Mentoring for Success: Graduate Student Mentors' Perceptions on the Impact of a One-on-One Technology Mentoring Program

Jiaqi Yu
jiaqiyu@iastate.edu
Iowa State University

Ozlem Karakaya
ozlem@iastate.edu
Iowa State University

Denise A. Schmidt-Crawford
dschmidt@iastate.edu
Iowa State University

Abstract

Individualized mentoring programs have shown promising results in preparing faculty for technology use and integration, but very limited attention has been paid to what individuals gained from their experiences while serving as technology mentors for faculty. This study revealed insights on how graduate student mentors perceived the impact of a one-on-one technology mentoring program, specifically intended to identify the ways this mentoring program benefited their professional development and what recommendations they proposed for improving the program. Our findings indicated that graduate student mentors were able to improve essential skills for professional development 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. The results of this study have implications for educators and researchers working in similar higher education contexts to better design and improve their technology mentoring programs.

Introduction

In recognition of the importance and effectiveness of applying technology in school settings, there has been a history of emphasis on preparing teachers for technology integration (Ertmer & Ottenbreit-Leftwich, 2010; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). If teachers are expected to demonstrate meaningful technology use in their classrooms, it is important for them to see best practices modeled by faculty in teacher education programs (Brenner & Brill, 2016; Georgina & Hosford, 2009; Kay, 2006). That in turns requires teacher preparation programs and institutions adequately prepare faculty to effectively model technology use for preservice teachers (Chuang, Thompson, & Schmidt, 2003; Sprague, Kopfman, & Dorsey, 1998).

Historically, teacher education programs have identified specific needs related to faculty mentoring and developed various strategies for faculty development in the areas of technology use and integration (Brush et al., 2003). Among varying formats of faculty development models, prior research has reported that one-time workshops without individual support failed to meet specific needs of faculty (Chung et al., 2003). However, individualized mentoring has proven to be effective when addressing individual needs and supporting sustainable learning (Herring, Meacham, & Mourlam, 2016; Leh, 2005).

Prior studies have focused on faculty members' experiences as mentees while participating in various types of technology mentoring programs (Grove, Strudler, & Odell, 2004; Gunuc, 2015). Very limited attention has been paid to students' experiences when serving as technology mentors for faculty (Leh, 2005; Kariuki, Franklin, & Duran, 2001). Present study revealed insights on how graduate student mentors perceived the impact of a one-on-one technology mentoring program on their professional development. Results from this study presents an in-depth understanding of the mentoring experiences and related benefits and challenges that graduate students faced while participating in a technology mentoring program specifically designed for faculty. This study provides implications related to the design and development of similar mentoring programs in the future and helps identify the potential needs of graduate students related to technology professional development.

Literature Review

The word mentoring can be described in several ways, but a general definition offered by Hansman (2001) is the "intense caring relationship in which person(s) with more experience work with less experienced person(s) to promote both professional and personal development" (p. 28). As generally understood, mentoring refers to purposeful and organized interactions between more-experienced and less-experienced persons, where mentors provide instrumental knowledge and support (Eby, McManus, Simon, & Russel, 2000; Klasen & Clutterbuck, 2002). The overall goal of mentoring is to help the less-experienced persons grow quickly in a transition stage and perform successfully in their professional and personal lives (Schunk & Mullen, 2013).

Mentoring has been a popular approach to professional development in different contexts such as education, healthcare, and business (Bullard & Felder, 2003; Foster, 2001, Pamuk, 2009). Also, different types of mentoring are documented in literature and include such approaches as individual, peer-supported, group or team mentoring (Beyene, Anglin, Sanchez, & Ballou, 2002; Patton et al., 2005). In educational settings, the type of mentoring was typically determined by the purpose of the program or the needs and expertise of the participants (Campell & Campell, 1997; Jacobi, 1991). For example, experienced teachers supervised novice or beginning teachers to improve their classroom management, and experienced students helped less-experienced students while transitioning into a program.

Particularly in the field of educational technology, various mentoring programs have been widely applied in K-12 settings to model the appropriate use of technology. One program in Southeastern Ohio paired instructional technology graduate students with eight teachers in a rural K-6 school to provide technology support (Kariuki, et al., 2001). As their results reported, most participants noticed a transition from observers to co-learners, and all of them experienced a transformation in their understanding and use of technology (Kariuki et al., 2001). In a program combining web-based training and mentorship, Polselli (2002) found that K-12 teachers who received peer mentoring support reported a higher quality and instance of using technology as well as improved comfort levels with technology. Another program utilizing peer mentoring support for mathematic teachers combined workshops with individual mentoring sessions (Swan & Dixson, 2006). This study revealed that a mentor-supported model was effective in assisting teachers with additional support and provided opportunities to build an awareness of technologies available for use.

Beyond the K-12 setting, different mentoring programs were also designed and implemented in higher education institutions with the aim of enhancing technology integration for faculty members. One program situated in a large Midwestern university paired nine graduate students as technology mentors for 19 faculty members (Smith & O'Bannon, 1999; Smith, 2000). This model featured a combination of pre-training sessions and one-on-one mentoring sessions. In semi-structured interviews, both the mentors and mentees highlighted an increase in technology use for faculty and students, and some graduate students also reported professional and personal development by gaining support and guidance from faculty members (Smith & O'Bannon, 1999; Smith, 2000).

Similarly, California State University implemented a mentoring program that highlighted the combination of group (workshops & small-group meetings) and individual (mentors & technology helpers) training (Leh, 2005). Instructional technology graduate students were recruited, and each was paired up with a faculty member for individual mentoring support. Using formative evaluations, results indicated that both mentors and mentees benefited from the experience. It was reported that graduate students were able to raise their self-esteem, gain real-life experience, and benefit from the relationship and network built with faculty members while some graduate students also reported frustration with the difficulty of connecting with faculty (Leh, 2005). Another similar program initialized by Texas A&M University was the Technology Mentor Fellowship Program (TMFP) that matched undergraduate students with teacher educators with the purpose of modeling technology use. Results indicated that student mentors acquired substantial technology skills and communication skills while providing technology support to the teacher educators (Denton, Davis, Smith, Strader, & Clark, 2005).

One-on-one mentoring programs have been found to be effective for assisting teacher educators with developing their technology skills in relation to the content they teach (Sprague et al., 1998). Both parties (mentor and mentee) involved in one-on-one mentoring programs identified multi-faceted benefits such as addressing individual needs with specific goals, building a mutual relationship, and fostering collaboration and learning community (Chuang et al., 2003). However, various challenges like time constraints, matching criteria, low motivation, and limited support and resources were also reported both from the mentors' and mentees' perspectives (Cox, 2005; Denton et al., 2005; Gunuc, 2015).

Even though previous studies have examined different types of mentoring programs (group vs. individual) in different settings (K-12 vs. higher education) or formats (online vs. in person), only a few studies explored the specific experiences and perceptions of the student mentors (Denton et al., 2005; Gunuc, 2015; Smith, 2000). Most rarely examined the specific teaching context and relationships of each mentoring pair. It is imperative to capture the individual experience and delve deeper into the specific contexts. This case study explored how graduate student mentors perceived the impact of a one-on-one technology mentoring program on their professional development. Specifically, we intended to identify in what ways this technology mentoring program impacted their professional development and what recommendations they proposed for improving this technology mentoring program.

Theoretical Framework

As participating in a mentoring program may not lead to any immediate behavior and attitude change, this study adopted the social learning theory (Bandura, 1977, 1986) to focus more on a process-oriented point of view and examine the interactions, relationships, and experiences associated with the mentoring program from the participants' perspectives.

Different from other traditional behaviorist theories, social learning theory argues that both internal and external factors play a role in the human learning process in different ways (Bandura, 1977, 1986). According to Bandura (1986), cognitive, behavioral, and environmental influences are not independent from each other but continuously affect human's leaning in a reciprocal fashion. Therefore, individual learning has been viewed as a result of the reciprocal interactions between a person, behavior, and environment (Bandura, 1986). In addition, it emphasizes more on the role of social interaction and environment. It argues that learning occurs not only through actual performance but also observing other people's actions and consequences as models (Bandura, 2001) Thus, modeling has been acknowledged as a fundamental and powerful way of disseminating knowledge and skills in various learning settings (Pamuk, 2008).

Applying the concept into this study, each mentor/mentee (person) involved in the technology mentoring program may change their ways of using technology (behavior) which might impact their peers and others working in the same office or department (environment) as well. From the point view of social learning theory, it is important to be aware that each pair (the mentor and mentee) was not only influenced by each other but also potentially affected or could be affected by other pairs in the mentoring program or other peers in the community.

The social learning theory was selected as a theoretical framework because: it focuses on learning from interacting and observing others that closely connect to the mentoring context of this study; it provides a lens to explain the process (instead of results) by keeping the focus on the interactions between or among the participants; and it directs us to pay attention to the contextual factors that may impact individual learning process that mentors and mentees could benefit from other sources beyond their individual mentoring pair.

Context of the Study

This study is situated in a graduate-level class during fall semester 2017 as part of the Curriculum and Instructional Technology (CIT) program in the School of Education (SOE). This faculty mentoring program in the SOE has had some type of presence in the program for 26 years. The main purpose of this faculty mentoring program is to bring graduate students together with faculty and to help faculty learn emerging technologies (Thompson, 2006). Moreover, it aims to assist faculty to meaningfully integrate these technologies into their curricula and become role models for using technology with their students.

Most students enrolled in this class are doctoral and master students majoring in the CIT program. As part of a class requirement, all nine graduate students (mentors) enrolled were paired with faculty or staff (mentees) who teach undergraduate classes in the SOE. Mentees and mentors were paired by the course instructor at the beginning of the semester. The course instructor checked with each graduate student for their personal expertise and preferences (such as their prior teaching experience and prior knowledge and skills with various educational technologies). In the meantime, the course instructor also reached out to potential faculty and staff members and identified individuals with strong interest in participating in this one-on-one mentoring program. When possible, the instructor matched mentees with mentors based on the mentees' needs and expectations as well as mentors' skills and preferences.

The overarching goal for the mentors was to help their mentees (i.e., faculty and staff) explore technologies relevant to their needs and interests, and thus encourage them to use these technologies in particular teaching or professional contexts. Therefore, mentors were expected to contact their mentees and set up an initial meeting to determine their own learning objectives and outcomes around the second week of the class. Other than the regular face-to-face class meetings (2 hours per week) with other mentors and course instructor, each graduate student was required to meet with their mentee on a weekly basis for at least one hour using self-determined goals and outcomes to guide the mentoring process. In their initial meetings, each pair determined their regular meeting times and formats. Although each group generated their own goals and outcomes, one common goal for most mentoring pairs was to learn more about the Learning Management System (LMS - Canvas) because it was a transitioning semester for the entire institution from Blackboard to Canvas.

Research Questions

Multifaceted benefits and challenges such as mutual benefits, non-hierarchal relations, and sustainable relationships have been identified in the literature (Campbell & Campbell, 2000; Chung et al., 2003; Hasman, 2001). This study investigated how graduate student mentors perceive the impact of this technology mentoring program on their professional development. Specifically, this study was guided by the following research questions:

1) In what ways, did this technology mentoring program benefit the professional development of graduate student mentors?
2) What recommendations were proposed by graduate student mentors for program improvement based on the challenges they experienced?

Methodology

This qualitative study adopted a case study design to reveal the complex nature of technology mentoring practices through examining the perceptions of selected individuals and providing a rich description of the context. With the permission of the course instructor, the researchers sent out a recruitment email to all the potential participants (nine students enrolled in the class and the mentoring program), and seven students agreed to participate in this study.

Table 1. Summary of Participant Profile

Mentor	Background	Paired Mentee	Technology Explored
Alice	Doctoral student, major in CIT	Faculty, science methods	Explain Everything, Coggle, Popplet
Andrew	Master student, major in CIT	Faculty, literacy	Google Slides, Google Forms, TopHat, Canvas
Beth	Master student, major in CIT	Faculty, science methods	Flipgrid, iMovie, Camtasia, Arc, Canvas
Jacklyn	Doctoral Student, major in CIT	Academic advisor	Canvas, Box, Flipgrid, Top Hat, Kahoot, Nearpod, Class Dojo
Olivia	Doctoral Student, major in CIT	Faculty, science methods	BreakoutEdu, Dash&Dot, 3D Printing, Ozobots, BlueBots, Makey Makey, Osmo, Code.org, Hour of Code, Scratch, Sphero, Little Bits
Sarah	Master Student, major in CIT	Faculty, literacy	Google Drive, Google Slides, Google Forms, Blackboard, Box, Lino, TitanPad, Wordle, LittleBirdTale, Flipgrid, Canvas.
Zac	Doctoral Student, major in AgEd	Faculty, teaching strategies	Google Drive, Box, Blackboard, SimSchool, ClassDojo, Canvas

Multiple sources of data were collected after receiving approval from the university's institutional review board. The data included: 1) an open-ended survey administered mid-semester, mentors were asked to report expectations, accomplishments, and experience, 2) individual interviews at the end of semester, mentors were asked to reflect on their experience and knowledge constructs, and 3) related technology artifacts created and/used by mentors.

Our data analysis involved two rounds of coding. For the first round of open coding, we independently read the transcripts, generated explicit themes inductively, and constantly compared data for similarities and differences (Saldaña, 2016), which allowed us to reflect deeply on the contexts and remain open to different directions that could help us answer the two research questions. For the second round of axial coding, we tried to group similar codes into major categories as informed by our theoretical framework. To ensure the trustworthiness of this study, the researchers collected multiple sources of data for triangulation purposes, used member checking for transparency, and provided a rich description of data collection and analysis procedures. All the researchers reviewed the major codes together and revised the codebook with iterative steps to ensure the inter-coder reliability throughout the data analysis process. Because the research team was also involved in the mentoring program and very familiar with most participants as personal connections, we were clearly aware of our potential bias and tried to interpret the results with caution.

Findings

Based on the analysis of the data, we focused on identifying in what ways, this technology mentoring program benefited the professional development of graduate student mentors. Research question 1 was stated as follows: *In what ways, did this technology mentoring program benefit the professional development of graduate student mentors?* Three major themes emerged as a result of data analysis and are summarized as follows.

Improved Essential Skills for Professional Development

As this program allowed each mentoring pair to determine their own learning goals and meeting format, each graduate mentor was involved in a one-on-one setting with continuous collaboration and communication that allowed them to build and improve a variety of skills essential for professional development. Among the seven participants, we noticed that five of them addressed the communication skills developed through the mentoring program. Most participants were actively communicating with their faculty mentees during and between their individual mentoring sessions. As Andrew said in the interview, "I think communication was key. I think ... trying to accomplish something in a short amount of time is challenging when you only meet once a week. I think the communication during the one-on-one meetings and in between was critical."

Other than communication skills, some participants also talked about other professional skills improved throughout this mentoring program including interpersonal, organizational, problem-solving, consultation, and leadership skills. Especially for those participants who were new to the CIT program, they needed to spend a lot of time on identifying the needs, exploring available technologies, and then providing appropriate solutions. Most of them emphasized the positive impact of this self-directed learning process, as they became accountable to their paired mentee and felt motivated to learn new technologies on their own. As Sarah pointed out in the interview,

> *I think my problem-solving skill improved a lot after this mentoring experience. First, I needed to discover different technologies that my mentor may be interested in. Second, I needed to find strategies to deliver the information, deliver the technology to my mentee. Third, I also faced some challenges like some technologies we explored were also new to me. Before I taught those technologies to my mentee, I needed to learn them.*

Developed a Deeper Understanding of Technology Use and Integration

Similar to other one-on-one mentoring programs, graduate mentors were paired with instructors teaching different subject areas, which allowed them to gain real-life experience and develop a deeper understanding of technology use and integration in specific teaching contexts. Although most participants were majoring in the CIT program, it was an essential requirement of the academic program for students to get familiar with a variety of educational technologies and understand how to use them effectively in educational settings. As Sarah reported in the mid-semester survey, "Through this mentorship experience, the most important thing I gained is to learn about different educational technologies. New Technologies are emerging every day. Especially as a CIT student, this experience helps me keep myself updated."

Participants were paired with faculty members teaching different grade levels and subject areas, so they were able to acquire first-hand experience of integrating technologies into specific teaching contexts in a meaningful way. Several participants described their rewarding experiences as getting familiar with the subject area taught by their mentees. For example, Andrew and Sarah found they explored different technologies that were useful in literacy classrooms, Olivia and Alice became more familiar with different coding and mind-mapping tools popular in a science classroom. Moreover, the mentors had the opportunity to apply different conceptual frameworks in the field of instructional technology. For example, most of them were using Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) to guide their mentoring practice and help their mentees focus on the interplay between and among content, pedagogy, and technology. As Jacklyn stated in the interview,

> *I think the TPACK framework is a useful one for myself. I used that more like a conceptual framework for myself that I should the lead my mentee as a content expert into the center place. I think that it is an ideal place for a faculty or staff, um, to guide them into the center place of TPACK because as a faculty she is a*

content expert. And I see myself as um, my expertise is on the technology and also on pedagogy. So, I think my job is help integrate the three together and lead my mentee to go into the center of this place and consider the three components in a dynamic way.

All graduate students met in a classroom on a weekly basis, and there most of them highlighted the importance of meeting regularly, sharing concerns, asking for help, and learning new technologies together. Several participants described similar scenarios in the interviews about how they supported each other. Especially for those who were new to the CIT program and not familiar with various educational technologies, they received useful recommendations and solutions from their classmates.

Established Collaborative Relationships with Faculty Mentees

Most participants also highlighted that the one-on-one setting made it easier for them to establish close and collaborative relationships with their faculty mentees in the program, which motivated both the mentor and mentee for continuous learning. As Beth elaborated in the interview, "I think the big thing is that it's just like that one-on-one piece. So, you get to build that relationship with each other and both of you benefit from that relationship." Another example from Zac also addressed the importance of building relationship, "mentorship is not for you to apply what you want to set goals or just teach the mentee what she needs to learn. This is like mutual experience and mutual relationship, ask the mentee about her or his desires and needs."

As we delved deeper into how their collaborative relationship benefited their learning process, we noticed that each graduate mentor was utilizing different strategies based on their mentees' needs in order to provide individualized support. Most of them started with modeling the use of new technologies and then encouraged their mentees to explore and practice on their own. Several participants also kept sustainability in their mind and always tried to direct their mentees to available support and resources either online or on campus. As they gained more real-world experience through providing individualized support, they also started to pay attention to the challenge of technology integration and kept reflecting on their practice. As Andrew described at the end of the interview,

I understand kind of the practical elements of it, you know, ideally, you'd like to move very quickly and fast, but that's not the case a lot of times. You have to be strategic about what the things you do put in place. Um, so kind of pick and choose your spots and then understand that technology is like learning chunks. There is not necessarily like a sequential path, it follows this kind of like jumping around, but at the same time you are kind of filling in areas of need.

Participants in this mentoring program encountered several challenges while working with their mentees. Research question 2 was stated as follows: *What recommendations were proposed by graduate student mentors for program improvement based on the challenges they experienced?* As a result of these challenges, specific recommendations were provided by the participants in survey responses and individual interviews, which was summarized as two major themes below.

Improving the Organization of the Technology Mentoring Program

Participants emphasized the importance of improving the organization of the mentoring program by revisiting the matching criteria, conducting the need analysis, and assigning homework for mentees.

Revisiting the mentor-mentee matching criteria. Several mentors reported the challenges they faced as they came from diverse teaching backgrounds with their mentees and that made their relationships complicated at times. For example, Alice stated that her mentee had hoped to work with a mentor who had experiences from a similar subject area. She stated, "I think she (mentee) started out hoping that she would have a mentor that really did and all the content and that would have been a much more seamless process for her because somebody already knew the content was, you know, knew the methodology, the way that they approach science teaching." Another mentor, Olivia, also pointed out the challenge she faced in finding the right content related technologies for her mentee, "as for the professional skills and backgrounds we were not good match, to be honest, because she was a science instructor and then I am coming from a language teaching and technology background. So, we tried to meet at the point of technology but since I was not that much familiar with the science contents/topics, it was kind of hard for me to find valuable technology for her."

Conducting a need analysis. Another challenge that some mentors faced was to determine the needs and goals that the mentees want to achieve. One of the mentors pointed out the importance of finding out the learning needs of mentees before the mentoring program starts. As Sarah elaborated in the interview, "Basically, except for Google Drive and Canvas, all other goals were what I established for my mentee, not what she asked. So, if I could do this mentoring program again, I would send a survey to my mentee to ask specific questions about her expectations, for example, identify her needs, problems in her class, what she wants to engage/motivate her students. And then, I would go/explore those type of technologies instead of just randomly discovering some technologies."

Holding both parties accountable. There were several participants who emphasized the significance of assigning homework for their mentees because it held each other accountable week to week. As Sarah stated, "we decided to do 'homework' for each of us. Before our meetings, we went through all tasks because we had already decided like in the next meeting, we are going to explore some specific tasks and our homework was to watch some tutorials at home. We went through the learning modules in Canvas for teachers. And in our meeting, we just practiced the strategies we learned." Some mentors thought that assigning homework would be extra work for both parties as Beth stated, "I had the feeling that she had so much on our plate already. She wouldn't have found that (assigning homework) beneficial, just would've been like a little more stressful... I think she was already like working on these videos and like recording them and doing the other stuff. So, she was still working towards her end goal even when I wasn't there." Although assigning homework was thought to be extra work for mentees, it would worth further exploration for future studies to focus on specific strategies that could effectively hold both parties accountable and improve their learning experience.

Creating a Learning Community for Sustainability

Participants of this study provided several recommendations to create a sustainable learning community. One of the recommendations was to invite previous faculty mentees (participants in mentoring program in previous semesters) to the final meeting/presentation at the end of the semester, which was organized by the course instructor and invited all the mentoring pairs to share their experience and achievements. In that way, past mentees would keep themselves up-to-date with new technologies. As Andrew stated, "I think that they should invite all the past mentees to the final presentations because that would allow them to kind of connect with what new technologies are being used, what's being implemented, and allow them to kind of reconnect with their mentee and mentor experience."

Other participants also provided relevant recommendations such as building a virtual place for sharing information and new technologies and involving faculty mentees' teaching assistants or colleagues into the mentoring process to collaboratively learn new technologies. As Jacklyn pointed out, "it would be nice to bring her TAs and other colleagues to join us. As I remember one session we met in October, her colleague next door who is also an academic advisor joined us to learn how to use Box and link that to Canvas. I think it will be a good way to make this learning outcome sustainable in the future, if we can encourage the faculty to bring their colleagues or TAs in. In that way, for the future, they can help each other and continuously learn new stuff."

Discussion

Even though prior studies already addressed the mutual benefits for both parties involved in the technology mentoring program, they only summarized those benefits in general without little elaboration. For example, typical benefits mentioned include gaining support and guidance from faculty members (Smith, 2000), benefiting from the relationship and network built with faculty members (Leh, 2005), and acquiring substantial technology skills and communication skills (Denton et al., 2005). This study specifically identifies in what ways a technology mentoring program might benefit the professional development of graduate student mentors. Mentors in this study were involved in one-on-one collaborations that involved continuous oral and written communication, so they were able to improve essential professional skills such as communication, interpersonal, and organizational skills. Through being paired with instructors in different subject areas, they could develop a deeper understanding of technology use and integration in specific teaching contexts, and thus build a close, collaborative relationship with mentees through individualized support.

On the other hand, various challenges including time constraints, matching criteria, low motivation, and limited support and resources were reported in previous studies (Cox, 2005; Denton et al., 2005; Gunuc, 2015). In the context of this study, participants provided specific recommendations based on the challenges they encountered in this program. We believe that addressing those environmental issues in the future would help leverage the quality of learning for all participants. As Cox (2005) indicated that the quality of matching the mentor and mentee affect the quality of mentoring process, our participants also highlighted the importance of revising the matching criteria. Some participants also suggested conducting a need analysis for faculty mentees before the mentoring program began. In reality, most of the mentees did not know what they needed or what technology they wanted to learn, so the graduate student mentors had to take the initiative and responsibility of identifying the potential needs and exploring new technologies. Prior research has also addressed the importance of creating a learning community

(Pamuk & Thompson, 2009), so this study specifically clarified different ways of facilitating a learning community, which suggests directions for future improvement of other technology mentoring programs situated in similar higher education contexts.

As informed by social learning theory, that viewed individual learning as the reciprocal interaction of person, behavior, and environment (Bandura, 1977, 1986), we not only focused on individual participants themselves but also paid attention to the mentor/mentee and mentor/mentor interaction. It was important to notice that most participants reported personal growth by collaborating with their paired mentees and meeting with their classmates (i.e. other graduate student mentors) on a regular basis. Through modeling best practices and observing the implementation by their mentees, they gained more experience with using different technologies and developed a better understanding of technology integration in real-world teaching contexts. Another environmental factor impacting the mentors' learning and growth in this program was their interactions with their classmates on a weekly basis for sharing information and concerns. It reminded us the importance of building a learning community to sustain the efforts they already established in this mentoring program.

Conclusion

In this study, we sought to identify specific ways this technology mentoring program benefited the professional development of graduate student mentors. In addition, important recommendations for improving the technology mentoring program were given. Overall, this one-on-one technology mentoring program received positive feedback from graduate student participants. Our key findings indicated the continued need for department and institution structures to be present for supporting such efforts because the individuals involved in a technology mentoring program might benefit in terms of professional development and knowledge acquisition. Future studies are highly recommended to expand the scope of this study and track the long-term impact of such technology mentoring programs on the professional development of both mentors and mentees.

References

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychology, 3*(3), 265–299.

Beyene, T., Anglin, M., Sanchez, W., & Ballou, M. (2002). Mentoring and relational mutuality: Protégés' perspectives. *Journal of Humanistic Counseling, Education and Development, 41*, 87–102.

Brenner, A. M., & Brill, J. M. (2016). Investigating practices in teacher education that promote and inhibit technology integration transfer in early career teachers. *TechTrends, 60*(2), 136–144.

Brush, T., Glazewski, K., Rutowski, K., Berg, K., Stromfors, C., Van-Nest, M. H., et al. (2003). Integrating technology into a field-based teacher training program: The project. *Journal of Educational Technology Research and Development, 51*(1), 57–72.

Bullard, L. G., & Felder, R. M. (2003). Mentoring: A personal perspective. *College Teaching, 51*(2), 66–69.

Campbell, T. A., & Campbell, D. E. (1997). Faculty/student mentor program: Effects on academic performance and retention. *Research in Higher Education, 38*(6), 727–742.

Campbell, D. E., & Campbell, T. A. (2000). The mentoring relationship: Differing perceptions of benefits. *The College Student Journal, 34*(4), 516–523.

Chuang, H., Thompson, A., & Schmidt, D. (2003). Faculty Technology Mentoring Programs. *Journal of Computing in Teacher Education, 19*(4), 101–106.

Cox, E. (2005). For better, for worse: the matching process in formal mentoring schemes. *Mentoring & Tutoring: Partnership in Learning, 13*(3), 403–414.

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). Phoenix, AZ, USA: Association for the Advancement of Computing in Education (AACE). Retrieved from https://www.learntechlib.org/p/19606/.

Eby, L. T., McManus, S. E., Simon, S. A., & Russell, J. E. A. (2000). The Protege's Perspective Regarding Negative Mentoring Experiences: The Development of a Taxonomy. *Journal of Vocational Behavior, 57*, 1–21.

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

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423–435.

Foster, L. (2001). *Effectiveness of Mentor Programs: Review of the Literature from 1995 to 2000*. Retrieved from http://www.library.ca.gov/crb/01/04/01-004.pdf.

Georgina, D.A., & Hosford, C.C. (2009). Higher education faculty perceptions on technology integration and training. *Teaching and Teacher Education, 25*(5), 690–696.

Grove, K., Strudler, N., & Odell, S. (2004). Mentoring Toward Technology Use, *Journal of Research on Technology in Education, 37*(1), 85–109,

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.

Hansman, C. A. (2001). Who Plans? Who Participates? Critically Examining Mentoring Programs. In R. O. Smith, J. M. Dirkx, P. L. Eddy, P. L. Farrell, and M. Polzin (Eds.), *Proceedings of the 42nd Annual Adult Education Research Conference*. East Lansing: Michigan State University, 2001.

Herring, M. C., Meacham, S., & Mourlam, D. (2016). TPACK Development in Higher Education. In Herring, M. C., Koehler, M. J., & Mishra, P. (Eds.), *Handbook of technological pedagogical content knowledge (TPACK) for educators* (pp. 207–223). New York, NY: Routledge.

Jacobi, M. (1991). Mentoring and undergraduate success: A literature review. *Review of Educational Research, 61*(4), 505–532.

Kariuki, M., Franklin, T., & Duran, M. (2001). A technology partnership: Lessons learned by mentors. *Journal of Technology and Teacher Education*, *9*(3), 407–417.

Kay, R. H. (2006). Evaluating Strategies Used to Incorporate Technology into Preservice Education. *Journal of Research on Technology in Education. 38*(4), 383–408.

Klasen, N. & Clutterbuck, D. (2002). *Implementing mentoring schemes: A practical guide to successful programs*. Burlington, MA: Butterworth-Heineman.

Leh, A. S. (2005). Lessons learned from service learning and reverse mentoring in faculty development: A case study in technology training. *Journal of Technology and Teacher Education*, *13*(1), 25–41.

Mishra, P. & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

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

Pamuk, S., & Thompson, A. D. (2009). Development of a technology mentor survey instrument: Understanding student mentors' benefits. *Computers & Education, 53*(1), 14–23.

Patton, K., Pagnano, K., Griffin, L. L., Dodds, P., Sheehy, D., Arnold, R., Henninger, M. L., Gallo, A. M., & James, A. (2005). Chapter 2: Navigating the mentoring process in a research-based teacher development project: A situated learning perspective. *Journal of Teaching in Psychical Education, 24*, 302–325.

Polselli, R. (2002). Combining web-based training and mentorship to improve technology integration in the K-12 classroom. *Journal of Technology and Teacher Education, 10*(2), 247–272.

Saldaña, J. (2016). *The Coding Manual for Qualitative Researchers*. Thousand Oaks, CA: SAGE Publications.

Schunk, D. H. & Mullen, C. A. (2013). Toward a Conceptual model of mentoring research: Integration with self-regulated learning. *Educational Psychology Review, 25, 361-389.*

Smith, S. J., & O'Bannon, B. (1999). Faculty members infusing technology across teacher education: A mentorship model. *Teacher Education and Special Education*, *22*(2), 123–135.

Smith, S.J. (2000). Graduate Students Mentors for Technology Success. Teacher Education and Special Education. *The Journal of the Teacher Education Division of the Council for Exceptional Children, 23*(2), 167–182.

Sprague, D., Kopfman, K., & Dorsey, S. L. (1998). Faculty Development in the Integration of Technology in Teacher Education Courses. *Journal of Computing in Teacher Education, 14*(2), 24–28.

Swan, B. & Dixon, J. (2006). The Effects of Mentor-Supported Technology Professional Development on Middle School Mathematics Teachers' Attitudes and Practice. *Contemporary Issues in Technology and Teacher Education, 6*(1), 67–86. Waynesville, NC USA: Society for Information Technology & Teacher Education. Retrieved from https://www.learntechlib.org/p/5544/

Thompson, A. (2006). History of the faculty technology mentoring program. In A. Thompson, H.-H. Chuang, & I. Sahin (Eds). *Faculty mentoring: The power of students in developing expertise* (pp. 1–12). Greenwich, CT: Information Age Press.