformation in teachers' teaching approaches (Avidov-Ungar & Shamir-Inbal, 2013).

European Commission (2019) analyzed policies and support measures (provision of ICT coordinator, teacher trainings, school heads' attitudes, etc.) of the schools for different grade levels across Europe, including Turkey. Based on this analysis, four profiles (strong policy & strong support, weak policy & strong support, strong policy & weak support, weak policy & weak support) were found for existing policies and support for ICT integration at European schools. Strong policy and strong support were observed in 21% of the European Union schools (see Figure 1). On the other hand, the schools in Turkey are below the average of the European schools in terms of strong policy and strong support (12%). Moreover, most of the schools in Turkey were placed in the category of weak policy and weak support (62%). This result indicated that ICT policies and ICT support of schools in Turkey need to be improved. In 2010, Turkey initiated the F@tih (Movement of Enhancing Opportunities and Improving Technology) project aimed to improve schools' ICT infrastructure, electronic educational content, ICT-integrated curriculum, ICT-related teacher training, and ICT use in a conscious, safe, manageable, and measurable manner (Milla, Kurt, & Mataruna-Dos-Santos, 2019). Although the F@tih project contributed to schools' ICT infrastructure, schools' vision, policies, and ICT support and coordination at some level (Aydin et al., 2016), teachers still need to be supported in ICT integration into their teachings.

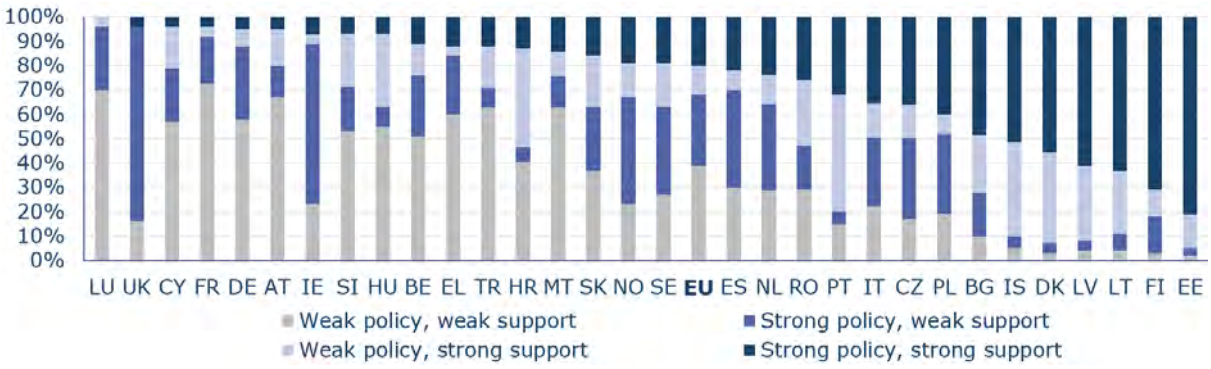

Figure 1. Percentages of students by school type in terms of policy and support
(European Commission, 2019, p.108)

Information Technology Related Mentoring

Recent studies indicated that teachers' professional development and ongoing support are needed to increase teachers' effective technology integration (Kopcha, 2012). Different institutions have implemented tutorials, technology training programs, workshops, conferences, webinars, professional learning communities, and mentoring programs to enable educators to integrate technology into their classrooms effectively. However, previous studies have presented confounding results about the effectiveness of these professional development endeavors on technology integration. For example, Tweed (2013) indicated that teachers are likely to transfer what they learned in these professional development environments into their teaching environment. On the other hand, some researchers stated that the outcomes of professional development programs for technology integration had not been fully realized because they are developed as one-shot events, and they mostly focused on theoretical knowledge instead of hands-on practices (Aslan & Zhu, 2016; Çetin, 2016; Karaseva et al., 2018; Paulus et al., 2020). One of the reasons for the failure of these trainings is that they ignore teachers' needs, pedagogical approaches, and learning context (Rokenes & Krumsvik, 2016).

Affordances of The Technology Mentoring Process

Mentoring is a process helping mentees to gain personal development through the exchange of wisdom, support, reciprocal teaching and learning, and guidance between mentors and mentees (Parsloe & Wray, 2000). In mentoring practices, the interaction between the participants is reciprocal. In other words, mentees mostly seek support about a topic they need help with, and mentors provide support. Therefore, the mutual communication between the mentor and the mentee contributes to their knowledge, skills, and reflective thinking during the mentoring process. As a result, a collaboration between the mentor and the mentee develops (e.g., Alemdag & Erdem, 2017).

Technology mentoring is applied to provide technology-related professional development for teachers. The main goal of technology mentoring is to meet educators' individualized needs in the process of their adaptation for technology integration into teaching and learning practices (Pamuk, 2008). The positive impacts of mentoring on teachers' classroom and time management skills, socialization, adoption of the norms and standards, and teaching skills have been reported (Hobson et al., 2009; Malderez et al., 2007). Developing programs based on educators' needs, motivation, concerns, and contexts improves their level of integration of technologies into classroom practices (Baran, 2016a). When the mentoring program is not developed based on mentees' specific needs, mentees might not want to follow the sessions regularly and lose their motivation on the content of the program (Gunuc, 2015).

In addition to reciprocal learning and content based on mentees' needs, mentoring programs provide a one-on-one setting that contributes to the development of required skills, an understanding of technology integration in a more comprehensive level, collaborative and organizational skills, and a sustainable learning community (Yu et al., 2018). For example, Gökoğlu and Çakıroğlu (2017) stated that technology mentoring activities enhance not only technology-related skills but also ethics and policies, professional development, and organization and

management skills. Similarly, with the help of technology mentoring programs, mentors develop their communication skills while supporting teachers in adopting technology for teaching and learning (Denton et al., 2005).

Contribution to Teachers

Mentoring is considered to be an effective training method for the professional development of teachers related to technology integration. Kopcha (2012) pointed out that mentoring helps teachers overcome technology barriers, improve their technology integration knowledge and skills, and develop a clear vision for using technology for instruction. Professional development of teachers with mentoring and ongoing support was found to be effective for improving teachers' technology-related knowledge and skills (Liu et al., 2015). Koh and Chai (2014) and Lowther et al. (2008) reported that mentored teachers used technology more frequently and felt more confident in using technology in the classroom than non-mentored teachers. Furthermore, Baran (2016a) expressed that ongoing technology-related mentoring leads faculty members to design their courses with new instructional technologies. Previous studies also emphasized that mentoring had been a promising way of increasing teachers' or faculties' technological-pedagogical-content knowledge (TPACK) (Jaipal-Jamani & Figg, 2015; Koh, 2020; Mourlam, 2017).

Mentoring has also been found to have emotional effects on teachers in terms of technology integration. For example, mentoring has the potential to eliminate teachers' anxiety about using ICT in their teaching environment. Blocher et al. (2011) found that teachers who participated in a mentoring program are no longer afraid of technology in the classroom, view technology more positively, and think of ways of using technology for designing materials, teaching, and evaluation. Mentoring for teacher professional development has the potential to reduce the feeling of isolation, increase confidence and self-esteem, enhance problem-solving and self-reflection, and develop professional learning (Hobson et al., 2009). Mentoring motivates teachers both intrinsically or extrinsically through hands-on activities and interaction with peers, teachers, and students (Yoon et al., 2018). The higher the consideration of teachers' needs and characteristics in a mentoring program, the higher the teachers' satisfaction with the program (Alemdag & Erdem, 2017).

Contribution to Mentors

As emphasized above, the benefits of mentoring are mutual between mentors and mentees. For mentors, practicing future-related work in advance helps to gain experience in doing the tasks in relation to the future job. Korthagen (2004) expressed that mentoring is beneficial for mentors in several ways. First of all, it helps mentors construct their identities as the person of that job (Bullough, 2005). During mentoring programs, mentors get the opportunity to develop specific skills and confidence in helping others. Moreover, they develop a sense of belonging to the field. Bullough and Draper (2004) pointed to the emotional aspects of mentoring such that mentoring not only supports specific skills but also feeds the feelings. In addition, Iancu-Haddad and Oplatka (2009) found that most of the benefits of mentoring for mentors are emotional, including feelings of satisfaction. Bower-Phipps et al. (2016) found that mentors gain practice in developing a competent teacher,

explicit mentoring of one another, reflecting on mentoring, and teaching explicitly. Frydaki and Mamoura (2014) highlighted that mentoring provides an informal learning community for mentors and a reflective stance as a colleague. The findings of Yu et al. (2018) indicated that mentoring helped graduate student mentors to improve essential professional development skills through continuous collaboration and communication, develop a deeper understanding of technology integration in specific teaching contexts, and establish collaborative relationships with faculty mentees through individualized support. Besides, Pamuk and Thompson (2009) identified the perceived benefits of one-on-one mentoring in four categories: technical, academic, pedagogical, and professional. While working with mentees on technology uses in teaching, mentors benefited a great deal if they witnessed their mentees' use of technology in their related tasks (e.g., in teaching) (Baran, 2016b).

Difficulties in Mentoring Processes

Although there are various affordances of one-on-one technology mentorship and contribution to both mentors and mentees, some difficulties may still arise during the mentoring process. For example, in different studies, various challenges related to the content in the mentoring process were mentioned, such as discontinuing the previously planned content, not covering the subject in detail, unattractive content for the mentees, mentees being at least as knowledgeable as mentors (Gunuc, 2015), mentors not competent in some subjects that mentees request (Gunuc, 2015; Yu et al., 2018), and mentors' limited knowledge of technological resources appropriate for mentees' subject areas (Konca & Tasdemir, 2018; Yu et al., 2018). Similarly, some researchers have mentioned various logistic challenges such as the mentors/mentees having difficulties in continuing the process (Baran, 2016a; Gunuc, 2015; Iancu-Haddad & Oplatka, 2009), using only a small part of the planned time in some meetings (Gunuc, 2015), and a lack of a suitable working environment (Gunuc, 2015). Similarly, some researchers mentioned teaching difficulties such as mentors' fear of failure due to unforeseen problems that may arise in meetings (Gunuc, 2015; Iancu-Haddad & Oplatka, 2009), a decrease in mentees' motivation as the process progresses (Doukakis et al., 2019; Gunuc, 2015), and mentors' difficulties in managing the process (Gunuc, 2015).

Weaknesses of and Suggestions for The Mentoring Process

Despite its benefits, researchers pointed out some limitations of the technology mentoring process. The mentoring approach requires much effort and contextual support of teachers while they are developing technology integration skills (Dysart & Weckerle, 2015). Researchers (Dempsey & Christenson-Foggett, 2011; Redmond, 2015) also noted the negative effect of insufficient time and high workloads of teachers in the effective implementation of the mentoring process. The workloads of mentor teachers increase as a result of their routine teaching roles (Lee & Feng, 2007). Bullough (2005) reported that mentor teachers sometimes experience feelings of insecurity, nervousness, and inadequacy with the act of being observed by mentees. Alemdag and Erdem (2017) pointed out that the interaction breaks by the mentees as the support seekers may negatively influence the effectiveness of the process. It is also suggested that this situation might have decreased the mentors' motivation. In addition, they pointed out that the quality of interaction between the mentors and

mentees is a critical point in starting and maintaining the mentoring process.

Significance

Graduates of the Computer Education and Instructional Technology department can be appointed to primary and secondary schools as ICT teachers and ICT coordinators in Turkey. Therefore, guiding teachers for technology integration at schools, where they are appointed, might be one of their duties in their professional lives. In this study, senior students at the Department of Computer Education and Instructional Technology were assigned as technology mentors of in-service teachers. In this way, as Gabriel and Kaufield (2008) suggested, both in-service teachers as mentees and senior students as mentors had the opportunity to apply the required knowledge and skills for their own professional lives into practice within a mentoring program so that reciprocal learning was achieved. Furthermore, developing senior students' skills for mentoring teachers is crucial as the study of Avidov-Ungar and Shamir-Inbal (2013) indicated that increasing the abilities of mentors leads to higher performance in teachers' transforming pedagogical approaches by technology.

Professional development through mentorship can meet the contextual needs of educators and provide immediate feedback for real-life issues that they experience (Baran, 2016a; Kodama et al., 2016; Steinke & Putnam, 2011). This study aims to examine the experiences of potential ICT coordinators on technology mentoring processes, considered as one of the successful implementations for developing teachers' technology integration skills (Belt & Lowenthal, 2020; Kopcha, 2010; McLoughlin, 2015; Steinke & Putnam, 2011). Studies related to technology mentoring (Baran, 2016a; Denton et al., 2005; Gökoğlu & Çakıroğlu, 2017; Lowther et al., 2008; Steinke & Putnam, 2011; Yu & Karakaya, 2018) mostly focused on the impact of technology mentoring on mentees. However, there is a need in the literature for understanding the mentorship process from the perspective of mentors as more experienced members on technology to provide mutual benefits for both mentors and mentees (Pamuk & Thompson, 2009). Especially, few studies are reflecting the experiences of mentors for teachers' professional development. Some researchers studied technology mentoring for teachers from mentors' perspectives by focusing on a specific point such as mentors' roles (Gökoğlu & Çakıroğlu, 2017) and benefits (Denton et al., 2005) while some researchers (Baran, 2016a; Corso & Devine, 2013; Gabriel & Kaufield, 2008; Pamuk & Thompson, 2009) discovered benefits of mentoring for faculty members. Accordingly, the purpose of the study is to analyze the perceptions of technology mentors of K12 teachers from a general perspective rather than focusing on a specific point.

Method

Research Design

This study inquired about the experiences of future ICT coordinators in the technology mentoring process with middle school teachers. Within this purpose, the mentors' perceptions about the mentoring process were examined. A qualitative approach (Merriam, 1998) was used to answer the research questions because it allowed researchers to identify common patterns of the technology mentoring process based on the future ICT coordinators' experiences. Specifically, a case study design within qualitative approach (Creswell & Plano

Clark, 2007; Yin, 2003) was embraced to detail the perceptions of the mentors as each mentor experienced their own ways of the mentoring process.

Participants

The mentors in the study were the senior students enrolled in a compulsory course at the Department of Computer Education and Instructional Technology at a university in Turkey. After graduation, the students studying in this department can work as computer science teachers, ICT coordinators in K-12 schools, instructional designers, and/or experts in ICT-related jobs. The study included 21 male and 21 female technology mentors aging between 21 and 24. Before the study, the mentors did not have any official experience of technology mentorship.

Mentoring Process and The Context

Mentors worked together with middle school teachers (as mentees) during two academic semesters in line with the teachers' needs, wishes, and preferences. The contents of the technology mentoring programs with teachers were arranged in the form of personal development, professional development, and material support in line with the requests of the teachers. The one-on-one technology mentoring process was conducted weekly at the time intervals determined by the mentors and the teachers together at the schools where teachers worked. Besides weekly meetings, the teachers could contact the mentors anytime to get on-time help or ask for their demands for the following meetings. The teachers' specialties were mathematics (N=16) and language (N=26) teaching, and they were from three different schools located in the same district as the university. Teacher-mentor matching was done by randomly assigning teachers from the discipline chosen by mentors.

This study constitutes the sub-dimension of a more comprehensive project in which improving the ICT coordinator skills of mentors and teachers' technology integration was targeted. One of the outputs of this study (Top et al., 2021) was found that teachers' requests from the most to the least emerged as learning software programs, designing teaching materials, workload support, and technical support. Another result of this project revealed that technology-related TPACK structures of the teachers had increased significantly through one-on-one mentorship (submitted). Therefore, we excluded these dimensions from the scope of this study and solely focused on the technology mentoring process through the eyes of mentors.

Mentors Job Definition

This study was conducted by five researchers, one of whom was the course instructor, one was a specialist in language teaching, one in mathematics teaching, and two in instructional technologies. The researchers shared the list of resources, programs, and applications that can be used for teachers' professional and personal development with the mentors before the study begins. Mentors were able to identify their topics from this list or any other source based on the choice of their assigned teacher. Mentors were asked to post information about the mentoring process online so that other mentors could see the reports. When teachers requested instructional

materials to use in their lessons, mentors were required to receive feedback from researchers before handing over these materials. Feedbacks to the documents were created by experts (mathematics or language teaching based on teacher's specialty) and instructional technologists. The instructor of the course bi-weekly examined the online posts of the mentors, and the necessary warnings and notifications were provided to the relevant mentor.

Data Collection and Analysis

The data used in this study consisted of technology mentors' answers to the open-ended questions about the process. A conventional content analysis was conducted for the data (Hsieh & Shannon, 2005) since the qualitative interpretation of the codes was central to the coding process rather than the counts. First, the responses were coded by at least two researchers individually, and then compared among the coders. This coding phase was inductive because the codes were generated during the analysis and derived from the data. After defining codes and categories, all the researchers discussed until they reached a final consensus for each code and category (Gläser-Zikuda et al., 2020).

Results

The coding procedure yielded that the responses of the mentors could be grouped into five main categories; (a) affordances of the technology mentoring process, (b) the contribution of the project to the teachers, (c) the contribution of the project to the mentors, (d) the challenges experienced by the mentors, and (e) the weaknesses of and the suggestions for the mentoring process. Firstly, we focused on the affordances and the strengths of the mentoring process; then, it was found that both stakeholders – the teachers and the mentors – benefited from the process, and we attempted to determine at which points the process contributed to the teachers and the mentors; the challenges encountered by the mentors were reported; and finally, the weaknesses of the project from the perspectives of the mentors were listed with their suggestions. In the following, the findings related to these dimensions are given with excerpts from the data. While reporting the results, pseudonyms are used to ensure anonymity.

Affordances of The Technological Mentoring Process

As for the first dimension, the mentors pointed out that the process had many strengths and affordances. For example, some mentors particularly mentioned that the content of the training was based on teacher needs and interests. At the beginning of the process, the mentors met the participating teachers, and they decided on the content collaboratively. The teachers individually listed what they needed in terms of educational and personal purposes. If they could not specify the tools, the mentors suggested some tools. As a final decision, the teachers' needs and interests were taken as the basis in content determination. Alex evaluated the process and particularly mentioned the importance of content determination. He claimed that "I think I provided useful information with the teacher because we mostly worked on the software programs that we had determined in line with the needs of the teacher". As can be seen in this excerpt, when the content was determined following the needs of the

teacher, the mentor felt helpful to the teacher in the mentorship.

Secondly, the mentors thought that there was effective communication among the academic supervisors, the teachers, and the mentors. The researchers helped the mentors while designing the trainings and gave feedback on the materials they developed for their teachers. The mentors were asked to share the training content with the researchers beforehand, and they made some changes if necessary. Thus, the mentors believed that the academic supervisors thoroughly carried out the process, and there was effective communication among the stakeholders. Another point was that this project improved the mentors' communication skills since they could work with other teachers. At this point, to indicate there was effective communication in the process, Mel stated that "I was able to stay in constant contact with my academic supervisors and take care of them directly in case of any problems".

Thirdly, although this mentorship process was designed to help the teachers use technology for both educational and personal purposes, it was found that there was mutual learning for the teachers and the mentors. While the teachers were offered personal trainings, the mentors had to prepare some activities for teaching ICT tools. Sometimes, the needs and interests of the teachers might not be the mentors' expertise, and in this case, the mentors had to explore the details of these tools. At some points, the mentors also had to discover how they could use ICT tools for educational purposes, and as a result, they also improved themselves. The mentors frequently mentioned this point throughout the data. For example, Sue stated that "the process was very successful and beneficial for our teachers and us, and there were bilateral benefits. As a result, I liked this process". Finally, the mentors believed that one-on-one mentorship was among the points that made this process successful. Instead of one-shot seminars or trainings for a large group of teachers, this kind of mentorship provided the teachers with individualized training sessions. As a result, the teachers had the opportunity to practice the tools with hands-on activities. In addition, they consulted the mentors when they experienced problems in the implementation of the tools.

Contribution to The Mentors

The mentors found an opportunity to meet teachers in real settings, at schools, and they could act as a mentor based on real needs of the teachers so that we believed that they had benefited from the study. As mentioned above, the main objective of this project was to train teachers on technology in a one-on-one mentoring implementation; however, the mentors also developed themselves. The analysis showed that the mentors had experiences as IT mentors, they improved their collaboration and communication skills, they developed professionally, they improved their technological and pedagogical knowledge, and finally, they were satisfied with the outcomes.

First, the mentors participating in this study were expected to work as IT mentors when they graduate. They would be appointed to the state schools, or they would be hired at private institutions, and they would help other teachers from various branches to integrate technology in their classrooms. In this study, almost all the mentors stated that they experienced how to help other teachers with real-world problems. Mel mentioned this point as

"Working with different teachers and being able to solve their problems and problems together with them and helping them was the best part. At the same time, we are already seeing the problems we may face in the future" so that the mentors could see the outcomes of ICT integration because the teachers shared their experiences after the implementations.

While acting as IT mentors, the mentors practiced teaching a tool to another teacher so that they noticed that knowing and using a tool was utterly different from teaching the features of the tool. They worked with teachers who had various technological competence. Some teachers were good at using technology, so the mentors had to focus on advanced features. On the other hand, some teachers were novice users of technology, so the mentors explained the basic functions of the ICT tools. This way of mentoring helped them to develop their pedagogical knowledge. The statements related to pedagogical knowledge were frequently observed in the data. For instance, Max stated that "I learned various software programs and transferred my knowledge to another person so that I could claim that this project helped me to gain experience".

Moreover, the mentors developed their technological knowledge. Although they were expected to mentor the teachers, some teachers asked them to show some discipline-specific tools. For example, a language teacher might ask for a tool in language teaching while the mentor had no idea about this language teaching tool. They studied the features of the requested tools beforehand, and this improved their technological knowledge. At the end of the project, it could be claimed that the mentors also improved their technological knowledge. As Adam mentioned that "the project was helpful while learning the applications the teachers asked", it could be claimed that the mentors also improved their technological knowledge.

Additionally, in all the stages of the study, the mentors also work in collaboration with their supervisors at the university and the teachers at schools. According to them, this kind of communication and collaboration improved them personally in terms of communication skills. Furthermore, they met new people, that is, teachers at schools, whom they would encounter in their future teaching career. Furthermore, the mentors always worked in collaboration with the researchers during the preparation of the training material. For instance, to emphasize the improvement of her communication skills, Lisa stated that "its biggest contribution was the development of my communication skills. I have experienced how to behave and what to do while teaching someone older than me".

Finally, it could be claimed that the mentors were also satisfied with the procedures of the implementation. They stated that they learned a lot in terms of technological and pedagogical knowledge, which could be an invaluable experience. Moreover, the teachers who did not participate in this study also wished to be a part of the project in the following years, which made the mentors satisfied with the outcomes. Adam was glad to hear that "some other teachers were willing to participate in the following year".

Contribution to The Teachers

In the affordances of this mentoring process, the mentors mentioned that the teachers benefited from the

process. The mentors in this study were asked at which points this process contributed to the teachers they worked with; so, the contribution of the mentoring process to the teachers was based on the observations of the mentors. Although few mentors claimed that there was no change in teachers in terms of technology use, most of the mentors acknowledged that they observed some improvement in teachers. These changes were classified into four categories. The first two categories were overlapping with the objectives of the study. As for the primary purpose of this study, the mentors observed that the teachers improved themselves in terms of their basic technological skills and ICT use for education. For example, respectively, Linda stated that "she [the teacher] is now constantly using Google Drive in her daily life and does not hesitate to use Office programs, and most importantly, she uses it more accurately and easily"; and Mona stated that "he [the teacher] learned how to make the lesson more understandable and more enjoyable thanks to animation preparation [tools], using a blog, website, and different quiz preparation programs".

The third category was related to the attitudes of the teachers. At the end of the study, it was claimed by the mentors that the teachers were more open to the new ideas related to technology uses for both educational and personal purposes. Some teachers allocated more time to explore the details of the tools. Some teachers allocated more time to explore the details of the tools. John claimed that

> I think our teacher started to spend more time on technology. Our teacher, who is curious about technology, stated that he repeats the activities we have done and that he has found another program and progressed in time because 3D paint was not enough after a while.

Finally, the mentors declared that the teachers were satisfied with the outcomes of the study. According to the mentors, teachers believed that they could use technology more effectively in their teaching. For example, Ella said, "I believe that our teacher is generally happy with the tools I introduced. I tried to show all the details, and she listened to me willingly. I could claim that the process was effective in terms of learning tools".

Challenges in The Mentoring Process

Although some mentors claimed that they had no difficulty in the mentoring process, we were not surprised to hear some challenges throughout the training. At the end of the data analysis, these challenges could be classified into three categories, namely content, logistics, and teaching-related difficulties. The content of the training sessions was determined by the mentors and the teachers in collaboration. While some teachers had some ideas about the ICT tools and their needs, some had very limited ideas about the potential uses of ICT for personal and/or educational purposes. If the teacher was a novice user of the technology, the mentor was reluctant to find a topic for each week. Also, if the teacher did not have any idea about the use of technology in their field and the mentor was not competent enough in the teacher's area, the mentor had difficulties in finding a topic for each week. Luke's words showed that "finding a new program for each week was challenging". He also stated that "the process was somehow affected negatively when the sources were limited". Moreover, the mentors needed more time to design a session for introducing the tool to the teacher. The mentors had limited time for the preparation, and they mentioned this issue as one of the challenges in the project. Although some mentors felt the need for a list of ICT tools beforehand, this contradicted the nature of one-on-one mentoring

since it should be based on the teachers' needs and interests. Among the challenges related to the content, the mentors had some doubts about the contribution of content to the teachers. One of the mentors was not sure whether the tool would be useful for the teacher.

Another challenge was logistics-related problems, which were observed in two ways. First, a few of the mentors complained about the location of the schools. They had to use public transportation to reach the school if they were living on the other side of the city. Second, they had difficulties in finding a convenient time to meet teachers. During the weekdays, the teachers had a tough schedule, and they could not allocate time at weekends so that they could only meet during the breaks, or sometimes they had to cancel the meetings at the last minute. In addition, communication issues sometimes caused problems related to the planning of the meetings. Two of the mentors mentioned that they had difficulties while communicating with the teachers. John clearly summarized the challenges with "time and distance issues".

Finally, as one of the main categories of challenges, the mentors stated that they had some problems or difficulties in teaching. Although they mentioned that their pedagogical knowledge improved in the process, they also had difficulties while teaching. First, the mentors were anxious during the period because they were unsure whether they could teach the tools to an adult partner. Before this project, they did not have any experience in working with adults. Indeed, mentors reported that they could hardly teach the features of some tools to the teachers. In addition to these, the study was a voluntary basis for the teachers; that is, the teachers participated in this study voluntarily. However, in time, some of them could lose their willingness to continue the project and take roles in the tasks, which was a challenge for the mentors. For example, Lisa mentioned that "the only problem during the process was the teacher's unwillingness to participate".

Weaknesses and Suggestions of The Mentoring Process

While most of the mentors claimed no weaknesses in the study, a few presented some points to be considered for future studies. It was found that the shortcomings in the study were somehow in parallel with the challenges mentioned by the mentors in the previous section. This finding means that the mentors thought that the problems and difficulties encountered in this study were mostly the weaknesses of the process itself. The flaws of the study were listed as logistics-related issues, the design of the project, and teacher-related problems, and the mentors suggested some recommendations for these weaknesses.

Logistics-related issues were mainly about the location of the schools, the place for training, and the availability of the teachers for meetings. The schools were considered to be outside the city center, so the mentors had some difficulties while transporting to the schools. Moreover, the mentors and the teachers usually worked in the teachers' room, which was quite noisy during the breaks. Another logistics-related issue was the availability of the teachers. The teachers were complaining about their schedules, and this was reflected in the statements of the mentors. The teachers could hardly find a suitable time to meet and work on the tools. These points were mentioned by John as follows:

> The shortcomings of this project were time and distance. There were some problems related to the

> scheduling, and the meetings were organized in the teachers' room which caused attention problems. I believe that the process should be designed more carefully and appropriate rooms should be allocated in the future.

In the excerpt above, the mentor suggested that the administrators could arrange a meeting room that was quiet and silent while working with the teachers. Moreover, it was also recommended that the assigned schools be chosen among the schools with easy access.

Another shortcoming of the study mentioned by the mentors was about the project design. This project was designed as a two-semester-long study, and the teachers remained the same. The mentors believed that one semester could be enough for the teachers because the teachers got bored towards the end of the second semester; or, different teachers could be invited for the second semester. They stated that the implementation period could be shortened in future studies to be more successful. Moreover, weekly trainings were found to be very loaded by the mentors. They recommended that the training be held once a fortnight or a month to handle the content more efficiently.

The final shortcoming was about the teacher-related issues. The motivation of the teachers decreased over time, as mentioned in the excerpt above. Even the enthusiastic teachers at the beginning of the study were demotivated in time because they could not find enough time to practice. Moreover, the teachers would like to learn as many ICT tools as possible without covering their details. Interestingly, some teachers had some prejudices about the technology, which was quite challenging to overcome. As for the suggestion, the mentors stated that the trainings should be followed-up in time so that it could be better to observe the development of both mentors and teachers, and only the teachers who committed themselves to the study should be accepted in future studies.

Discussion

Results indicated that determining the content of the trainings based on teachers' needs and interests influenced the mentoring process positively, which supports the claim of Baran (2016a), Gunuc (2015), and Pamuk (2008). The mentors found the mentoring process successful in providing benefits for the teachers with the help of need-oriented content. One-on-one mentorship was also one of the key attributes of the process, according to the mentors. As a result, the teachers comprehensively developed their skills related to technology integration with the help of contextualized one-on-one training rather than one-size-fits-all sessions (Yu et al., 2018). The mentors also stated that the teachers learned ICT tools and resources for teaching and learning through mentoring. As Gabriel and Kaufield (2008) suggested, mutual benefit for mentors and mentees increased motivation to engage in the mentoring process. Besides improvement in technical knowledge, the mentors emphasized that mentoring developed their communication skills while providing support for the teachers for a long-term period (Denton et al., 2005) and management skills (Gökoğlu & Çakıroğlu, 2017). With the help of these benefits, mentors could develop their performance as successful ICT coordinators, which might affect technology integration practices at schools that they will be appointed in the future (Avidov-Ungar & Shamir-Inbal, 2013).

At the end of the data analysis, it was seen that mentors had experience as IT mentors. They listed the affordances of the mentoring process as improving their collaboration and communication skills, developing professionally, improving their technological knowledge, and finally, they were satisfied with the outcomes. Therefore, it can be said that the experiences of future ICT coordinators within actual school settings improved their skills which are expected from them (Yu et al., 2018). The findings of the study support the assertions of the literature that the mentoring process might be beneficial and educational for the mentors. This overall finding is in accordance with the view of Bower-Phipps et al. (2016), such that mentors benefit in several ways from helping others. For example, the mentors in the project considered that they improved their collaboration and communication skills, which was also found in the study of Yu et al. (2018). The results of this study supported the outcomes of the studies conducted by Bower-Phipps et al. (2016) and Yu et al. (2018), such that mentors developed professionally and improved their technological knowledge. Moreover, the mentors expressed that they were satisfied with the outcomes as they saw improvement in both their understanding of IT mentoring and the positive attitudes of the teachers they had worked with (Iancu-Haddad & Oplatka, 2009).

The results of this study indicated that according to mentors, individualized technology-related mentoring programs had positive influences on teachers' basic technology skills and increased their technology use in the classroom. This result corroborates with the findings of different studies in the literature (e.g., Baran, 2016a; Kopcha, 2012; Liu et al., 2015). While professional development programs that were developed without considering teachers' needs mostly failed (Kopcha, 2012), contextual and need-driven design and development of trainings and materials led educators to integrate technology into their teaching (Baran, 2016a). The mentors also observed that some technology-resistant teachers were open and started to use technology in their classrooms. This result implicated that mentoring helped teachers gain positive attitudes towards technology use for teaching and transfer what they learned in the mentoring process to the classroom activities (Tweed, 2013). The mentors also stated that the teachers were satisfied with the achievements of the project. Although the mentors did not state explicitly, the following factors might cause the teachers to be satisfied with this project: a) the interaction among the researchers, mentors, and teachers, b) the teachers' gains in terms of technology and technology integration into teaching, and c) positive effects of technology on teaching and learning (Alemdag & Erdem, 2017).

Some mentors stated that they did not have any difficulties in the process. However, as some researchers (Konca & Tasdemir, 2018; Yu et al., 2018) stated in the literature, some mentors had difficulties in finding and preparing content continually for the teachers they work with. Long preparation times and not being sure about the suitability of the content (Konca & Tasdemir, 2018; Yu et al., 2018) were other content-related challenges stated by mentors. In this study, mentors reported difficulties in transportation, setting the appropriate time for meetings, and communication problems. These findings are parallel to the results of the researchers (Baran, 2016a; Gunuc, 2015; Iancu-Haddad & Oplatka, 2009), who stated that mentors and teachers had difficulty in continuing the process for various reasons. The decrease in teachers' motivation about the project (or to learn new content) has emerged as one of the challenges mentioned by the mentors under the teaching title. Similarly, Gunuc (2015) and Doukakis et al. (2019) emphasized that the motivation of learners decreased as the process progressed. This point can also be considered as an invaluable experience since unmotivated students would

always be available in their future classes. Being anxious about their teaching ability and straining while teaching (Gunuc, 2015; Iancu-Haddad & Oplatka, 2009) were other teaching-related challenges expressed by mentors.

Although its affordances, the technology mentoring processes might have some weaknesses, which the mentors in this study also mentioned. The main weaknesses listed in this study were logistics, the project design, and teacher-related issues. First, although the lack of contextual support for teachers was stated in the literature (Dysart & Weckerle, 2015), this point was not observed in this study. The reason for this might be related to the data collection procedure in this study. We attempted to explore the process from the mentors' perspective, and they might not be aware of the lack of support for teachers.

The second point mentioned by the mentors as the weakness of this project was project design, which includes the duration of the project and intensive training. This issue was also raised by some researchers (Dempsey & Christenson-Foggett, 2011; Redmond, 2015) in the field. They stated that the high workloads of teachers and some additional works were perceived as a burden for teachers, which leads to a remarkable decrease in the motivational levels of the teachers (Rasheed et al., 2016). Some mentors suggested that this project be limited to one semester so that the teachers did not have to follow this project for a year, and they might be more motivated. From this perspective, we can claim that this kind of mentoring project should not last for months, contrary to the literature (e.g., Baran, 2016a). The reason for the demotivation of the teachers could be that their needs of ICT tools were met to some extent so that they did not feel to learn anymore.

Finally, as it was found in this study, the main concerns were about teacher-related issues. They could not find enough time, lost their motivation in time, and had some communication problems with the mentors. These interaction problems were mentioned by Alemdag and Erdem (2017) in the literature. Bullough (2005) reported some issues related to mentors, such as feelings of insecurity, nervousness, and inadequacy; however, the mentors did not state any problems like these throughout the study.

Conclusions

Based on the result of the study, it can be said that mentors and mentees have mutual benefits during a one-on-one mentoring process as a teacher training approach. This study also advocated that - in the eyes of the mentors - both agencies improved themselves in terms of several areas which are important for technology integration at schools. Mentors reported that they benefited from the project in different ways, such as having experience as an ICT mentor, increasing collaboration and communication skills, developing their pedagogical and technological knowledge, and being satisfied with their mentoring.

The contribution of the project to the teachers pointed out by the mentors are an increase in basic ICT knowledge and ICT usage in their teaching, being open to technology, and feeling of satisfaction with their use of technology. This finding is crucial for individualized technology-related (ITR) mentorship because, as the experts and providers of knowledge on technology, the mentors evaluated the process of their own mentorship

and realized the positives and shortcomings of the process. Mentors reported the positive features of the project as content based on teacher needs and interests, effective communication and management, mutual learning, and one-on-one teaching. On the other hand, logistics, project design, and teacher-related problems emerged as the shortcomings of the process. This kind of awareness through the eyes of mentors is very valuable in constructing their identities as ICT coordinators.

Implications

In the light of the discussion above, this study has some implications for ICT providers in schools. First, one-on-one mentoring is an effective way of supporting teachers to overcome their technology-related hassles so that they can adapt technology into their subject teaching. Second, the mentoring process should be experienced in real settings so that mentors can easily handle unexpected issues in relation to helping teachers with confidence. Third, considering the weaknesses of the project in this study, the researchers or experts in field teaching with ICT might inspire or guide teachers at the beginning of the project or periodically by presenting the ICT tools, their potentials, and their uses in teaching. Finally, finding appropriate time for mentors and teachers to work together in the mentoring process is a challenging task. For the cooperation of mentors and teachers for effective technology integration, at least one class hour a week or biweekly could be devoted by the school administration.

Limitations and Further Studies

This study was conducted with Computer Education and Instructional Technology students and teachers in mathematics and language teaching for two semesters. For further studies, teachers from other disciplines might be considered as participants. Specific to this particular paper, the data from the mentors were collected through an open-ended questionnaire. On-site observation of the meetings of mentors and mentees could be incorporated into data collection to elaborate on the effects of the mentoring process. As emphasized by some mentors, mentors might enter the classroom with teachers to support them in a real teaching environment so that the effect of the mentoring process on teachers' technology integration can be examined thoroughly.

References

Akbaba-Altun, S. (2006). Complexity of integrating computer technologies into education in Turkey. *Educational Technology & Society, 9*(1), 176–187.

Alemdag, E., & Erdem, M. (2017). Designing an e-mentoring program for novice teachers in Turkey and investigating online interactions and program outcomes, *Mentoring & Tutoring: Partnership in Learning*, *25*(2), 123–150. https://doi.org/10.1080/13611267.2017.1327394

Aslan, A., & Zhu, C. (2016). Influencing factors and integration of ICT into teaching practices of pre-service and starting teachers. *International Journal of Research in Education and Science*, *2*(2), 359–370. https://doi.org/10.21890/ijres.81048

Avidov-Ungar, O., & Shamir-Inbal, T. (2013). Empowerment patterns of leaders in ICT and school strengths

following the implementation of national ICT reform. *Journal of Information Technology Education: Research*, *1*2, 141–158. https://doi.org/10.28945/1865

Avidov-Ungar, O., & Shamir-Inbal, T. (2017). ICT coordinators' TPACK-based leadership knowledge in their roles as agents of change. *Journal of Information Technology Education: Research*, *16*, 169–188. https://doi.org/10.28945/3699

Aydin, M. K., Gürol, M., & Vanderlinde, R. (2016). Evaluating ICT integration in Turkish K-12 schools through teachers' views. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(4), 747–766. https://doi.org/10.12973/eurasia.2016.1227a

Baran, E. (2016a). Investigating faculty technology mentoring as a university-wide professional development model. *Journal of Computing in Higher Education*, *28*, 45–71. https://doi.org/10.1007/s12528-015-9104-7

Baran, E. (2016b). Examining the benefits of a faculty technology mentoring program on graduate students' professional development. *Journal of Digital Learning in Teacher Education*, *32*(3), 95–104. https://doi.org/10.1080/21532974.2016.1169958

Belt, E., & Lowenthal, P. (2020). Developing faculty to teach with technology: Themes from the literature. *TechTrends: Linking research and practice to improve learning*, *64*(2), 248–259. https://doi.org/10.1007/s11528-019-00447-6

Bergeson, K., & Beschorner, B. (2020). Modeling and scaffolding the technology integration planning cycle for pre-service teachers: A case study. *International Journal of Education in Mathematics, Science and Technology, 8*(4), 330-341. https://doi.org/10.46328/ijemst.v8i4.1031

Blocher, J. M., Armfield, S. W., Sujo-Montes, L., Tucker, G., & Willis, E. (2011). Contextually based professional development. *Computers in the Schools*, *28*, 158–169. https://doi.org/10.1080/07380569.2011.577398

Bower-Phipps, L., Klecka, C.V., & Sature, A. L. (2016). Developing mentors: An analysis of shared mentoring practices. *The New Educator*, *12*, 289–308. https://doi.org/10.1080/1547688X.2016.1187979

Bullough Jr., R. V. (2005). Being and becoming a mentor: School-based teacher educators and teacher educator identity. *Teaching and Teacher Education*, *21*, 143–155. https://doi.org/10.1016/j.tate.2004.12.002

Bullough Jr., R. V., & Draper, R. J. (2004). Mentoring and the emotions. *Journal of Education for Teaching: International research and pedagogy*, *30*(3), 271–288. https://doi.org/10.1080/0260747042000309493

Corso, J., & Devine, J. (2013). Student technology mentors: A community college success story. *Community College Enterprise*, *19*(2), 9–21.

Creswell, J.W., & Plano Clark, V.L. (2007). *Designing and conducting mixed methods research*. Sage Publications.

Çetin, N. I. (2016). Effects of a teacher professional development program on science teachers' views about using computers in teaching and learning. *International Journal of Environmental and Science Education, 11*(15), 8026–8039.

Davis, N. (2003). Technology in teacher education in the USA: What makes for sustainable good practice? *Technology, Pedagogy and Education*, *12*(1), 59–84. https://doi.org/10.1080/14759390300200146

Dempsey, I., & Christenson-Foggett, J. (2011). External mentoring support for early career special education teachers. *Australasian Journal of Special Education*, *35*, 61–71. https://doi.org/10.1375/ajse.35.1.61

Denton, J. J., Davis, T. J., Smith, B. L., Strader, R. A., & Clark, F. E. (2005). Net generation college students as technology mentors for teacher educators. In C. Crawford, R. Carlsen, I. Gibson, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2005--Society for Information Technology & Teacher Education International Conference* (pp. 3150–3154). Arizona, United States.

Devolder, A., Vanderlinde, R., van Braak, J., & Tondeur, J. (2010). Identifying multiple roles of ICT coordinators. *Computers & Education*, *55*(4), 1651–1655. https://doi.org/10.1016/j.compedu.2010.07.007

Doukakis, S., Koutidou, E., & Aspasia, O. (2019). Designing an e-mentoring program for supporting teachers' training. Proceedings of the *4th South-East Europe Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA-CECNSM)* (pp. 1-6). Piraeus, Greece. https://doi.org/10.1109/SEEDA-CECNSM.2019.8908358

Dysart, S., & Weckerle, C. (2015). Professional development in higher education: A model for meaningful technology integration. *Journal of Information Technology Education: Innovations in Practice*, *14*, 255–265. https://doi.org/10.28945/2326

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, *47*(4), 47–61. https://doi.org/10.1007/BF02299597

European Commission. (2019). *2nd Survey of Schools: ICT in Education*. *Final report Objective 1 - Benchmark progress in ICT in schools.* Publications Office of the European Union. Retrieved from https://digital-strategy.ec.europa.eu/en/library/2nd-survey-schools-ict-education-0

Frydaki, E., & Mamoura, M. (2014). Mentoring as a means for transforming mentor-teachers' practical knowledge: A case study from Greece. *International Education Research 2* (1), 1–16. https://doi.org/10.12735/ier.v2i1p1

Gabriel, M. A., & Kaufield, K. J. (2008). Reciprocal mentorship: An effective support for online instructors. *Mentoring and tutoring: Partnership in learning*, *16* (3), 311–327. https://doi.org/10.1080/13611260802233480

Gläser-Zikuda, M., Hagenauer, G., & Stephan, M. (2020). The potential of qualitative content analysis for empirical educational research. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 21*(1), 35-61.

Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. *Delta Pi Epsilon Journal*, *50*(2), 63–76.

Gökoğlu, S., & Çakıroğlu, Ü. (2017). Determining the roles of mentors in the teachers' use of technology: Implementation of systems-based mentoring model. *Educational Sciences: Theory & Practice*, *17*, 191–215.

Gunuc, S. (2015). Implementation and evaluation of technology mentoring program developed for teacher educators: A 6M-framework. *Qualitative Research in Education*, *4*(2), 164–191. https://doi.org/10.17583/qre.2015.1305

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research & Development, 55*(3), 223–252. https://doi.org/10.1007/s11423-006-9022-5

Hill, G., & Valdez-Garcia, A. (2020). Perceptions of physical education teachers regarding the use of technology in their classrooms. *The Physical Educator*, *77*(1), 29–41. https://doi.org/10.18666/TPE-2020-V77-I1-9148

Hill, J.E. & Uribe-Florez, L. (2020). Understanding secondary school teachers' TPACK and technology implementation in mathematics classrooms. *International Journal of Technology in Education, 3*(1), 1–13. https://doi.org/10.46328/ijte.v3i1.8

Hilton, J.T. & Canciello, J. (2018). A five-year reflection on ways in which the integration of mobile computing technology influences classroom instruction. *International Journal of Technology in Education, 1*(1), 1-11.

Hobson, A., Ashby, P., Malderez, A., & Tomlinson, P. D. (2009). Mentoring beginning teachers: What we know and what we don't. *Teaching and Teacher Education*, *25*, 207–216. https://doi.org/10.1016/j.tate.2008.09.001

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Iancu-Haddad, D., & Oplatka, I. (2009). Mentoring novice teachers: Motives, process, and outcomes from the mentor's point of view. *The New Educator*, *5*, 45–65. https://doi.org/10.1080/1547688X.2009.10399563

Jaipal-Jamani, K., & Figg, C. (2015). A case study of a TPACK-based approach to teacher professional development: Teaching science with blogs. *Contemporary Issues in Technology and Teacher Education*, *15*(2), 161–200.

Karaseva, A., Pruulmann-Vengerfeldt, P., & Siibak, A. (2018). Relationships between in-service teacher achievement motivation and use of educational technology: Case study with Latvian and Estonian teachers. *Technology, Pedagogy and Education, 27*(1), 33–47. https://doi.org/10.1080/1475939X.2017.1339633

Kaur, D. (2020). Post-positivist approach to factors that influence K-12 teachers' use of iPads and Chromebooks. *International Journal of Technology in Education and Science, 4*(1), 26-36. https://doi.org/10.46328/ijtes.v4i1.30

Kodama, C., DiScala, J., Weeks, A. C., Barlow, D. L., Jacobs, L., & Hall, R. (2016). Lilead fellows program: An innovative approach to professional development for school library leaders. *Knowledge Quest*, *44*(4), 54–59.

Koh, J. H. L. (2020). Three approaches for supporting faculty technological pedagogical content knowledge (TPACK) creation through instructional consultation. *British Journal of Educational Technology, 51*(6), 2529–2543. *https://doi.org/10.1111/bjet.12930*

Koh, J. H. L., & Chai, C. S. (2014). Teacher clusters and their perceptions of technological pedagogical content knowledge (TPACK) development through ICT lesson design. *Computers & Education*, *70*, 222–232. https://doi.org/10.1016/j.compedu.2013.08.017

Konca, A. S., & Tasdemir, A. (2018). Faculty technology mentoring program facilitates: A case study. *Malaysian Online Journal of Educational Technology*, *6*(3), 38–51. https://doi.org/10.17220/mojet.2018.03.003

Kopcha, T. J. (2010). A systems-based approach to technology integration using mentoring and communities of practice. *Educational Technology Research and Development*, *58*, 175–190.

https://doi.org/10.1007/s11423-008-9095-4

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education*, *59*, 1109–1121. https://doi.org/10.1016/j.compedu.2012.05.014

Korthagen, F. A. J. (2004). In search of the essence of a good teacher: Towards a more holistic approach in teacher education. *Teaching and Teacher Education*, *29*(1),77–97. https://doi.org/10.1016/j.tate.2003.10.002

Lee, J. C., & Feng, S. (2007). Mentoring support and the professional development of beginning teachers: A Chinese perspective. *Mentoring and Tutoring: Partnership in Learning*, *15*(3), 243–263. https://doi.org/10.1080/13611260701201760

Liu, H., Lin, C. H., & Zhang, D. (2019). Pedagogical beliefs and attitudes toward information and communication technology: A survey of teachers of English as a foreign language in China. *Computer Assisted Language Learning*, *30*(8), 745–765. https://doi.org/10.1080/09588221.2017.1347572

Liu, S. H., Tsai, H. C., & Huang, Y. T. (2015). Collaborative professional development of mentor teachers and pre-service teachers in relation to technology integration. *Educational Technology & Society*, *18*(3), 161–172.

Lowther, D. L., Inan, F. A., Strahl, D., & Ross, S. M. (2008). Does technology integration "work" when key barriers are removed? *Educational Media International*, *45*(3), 195–213. https://doi.org/10.1080/09523980802284317

Malderez, A., Hobson, A. J., Tracey, L., & Kerr, K. (2007). Becoming a student teacher: Core features of the experience. *European Journal of Teacher Education*, *30*(3), 225–248. https://doi.org/10.1080/02619760701486068

McLoughlin, C. (2015). How teachers develop technological pedagogical content knowledge (TPACK) for contemporary learning environments: Exemplars of effective practice. In M. S. Khine (Eds.), *New Directions in Technological and Pedagogical Content Knowledge Research: Multiple Perspectives* (pp. 147–161). Charlotte, NC: Information Age Publishing.

Merriam, S. B. (1998). *Qualitative research and case study applications in education. Revised and expanded from "Case study research in education*". Jossey-Bass Publishers, San Francisco, CA.

Milla, A. C., Kurt, O., & Mataruna-Dos-Santos, L. J. (2019). User perceptions of technology integration in schools: Evidence from Turkey's Fatih project. *International Journal of Education and Practice*, *7*(4), 430–437. https://doi.org/10.18488/journal.61.2019.74.430.437

Mourlam, D. (2017). Preparing for infusion: Emergence of a model for faculty TPACK development. *Journal of Technology and Teacher Education*, *25*(3), 301–325.

Paje, Y. M., Rogayan, D. V., & Dantic, M. J. P. (2021). Teachers' utilization of computer-based technology in science instruction. *International Journal of Technology in Education and Science, 5*(3), 427–446. https://doi.org/10.46328/ijtes.261

Pamuk, S. (2008). *Faculty technology mentoring: How graduate student mentors benefit from technology mentoring relationship*. Unpublished doctoral dissertation, Iowa State University, Ames.

Pamuk, S., & Thompson, A.D. (2009). Development of a technology mentor survey instrument: Understanding student mentors' benefits. *Computers & Education*, *53*, 14–23.

https://doi.org/10.1016/j.compedu.2008.12.017

Parsloe, E., & Wray, M. (2000). *Coaching and mentorship: Practical methods to improve learning*. London: Kogan.

Paulus, M. T., Villegas, S. G., & Howze-Owens, J. (2020). Professional learning communities: Bridging the technology integration gap through effective professional development. *Peabody Journal of Education, 95*(2), 193-202, DOI: 10.1080/0161956X.2020.1745610

Rasheed, M. I, Humayon, A. A., Awan, U., & Ahmed, A, D. (2016). Factors affecting teachers' motivation: an HRM challenge for public sector higher educational institutions of Pakistan (HEIs). *International Journal of Educational Management, 30*(1), 101–114. https://doi.org/10.1108/IJEM-04-2014-0057

Redmond, P. (2015). Discipline specific online mentoring for secondary pre-service teachers. *Computers & Education*, *90*, 95–104. https://doi.org/10.1016/j.compedu.2015.08.018

Rokenes, F. M., & Krumsvik, R. J. (2016). Prepared to teach ESL with ICT? A study of digital competence in Norwegian teacher education. *Computers & Education*, *97*, 1–20. https://doi.org/10.1016/j.compedu.2016.02.014

Ronnkvist, A. M., Dexter, S. L., & Anderson, R. E. (2000). Technology support: Its depth, breadth and impact in America's schools. *Teaching, learning, and computing* [1998 National Survey Report #5]. Irvine, CA: The Center for Research on Information Technology and Organizations, University of California, Irvine. https://eric.ed.gov/?id=ED445658

Steinke, L. J., & Putnam, A. R. (2011). Mentoring teachers in technology education: Analyzing the need. *Journal of Technology Studies*, *37*(1), 41–49. https://doi.org/10.21061/jots.v37i1.a.5

Sullivan, R., Neu, V., & Yang, F. (2018). Faculty development to promote effective instructional technology integration: A qualitative examination of reflections in an online community. *Online Learning*, *22*(4), 341–359. https://doi.org/10.24059/olj.v22i4.1373

Tondeur, J., Coenders, A., van Braak, J., ten Brummelhuis, A., & Vanderlinde, R. (2009). Using online tools to support technology integration in education. In L. T. W. Hin & R. Subramaniam (Eds.), *Handbook of Research on New Media Literacy at the K-12 Level: Issues and Challenges (Vol. 1)* (pp. 389–402). https://doi.org/10.4018/978-1-60566-120-9.ch025

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2016). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research & Development, 65*(3), 555–575. https://doi.org/10.1007/s11423-016-9481-2

Top, E., Baser, D., Akkus, R., Akayouglu, S., & Gurer, M.D. (2021). Secondary school teachers' preferences in the process of ındividual technology mentoring. *Computers & Education, 160*. https://doi.org/10.1016/j.compedu.2020.104030

Tweed, S. R. (2013). *Technology implementation: Teacher age, experience, self-efficacy, and professional development as related to classroom technology integration*. Unpublished doctoral dissertation, East Tennessee State University, Tennessee.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Sage Publications.

Yoon, S.Y., Kong, Y., Diefes-Dux, H.A., & Strobel, J. (2018). Broadening K-8 teachers' perspectives on professional development in engineering integration in the United States. *International Journal of*

Research in Education and Science (IJRES), 4(2), 331-348. https://doi.org/10.21890/ijres.409263

Yu, J., & Karakaya, O. (2018). Examination of the impact of a one-on-one technology mentoring program: Multiple case studies on the mentees' perspectives. In E. Langran & J. Borup (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 594–599). Washington, D.C., United States: Association for the Advancement of Computing in Education (AACE). Retrieved May 1, 2020, from https://www.learntechlib.org/p/182588.

Yu, J., Karakaya, O., & Schmidt-Crawford, D.A. (2018). Mentoring for success: Graduate student mentors' perceptions on the impact of a one-on-one technology mentoring program. In M. R. Simonson & D. J. Seepersaud (Eds.) *Proceedings of Annual Convention of the Association for Educational Communications and Technology* (pp. 229–237). Missouri, United States.

Author Information

Ercan Top
https://orcid.org/0000-0001-7175-8677
Bolu Abant Izzet Baysal University
Department of Computer Education and Instructional Technology
Turkey
Contact e-mail: *ercantop@gmail.com*

Melih Derya Gurer
https://orcid.org/0000-0002-2627-7847
Bolu Abant Izzet Baysal University
Department of Computer Education and Instructional Technology
Turkey

Derya Baser
https://orcid.org/0000-0002-2006-8737
Bolu Abant Izzet Baysal University
Department of Computer Education and Instructional Technology
Turkey

Sedat Akayoglu
https://orcid.org/0000-0002-9865-2546
Bolu Abant Izzet Baysal University
Department of Foreign Language Education
Turkey

Recai Akkus
https://orcid.org/0000-0001-6044-4293
Bolu Abant Izzet Baysal University
Department of Mathematics and Science Education
Turkey