A Review of Faculty Development Models that Build Teacher Educators’ Technology Competencies

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The U.S. Department of Education, national organizations, and accrediting bodies require that teacher candidates be ready to effectively integrate technology in their instruction. In order to ensure this preparedness, teacher educators must model and teach the use of technology across educator preparation programs. Development of the Teacher Educator Technology Competencies has set the stage for educator preparation programs to gauge current abilities and establish goals in order to meet this call. However, faculty development of teacher educators is necessary to accomplish any goals that we set. This manuscript presents a review of the literature on faculty development models and how our knowledge and experience with these models can be used to prepare educator preparation programs’ faculty in acquiring the necessary competencies. This manuscript provides recommendations for designing faculty development based on the current literature and advocates a research agenda connected to the implementation of these strategies in order to advance the ways that we support teacher educators so that they produce future-ready teachers.

Effective faculty development initiatives begin with a culture that extends beyond personal research to include a commitment to improving the
pedagogical modeling we provide in the university classroom (Nworie & McGriff, 2001). Together, teacher preparation leadership and faculty can progress toward this culture by first coming to the collective understanding that, no matter what our role in teacher preparation, we do a disservice to our teacher candidates if we do not possess the very competencies we are working to develop in them. For example, our knowledge of teacher development has progressed through the research on High Leverage Practices (HLPs) for educators and has broadened our understanding that teacher preparation cannot simply be about discussing and explaining pedagogy (Grossman, Hammerness, & McDonald, 2009). Effective teacher preparation must also include deliberate practice and the ability to facilitate that practice originates with the teacher educator’s ability to perform those skills themselves.

Extending from the call from the U.S. Department of Education’s Office of Educational Technology and the National Educational Technology Plan (2017), educator preparation providers (EPPs) were challenged to focus on the use and integration of technology in learning and teaching; to build program-wide professional learning for teacher preparation faculty; to ensure that preservice teacher technology experiences span the whole curriculum; and align curriculum with standards across the field, such as the International Society for Technology in Education (ISTE) Standards for Educators (2017). Moreover, accreditation agencies such as the Council for the Accreditation of Educator Preparation (2015) require that EPPs provide evidence to ensure that teacher candidates model and apply engaging uses of technology in the design and implementation of learning experiences and demonstrate the ability to integrate technology across the knowledge domains expressed in the Technological Pedagogical Content Knowledge (TPACK) model (Mishra & Koehler, 2006) throughout their program of study.

In their editorial piece, Borthwick and Hansen (2017) argued in favor of a set of teacher educator technology competencies vetted and accepted by the field to serve as a pathway for faculty development. To that end, the Teacher Educator Technology Competencies (TETCs) identify the roles and responsibilities of all teacher educators involved in preparing teachers (Foulger, Graziano, Schmidt-Crawford, & Slykhuis, 2017).

The release of the TETCs provided a call to action for faculty development in EPPs (Foulger et al., 2017). During the development of the TETCs, public comment included individuals from the 2017 Annual Conference of the Society for Information Technology in Education (SITE); the 2017 ISTE Conference and Expo; and the 2017 National Technology Leadership Sum-
mit (NTLS) (Schmidt-Crawford, Foulger, Graziano, & Slykhuis, 2019). Respondents from across these events and organizations noted that the TETCs served as a useful framework for faculty development of teacher educators and have the potential to spark discussions amongst EPP leaders about organizational growth and change (Foulger et al., 2017). While the TETCs epitomize where we need to be, faculty development is the vehicle that ensures teacher educators are prepared to model these practices. As teacher educators, our history, research and experience with effective faculty development will assist us in reaching the TETCs.

**BACKGROUND**

Teacher educators reside within academic institutions that have a rich history of traditional pedagogy. This culture in academia impacts the context of faculty development, providing distinctions between EPPs and the professional training that occurs in other settings, such as P-12 schools. In their review of professional learning experiences designed for teacher educators, Ping, Schellings, and Beijaard (2018) characterize professional learning experiences for teacher educators as a “growing field of interest but fragmented in focus” (p. 93). Ping et al. (2018) categorize the content of faculty development for teacher educators in three key areas: (1) pedagogical skills, including how to incorporate technology; (2) faculty development which focuses on how to teach in ways that promote the skill acquisition of future teachers; and (3) proper mentoring and supervision of teacher candidates. These three areas help to articulate the ways in which content for faculty development may differ slightly for teacher educators as compared to those in P-12 schools. Primarily, the goal of faculty development within an EPP is not solely to develop the competencies of the teacher educator, but to support the faculty member in using and modeling those competencies in ways that positively impact the development of all teacher candidates.

Teacher education has its own history of supporting faculty members to incorporate technology in the classroom. As recounted by Brown and Warschauer (2006), during the era of the federal grant program known as PT3 (Preparing Tomorrow’s Teachers to Use Technology), large, multi-year faculty development related to technology integration was common. Adamy and Boulmetis’ (2005) research serves as a good example in which intensive supports for increasing effective technology integration skills was delivered to both P-12 teachers and EPP faculty. However, the culmination of PT3 funding has resulted in less large-scale initiatives of this kind in more recent
years (Hughes, Liu, & Lim, 2016). Even without this funding, the literature indicates that EPPs continue to place value on technology integration among teacher educators. For instance, Phuong, Cole, and Zarestky (2018) examined 22 instances of faculty development for teacher educators from 2005 through 2015 and found that the majority of the faculty development initiatives focused on the use of technology in teaching.

Despite these ongoing efforts to support faculty, trends suggest that teacher educators lack technology-related teaching competencies. Uerz, Volman, and Kral’s (2018) examination of teacher educators’ competence illustrated that many teacher educators lacked proficiency with a wide range of technologies that could be used to enhance instruction. Those with the most teaching experience (more than 15 years in an EPP) exhibited the lowest rates of technology adoption and used technology less often than their more inexperienced counterparts (Uerz et al., 2018). Uerz et al. (2018) concluded that a dominant trend in the literature was that teacher educators were often unfamiliar with more recent web tools, such as Web 2.0 technologies, or uncomfortable with their ability to integrate these technologies with their students.

In order to assess the mediating factors which influenced the TPACK (Mishra & Koehler, 2006) of current teacher educators across the U.S.; Nelson, Voithofer, and Cheng (2019) surveyed more than 800 teacher educators, a sample representing the majority of accredited EPPs across the U.S. Higher levels of TPACK were predicated by faculty who felt strong levels of institutional support for their use of technology (Nelson et al., 2019). Thus, in instances where the institution had, by some means, developed the Technological Knowledge (TK) of the teacher educators, this was predictive of higher TPACK among those faculty. Additionally, the faculty with the highest levels of TPACK were more likely to reside in EPPs where there was alignment between coursework and the ISTE standards (2017).

**ROLE OF TEACHER EDUCATORS**

Teacher educators have both the opportunity and the responsibility to demonstrate technology integration for aspiring educators, and the competency to do so constitutes best practice in teacher preparation (Hur, Cullen, & Brush, 2010). When teacher educators effectively model technology use, this positively affects preservice teachers’ development of technology integration skills (Alayyar, Fisser, & Voogt, 2012; Koh & Divaharan, 2011; Maeng, Mulvey, Smetana, & Bell, 2013; West & Graham, 2007).
While there are multiple benefits to faculty modeling, including the correlation between students’ skill acquisition (Baran, Chuang, & Thompson, 2011) and the increase in preservice teachers’ perceptions of technology’s impact on teaching and learning (Adamy & Boulmetis, 2005; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012), effective modeling is not commonplace in most university classrooms (Stover & Veres, 2013). When it does occur, modeling is mostly seen in technology-specific courses (Dorfman, 2016; Kajder, 2005). Mishra, Koehler, and Zhao (2007) indicate teacher educators may struggle to use “technology in systematic or pedagogically sound ways” (p. 2). Unfortunately, even when there are systematic approaches to the use of technology in teaching, these are characterized as rare because the decision to incorporate technology is typically left up to the individual instructor (Murthy, Iyer, & Warriem, 2015).

An understanding of our past and present faculty development activities allows us to appreciate how we have arrived at this current stage of competence among teacher educators. Additionally, past research on the role of teacher educators’ modeling for teacher candidates has advanced our understanding of how important it is that we demonstrate effective technology integration. Until recently, faculty development for teacher educators varied in focus; in the frameworks for evaluation; and faculty development lacked a common language as to the actual skills and dispositions teacher educators should embody to demonstrate competence. The TETCs now provide this common language; they clarify the competencies required of teacher educators; and they provide a framework to evaluate faculty development. However, as our collective understanding of needed competencies has advanced, so too has our understanding of what constitutes effective faculty development of teacher educators. The purpose of this review is to examine the faculty development literature in order to identify promising models that will support teacher educators in acquiring the TETCs.

RESEARCH METHOD

Search Strategy and Inclusion Criteria

In order to identify relevant literature, the authors conducted a systematic review of scholarly sources related to faculty development in higher education contexts. In the initial search, the following databases were used to identify peer-reviewed research: Academic Search Complete, Academic Search Premier, Education Research Complete, ERIC, and
Primary Search. Keywords for this search included “faculty development OR professional development” and “higher education OR teacher preparation.” This yielded an initial list of 424 results. When adding the exclusion criteria of “technology” and limiting the results to articles published between 2005 and 2019, this resulted in 108 peer-reviewed articles. Four publications were identified as duplicates and were discarded. The abstracts of these remaining 104 articles were reviewed to further determine the focus of each publication.

During this stage, the authors excluded articles which concentrated on the skill acquisition of preservice or inservice teachers, as the primary unit of analysis for this review was the teacher educator. Thus, we included those articles which focused on the teacher educator as the primary recipient of faculty development. However, it was clear early in the review process that publications which discussed technology-related faculty development in other disciplines, such as the article by Murthy et al. (2015) which discussed a large-scale project aimed at developing the technology skills of over 1,000 engineering professors, could aid in our understanding of the issues facing teacher education. Our decision to include related publications like this one was based on our desire to learn from other fields, as similar lines of inquiry related to faculty development appeared relevant in other disciplines throughout our search.

At times, the relevance of an article was difficult to assess based on the abstract alone. In these cases, a more in-depth review of the entire publication was necessary to determine whether there were findings which would be useful in this discussion. For instance, some articles did not expressly identify technology integration or teacher educators as the focus of the faculty development, but one or both of these was discussed in the publication’s findings. In a few cases, this additional analysis led the authors to identify articles (e.g., Adamy & Boulmetis, 2005; Hur et al., 2010) that focused on preservice teachers as the primary unit of analysis, but with additional information related to the development of teacher educators’ skills. For instance, it was not uncommon for teacher educators to report the findings related to skill development of their preservice teachers and also comment on the lessons they had learned in the process of preparing their students. This provided useful information related to contextual factors for faculty development of teacher educators, thus studies with these characteristics were included in the scope of this review.

Screening resulted in the identification of 31 articles that were analyzed for thematic review. We also used the snowballing technique to identify additional relevant sources, by scanning references pages. This allowed us to
identify four additional titles for a total of 35 articles included in the final review. These 35 publications include 19 individual studies, nine reviews of faculty development research, and seven theoretical or contextual papers related to the faculty development of teacher educators or higher education faculty. Table 1 provides an overview of each source included in the review.

**Framework for Analysis**

Following the systematic narrowing of results based on inclusion criteria, the remaining articles were thematically analyzed based on content. This process involved inductive thematic analysis, as our coding process did not include pre-identified themes (Boyzatzis, 1998). This process allows for the themes to be directly drawn from the data and not influenced by predetermined theoretical interests (Braun & Clarke, 2006). Authors highlighted key information in each publication that could aid in a discussion of how best to prepare teacher educators to develop technology-related competencies. First, this analysis of themes was conducted singularly by each researcher, then codes were compared to determine points of intersectionality for eventual consensus.

Occurring in parallel with thematic analysis, synthesis included a more extensive assessment to determine how much weight could be attributed to the findings of both individual studies and research syntheses. This evidence assessment was based primarily upon the Weight of Evidence framework posed by Gough (2007). This additional analysis allowed authors to move beyond relevance criteria to also consider factors related to research design and execution. While Gough (2007) contends that quality and relevance assessment is complex, the Weight of Evidence framework offers a series of practical strategies for authors incorporating it as a methodological procedure in research synthesis. In line with Gough’s (2007) recommendations, the authors took a broad approach to include all forms of research design and placed less emphasis on the results yielded by any particular forms of research design. In this review, the authors adhered to Gough’s (2007) strategy of placing value on an individual study or review that brought extra contributions related to the purpose statement in this review. In this synthesis, the authors heavily weighted articles or reviews which provided extra information as to how faculty development could be applied to support teacher educators in developing the TETCs. Those articles which were deemed to provide this highly valued, additional information are expressly cited in the findings section of this review, under *Promising Models*. 
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*Note.* The research methods associated with literature reviews have been categorized using the range of review types provided by Gough (2007).
Authors also applied the Weight of Evidence framework to conduct quality and relevance appraisal of the various research syntheses included in the review, placing particular emphasis on appraisal of quality execution (including issues of transparency, accuracy, accessibility, and specificity), appropriateness of methods, and the focus or approach of the review. Each of these factors were used to select the research syntheses that have been included in these findings.

**FINDINGS**

The analysis yielded the identification of several primary themes, each of which make up the next sections of this review. Information contained in these findings was most often present in the results sections of individual studies, but we also found useful information in the background sections of studies as well as theoretical sources (such as forewords or organization-sponsored papers). Additionally, the descriptions of faculty development projects aided in the organization of the “promising models” section that follows. These models were categorized to include mentoring, mutually beneficial partnerships, and communities of practice. To offer additional discussion, the authors collected recommendations from various publications to feature information related to planning and designing faculty development. Therefore, the findings from this review are intended to support EPP leaders in assessing contextual factors for faculty development, such as the use of the TPACK diagnostic tool developed by Graziano, Herring, Carpenter, Smaldino, and Finsness (2017) and later implemented by Clausen et al. (2019).

**Assessing Contextual Factors for Faculty Development**

As established by the multiple calls to action extended by the U.S. Department of Education (2017), ISTE (2017), and CAEP (2015); EPPs and the teacher educators who reside within them are tasked with exemplifying TPACK and modeling this throughout their teacher preparation programs. As such, the leaders of EPPs help to set this vision for faculty and they must support the steps that make this vision a reality (Graziano et al., 2017). This can be particularly challenging in research-intensive institutions where faculty teaching may be underemphasized, requiring EPP leaders to exercise diligence in creating change within that culture (Hughes et al., 2016).
little research available about how deans, department chairs, and related administrative staff could achieve this aim, Graziano et al. (2017) responded to a request from the American Association of Colleges for Teacher Education (AACTE) to create a diagnostic tool that would support these types of TPACK faculty development initiatives. Together, Graziano et al. developed questions for EPP leaders that became the backbone of their diagnostic tool. The tool focuses on supporting leaders in developing a vision, identifying available resources, and establishing how the institution will look after change has occurred (Graziano et al., 2017). Using the tool provides any leadership team with a framework for evaluating current practice by identifying an EPP’s current stage of development and provides guidance for moving on to future stages of faculty development (Graziano et al., 2017). The tool also allows EPP leaders to identify artifacts that can be used to evaluate evidence of the steps taken; a useful feature for accountability. Further analysis of how EPP leaders can apply this diagnostic tool has shown that it can be a useful starting point when embarking on faculty development initiatives and that it can be advantageous for supporting leaders’ reflections during various stages of faculty development (Clausen et al., 2019).

The TPACK diagnostic tool developed by Graziano et al. (2017) provides a pragmatic and timely framework for much of the work that lies ahead in helping teacher educators develop the TETC’s. The next important step in planning effective faculty development involves identifying how the faculty development will occur. There is debate about the design of faculty development for teacher educators (discussed more extensively by Stover & Veres, 2013) and there are also several promising approaches in the literature that echo recent theoretical models like TPACK. Regardless of the approach to building teacher educators’ competency, those in the field have come to place emphasis on the fundamental relationships that exist between knowledge of content, pedagogy, technology, and the interplay between these (Koehler, Mishra, & Yahya, 2007; Mishra et al., 2007; Nworie & McG riff, 2001). Koehler et al. (2007) warn that de-contextualized approaches to faculty development which emphasize only technology-based skills are unlikely to achieve intended goals. Similarly, Baran et al. (2011) advocate in favor of research which focuses on how teacher educators’ modeling shapes both the knowledge and dispositions of their students. The sections that follow will share several promising models for design and implementation of effective faculty development.
Promising Models for Faculty Development

The literature indicates that faculty development can be creatively designed to extend beyond traditional workshops to include pedagogical constellations which engage teacher educators' various needs, interests, and disciplines. For example, Murthy et al. (2015) implemented a constructivist, learner-centered approach to faculty development that was based on the TPACK framework. In their description of a large faculty development project aimed at developing the technology integration skills of more than 1,000 engineering professors, their model focused on faculty’s use of digital tools as well as the inclusion of student-centered forms of pedagogy in the classroom (Murthy et al., 2015). Murthy et al.’s faculty development consisted of an initial three days of synchronous online learning followed by “five weeks of asynchronous Moodle-based interactions” (2015, p. 20). These asynchronous activities included active learning such as debates, group problem solving, and peer instruction (Murthy et al., 2015). Models like this are far from a traditional, lecture-based workshop and provide occasions for faculty to review and revise existing course materials while also considering the pedagogical and content-based integration of technology in their instruction. In the sections that follow we outline three models for faculty development of teacher educators that were frequently noted in our review of the literature: mentoring, mutually beneficial partnerships, and communities of practice.

Mentoring. Mentoring is defined as the establishment of relationships (usually one-to-one) designed to support learning between experienced and less experienced or informed and less informed individuals (Murray, 2001). These relationships may occur in formal or informal settings. Mentoring models in EPPs are not new. In their review of trends in technology mentoring programs, Chuang, Thompson and Schmidt-Crawford (2003) shared examples of effective practices. While mentoring comes in many forms, historical mentoring models noted through this manuscript include those led by graduate students or undergraduate students working with EPP faculty; traditional mentoring models between two faculty; and mutual mentoring models with faculty working in groups. Chuang et al. (2003) argued that mentoring relationships provide reciprocal teaching opportunities, established by an open dialogue about technology integration, and that these relationships supported the growth of learning communities within the EPP.

Kopcha (2010) suggested a systems-based mentoring model grounded in a teacher-led community of practice. Using a systems-based approach, mentors assess need; establish short and long term goals; and an overarch-
ing vision. Time is spent discussing culture to help minimize or address any negative beliefs teachers may have surrounding the use of technology and how to break down these barriers which create resistance. At the end of each stage, mentors should evaluate and revise to ensure a dynamic model and measure progress being made towards the goals and vision. Kopcha (2010) attests that using this systems-based approach to mentoring creates a teacher-centered process for technology integration faculty development. Kopcha (2010) argued that faculty development-based mentoring practices can be a good fit for technology integration because if an individual has anxiety related to technology use, this can be balanced by the support of a mentor. In these cases, the mentor provides timely assistance, modeling, and apprenticeship situated within the context of the classroom and fitted to the mentee’s needs.

Snyder, Best, Griffith, and Nelson (2011) used an academic coaching model to support faculty’s integration of technology. The purpose of the peer coaching model was to support university students through a higher quality of instruction provided by improved pedagogical practices of faculty. Snyder et al.’s approach emphasized faculty choice, allowing those who wished to learn more to “make the leap from the general orientation to a more in-depth examination into and effective use of its potential” (2011, p. 5). Learning activities, completed in pairings of coach and coachee, were based on the questions or concerns raised by faculty members. Whole group learning activities along with individual coaching sessions were followed by reflective conferencing (Synder et al., 2011). While the process did provide some implementation challenges, post-study surveys of staff members showed general benefits to instruction, a high level of interest among faculty, and for some, a desire to continue this type of learning.

More recently, List and Sorcinelli (2018) and Yun, Baldi and Sorcinelli (2016) explored the impact of faculty-initiated, mutual mentoring programs. While their work focused more on leadership, the model shows potential for impacting change in technology integration and provides an alternative to traditional forms of mentoring. The mutual mentoring model builds on previous research noting the power in numbers and the use of a collection or team of mentors that can help to address a variety of career competencies (e.g., de Janasz & Sullivan, 2004; Girves, Zepeda, & Gwathmey, 2005; Higgins & Kram, 2005). List and Sorcinelli (2018) indicated that mutual mentoring provided a flexible network and a variety of areas of expertise through relationships that addressed specific professional needs. Yun et al. (2016) argued that mutual mentoring is best because faculty members’ roles are complex and no single person or mentor holds all of the
knowledge or experience that another needs to succeed. In the description of mutual mentoring described by List and Sorcinelli (2018), the model was so successful that a project initially planned for one year was voluntarily continued for four. The mutual mentoring resulted in a safe space for faculty and a sounding board where faculty could work together on professional problem solving. The mutual mentoring also provided camaraderie among participants and was effective in making an impact in teaching and leadership practices across the institution (List & Sorcinelli, 2018).

Mentoring programs do not come without their own struggles. Grunuc (2015) conducted an evaluative case study on a graduate student-to-faculty mentoring model referred to as the Technology Mentoring Program (TMP). While both participants in the one-to-one mentoring groups mutually agreed upon benefits, Grunuc (2015) identified a number of challenges that faculty encountered, including: available time (sometimes created by conflicting administrative duties); the need for planning; commitment to the mentoring program itself; clear goals and intent, and motivation. Grunuc (2015) argued that effective mentoring programs should implement strategies referred to as the 6M Framework (Modifying, Meeting, Matching, Managing, Mentoring and Monitoring). Similar to Kopcha’s recommendations (2010), the 6M Framework allows time to identify mentoring infrastructure, hold regular meetings, make appropriate mentor pairings and establish a plan by setting clear goals and intentions.

History has shown mentoring models to be effective, especially when guided with a formal structure such as Kopcha’s systems-based approach. As EPPs continue to pursue ways to meet their faculty development needs, mentoring strategies such as these should be supported and pursued.

**Mutually beneficial partnerships.** In addition to these instances of on-campus faculty development design models, partnerships between local school systems and universities have been utilized to develop the technological knowledge of both teacher educators and P-12 faculty members (Adamy & Boumeltes, 2005; Knowlton, Fogleman, Reichman, & de Oliveira, 2015). These opportunities provided benefits to both groups, strengthening university faculty’s understanding of the expectations for practicing teachers and developing the TPACK of both groups of participants.

In a faculty development initiative funded by the National Science Foundation (NSF), Knowlton, Fogleman, Reichman, and de Oliveira (2015) describe a project in which teacher educators and P-12 middle and high school STEM teachers were paired to create Research Teams (RTs). Each RT was provided technical support as they worked together for a period of six months to create “technology-rich activities incorporating strong science inquiry” (Knowlton et al., 2015, p. 46). The pairs developed cur-
ricular materials and co-taught a two-and-a-half-day summer workshop designed for inservice STEM teachers. Each partner in the RT had a role: the in-service teacher clarified the P-12 standards and district expectations, while the teacher educator offered insights related to science education research and related pedagogies (Knowlton et al., 2015). Individuals in both roles reported a high level of satisfaction with this professional learning experience, with the teacher educators reporting a particular interest in how the experience broadened their own pedagogical knowledge; the realities of teaching middle and high school students; and fostered a deeper understanding of the content standards. Teacher educators who attended and participated in the summer workshop also reported increases in their use of technologies in the classroom (Knowlton et al., 2015).

Adamy and Boulmetis (2005) describe a similar collaborative effort in which P-12 teachers and university professors (identified as “fellows”) worked together to integrate technology in their instruction. Together, pairs of teachers collaborated to co-develop the teacher preparation curriculum. Prior to the start of each semester, the groups met for a week-long technology institute and engaged in monthly planning meetings related to the project. Adamy and Boulmetis (2005) likened the model to cognitive apprenticeship (Collins, Brown, & Newman, 1989), but with some key differences given the various contexts of EPPs versus P-12 settings. The outcomes of Adamy and Boulmetis’ study also included increases in the preservice teachers’ confidence in technology usage.

In each case, these collaborative faculty development partnerships strengthened the teacher educators’ understanding of the expectations of P-12 teachers, an important implication for every EPP. These types of mutually beneficial partnerships represent an essential method for consideration, as they provide potential to build capacity within both P-12 schools and EPPs (Knowlton et al., 2015).

Communities of practice. Communities of practice are based on situated learning theory, which emphasizes learning as social practice within activity, context, and culture (Brown, Collins, & Duguid, 1989). Developed to operationalize components of situated learning and how individuals learn through legitimate peripheral participation (Lave & Wenger, 1991), communities of practice describe the collective learning that is derived from individuals’ social relationships and those practices which are distinctive to a shared experience (Wenger, 1998); in this case, integrating technology in the classroom. Learning occurs in communities of practice through mutual engagement of participants as they work toward a joint enterprise and develop a shared repertoire of knowledge or skills (Wenger, 1998).
Communities of practice have been applied to the faculty development of teacher educators (Ping et al., 2018) and the use of the model has been shown to provide faculty with supportive opportunities to apply what they are learning through faculty development (Abigail, 2016). For instance, Tee-ter et al. (2011) supported faculty to form communities of practice which provided an opportunity for social inquiry, choice, and reflection. Teeter et al. (2011) reported on the development of individual communities of practice to foster faculty members’ development in multiple areas, including teaching with technology. These groups provided an opportunity for faculty to engage in inquiry around topics of their choice and reflect on this with others who shared common interests and goals. These aspects reflect Wenger’s core emphasis on a socially negotiated learning system. Groups in Teeter et al.’s study were made up of multidisciplinary teams, which provided opportunities for new relationships and the development of innovative pedagogical methods.

Cruthaka and Pinngern (2016) conducted faculty development within a community of practice model aimed at increasing the competency of university lecturers to integrate technology in their teaching. Participants began by self-assessing their current competency so that these results could be used to design the faculty development that followed. Lecturers participated in self-study lessons, practice sessions, and shared resources through an online repository hosted on the project’s website. Based on a sample of more than 800 lecturers from 28 institutions, survey results indicated that the lecturers experienced statistically significant increases in their development of competencies related to general technology knowledge, the use of technology to enhance communication, and the ways technology could be used to enhance curricular development (Cruthaka & Pinngern, 2016). Additionally, there was a statistically significant increase in lecturers’ positive attitudes toward the impact of technology on teaching and learning.

**DISCUSSION AND IMPLICATIONS FOR FACULTY DEVELOPMENT**

**The Design of Faculty Development**

Comprehensive faculty development in EPPs ought to be grounded in theoretical frameworks that inform the design process. In addition to the theoretical models surrounding technology integration, such as TPACK, we must not forget that faculty development is aimed at adult learners as the
audience. Therefore, adult learning theory and its ontological roots should be used to inform the design process. Adult learning and the theories associated with it are largely influenced by the social sciences, most notably cognitive and developmental psychology, sociology, and philosophy (Knowles, Holton, & Swanson, 2015; Merriam, 1993). Though used in previous related contexts to describe the education of adults, Knowles popularized the term andragogy in the 1970s and its applications in the U.S., contrasting the andragogical model with the commonly used pedagogical model of instruction (Knowles et al., 2015). In the pedagogical model, decision-making power rests with the instructor who typically decides how the content will be learned (Knowles et al., 2015). This approach places learners in a submissive role. The major assumptions of andragogy contrast this, placing emphasis on self-directedness in learning, the opportunity for choice, and a more active role in the learning process. According to Knowles et al. (2015), andragogy is based on the adult learners’ desire for purpose, their need for control in the learning process, and the appeal for individualization. Because adult learners (and, in our case, teacher educators) bring a vast array of experiences, we can rely on them to provide guidance as we plan for their needs. While we must help the teacher educator audience see the potential for new learning and shape their intrinsic motivation, there is no reason to relegate them to passive recipients of faculty development.

The assumptions presented in Knowles’ andragogical model have implications for the design of adult learning experiences, including the faculty development of teacher educators. While not completely grounded in andragogy, some of the studies contained in this review incorporated aspects that coincide with these assumptions. For example, Teeter et al. (2011) allowed the adult learners to share control and decision-making power by participating in socially negotiated communities of practice to improve their teaching skills. Learners were thus in an active role as they worked to develop their teaching practices and engaged in experiential techniques through various forms of peer collaboration. Snyder et al.’s (2011) coaching model incorporated components of the andragogical model by allowing faculty to capitalize on the experiences of others and encouraged problem solving which aligned with faculty members’ professional responsibilities. Knowlton et al. (2015) provided faculty with a clearly identified purpose for learning by allowing them to construct curricular materials that they could later use for the courses they taught. These instances of alignment exemplify that the components of andragogy can be incorporated into faculty development models for teacher educators and likely strengthen faculty members’ retention and support their willingness to participate. As lack of motivation can
be a persistent challenge in teacher education faculty development (Nehme, 2012), Knowles’ perspectives about the adult learner provide many pragmatic solutions.

In line with allowing adult learners opportunities for choice, Schols (2016) conducted a study which sought, in part, to ascertain the types of faculty development activities preferred by teacher educators when learning about technology. Teacher educators indicated that they valued informal learning opportunities that were specifically tailored to their individual needs and that they valued the chance to share what they knew about the integration of technology with their colleagues (Schols, 2016). Schols’ results provide further support for the mutual mentoring model discussed by List and Sorcinelli (2018) and Yun et al. (2016).

When designing models for the faculty development of teacher educators, it is important to acknowledge that the development of technology-based competencies may not progress in a linear manner, therefore, flexibility may need to be exercised within various stages of mentoring or related approaches (Kopcha, 2010). For instance, a mentor may need to oscillate between just-in-time technical support and modeling to meet a teacher educator’s needs. Additionally, it is possible that faculty development may need to occur over an extended period, such as the mentoring model which Guenec (2015) suggests may require more than an academic year to implement.

EPP leaders and teacher educators involved in planning faculty development need to be aware of the research and resources available to support them in these endeavors. As mentioned in this review, the TPACK diagnostic tool developed by Graziano et al. (2017) provides a framework for making decisions about faculty development before, during, and after these initiatives. While additional research is needed in this area, instruments like the one developed by Graziano et al. assist in identifying the current technology practices in an EPP, the available resources to support faculty development, and provides various exemplars for creating a more strategic approach to faculty development of this kind.

The Scholarship of Faculty Development

In 2013, Kirkwood and Price called for a more scholarly approach to faculty development, citing that training efforts often overemphasize technology tools, rather than a conceptual use of them. Specifically, Kirkwood and Price argued that studies generally failed to show “actual application of technology for teaching and/or learning purposes in higher education” and
thus, we know little about the impact of these processes on teaching and learning (2013, p. 330). Therefore, faculty development must be designed to focus on technology-specific skills in tandem with the use of these tools to support effective pedagogy and content. One of the predominant themes in the literature is the importance of embedding faculty development in technology integration within a context of teaching and learning, rather than presenting technology skills in isolation (Adamy & Boulmetis, 2005; Kirkwood & Price, 2013; Mishra et al., 2007; Murthy et al., 2015; Nehme, 2012).

In order to garner a better understanding of the impact of faculty development and our ability to help teacher educators reach their technology integration goals through these practices, the field of teacher education must continue to apply promising models such as those presented in this article. It is important that teacher educators and leaders pursue a research agenda focused on the scholarship of teaching and learning by encouraging faculty to connect their own professional growth in teaching to their research. Faculty development research related to technology integration expectations and accreditation needs to be published and celebrated. These efforts go beyond mere accountability. Faculty development of this kind makes certain that teacher educators are able to model effective technology integration so that teacher candidates can effectively teach with technology when they enter their classrooms.

Moreover, teacher educators must implement research to measure the impact, then present and publish on the results of our faculty development efforts. For example, Pamuk and Thompson (2009) designed an instrument to measure the benefits of student-faculty mentoring groups. Pamuk and Thompson’s work focused on the human interactions between mentor and mentee in the following four dimensions: technical, pedagogical, academic and professional. Following the systems approach described by Kopcha (2010), we should also pursue research to measure faculty preparedness to meet the TETCs and use that research to serve as a baseline for measuring change. This will allow us to gain insight as to where faculty strengths lie and where there are the greatest opportunities for improvement.

Over the past several decades, many colleges and universities have created centers for teaching and learning that can support faculty with technology usage, however, there are questions as to whether or not centers for teaching and learning adequately address the needs of faculty in higher education. Austin and Sorcinelli (2013) suggest that reliance on a structural model that requires faculty to seek out support must shift. Instead, opportunities for development should be brought to the faculty member
and meet them where they are in terms of logistics, interest, and need. As faculty development centers become more prominent in higher education, it would benefit the field as a whole for teacher preparation programs to set up faculty teams that conduct research to better understand how these models improve teaching. Alternatively, we must also be open to alternative methods, like the use of instructional designers who work within EPPs to support faculty members’ integration of technology described by Foulger, Wetzel, & Buss (2019). Further investigations of this type would be useful in continuing to build our current base of knowledge.

**Applying These Findings to the TETCs**

Public comments following the release of the TETCs indicate that, universally, stakeholders viewed the competencies as a framework to guide faculty development among teacher educators (Foulger et al., 2017). The purpose of this review of literature has been to initiate the conversation of how the TETCs can translate to faculty development initiatives that are designed and delivered across EPPs. To that end, the most important implication is to address how the promising models outlined here may be reasonably applied to the TETCs in EPPs across the U.S. and internationally. In doing so, it is important to acknowledge both the strengths and limitations of the individual studies, theoretical papers, and research syntheses included in this review. The body of existing literature on faculty development among higher education faculty and of teacher educators is longstanding and includes common themes that can be applied to multiple areas of a teacher educator’s development, including the TETCs. In short, we see no need to disregard previously effective methods of faculty development based on the existence of new competencies. However, as teacher educators and leaders in the field, we must be cognizant that research conducted in the past did not have the benefit of competencies to guide faculty development initiatives. We assert that past research on faculty development for teacher educators still holds great value, but it is imperative that each EPP examine these results in light of how they can now be applied meaningfully to the TETCs. A thorough examination and implementation of these results means:

- attending to the relevant contextual factors that exist within both one’s institution and EPP;
- examining the past research results, using this review as a starting point, to better understand faculty development models that can be applied; and
• developing a deeper, collective understanding of the TETCs and related criteria themselves so that everyone involved in faculty development has a firm grasp of the end goal.

As indicated in the findings included in this review, EPPs would benefit from a thorough review of the contextual factors that exist in their institution and within their EPP. Careful analysis of these factors will inform and sustain the steps that follow. A useful starting point for this analysis would begin with the implementation of the TPACK leadership diagnostic tool (Clausen et al., 2019; Graziano et al., 2017). Utilization of this tool can help an EPP measure these contextual factors and, ultimately, will assist them in designing a faculty development initiative that increases teacher educators’ mastery of the TETCs. For instance, the diagnostic tool provides benchmarking levels for the types of human, fiscal, and personal resources that exist to support faculty development. At a broader and conceptual level, this process includes a close examination of the leadership functions to support faculty development, including readiness for change through visioning, developing faculty capacity, and organizational design (Clausen et al., 2019; Graziano et al., 2017). At a more granular level, the diagnostic tool establishes which models are even viable for the EPP to consider. For example, are there established school partners who might embark on this journey with the EPP? How could existing partnerships be leveraged to support teacher educators in developing the TETCs while also supporting inservice teachers in the partner district to develop TPACK? Or, if strong partnerships do not exist, how can relationships be established or strengthened to support the skill development of both teacher educators and teachers in surrounding local school districts? Questions like these allow an EPP to think beyond planning a singular faculty development initiative and utilize the TETCs as a catalyst for positive change amongst not just EPPs, but also practitioners in the field.

Once a review of contextual factors has been conducted, key members of an EPP are in a position to take action as to how they will support teacher educators in developing the TETCs. This means selecting from promising models for faculty development, including the ones that are outlined in this review. Selection may include one model or a combination of models, depending on both the aforementioned contextual factors and a needs assessment of teacher educators’ current competency. While outside of the scope of this review, deciding on a baseline for the knowledge, skills, and attitudes contained in the TETCs is an important step that each EPP cannot overlook. Without discounting the importance of this, we advocate further
research in this area to support faculty development. Using this combination of information related to context and teacher educators’ competence, EPPs should select the most appropriate model(s) for faculty development and apply these using the aforementioned implementation recommendations. In order to adequately apply a faculty development model, EPPs may find it useful to look to previous research on the model in practice. For instance, EPPs who select mentoring as a model for faculty development have a depth and breadth of findings related to this approach, some of which have been summarized in this review. Finally, it is imperative that EPPs establish mile markers for successful faculty development by understanding the essence of each of the TETCs and how they can be identified in practice. This can be established through internal conversations within EPPs regarding the TETCs, starting by building awareness and then moving toward authentic conversations using the TETCs as a guide to establish how competent technology-using teacher educators perform. With regard to this last step, leaders engaged in this type of implementation of the TETCs ought to disseminate their findings through scholarship and research publication, so that we can support one another through lessons learned.

CONCLUSION

Successful faculty development programs are those which emphasize how technology can be used to support students and assess outcomes while also providing choice to faculty members (Austin & Sorcinelli, 2013). These initiatives are best implemented by innovative leaders who understand the importance of building a culture of learning that moves beyond personal research and scholarship to include the improvement of teaching and learning in the university classroom (Austin & Sorcinelli, 2013; Nworie & McGriff, 2001). However, teacher educators’ development of competencies will take time. EPP leaders, administrators, and faculty development recipients must be cautious not to draw immediate conclusions about the success of any faculty development based on the ebb and flow of teacher educators’ knowledge and performance. In applying the TETCs to faculty development, it is useful to resort to what we know about the overall acquisition of technology integration through TPACK: that this body of knowledge cannot be acquired as a result any one-time learning opportunity, but rather is developed over years of time. Teacher educators benefit from faculty development that is offered in various forms and the decisions for selecting the most appropriate model (or combination of models) can
best be determined through an assessment of contextual factors that exist within the teacher preparation program itself and the institution as a whole. Additionally, the findings of this review make clear that teacher educators are likely to require varying levels of intensity in the faculty development they need, and we cannot assume that the level of intensity required is commensurate with years of experience as a teacher educator. In short, even seasoned teacher educators may need intensive faculty development and support to reach the TETCs and, to address this, EPPs will need to be innovative in addressing the needs of these individuals moving forward.

Reaching the TETCs provides both an opportunity and a challenge for teacher educators to reflect on their current skills and consider how they can grow. When he described how individuals acquire TPACK, Kenton (2009) warned: mistakes will happen and sometimes, even under the best of conditions, instruction may be less than optimal for some time. But as in most new learning, time, focus and dedication will give way to adoption and change will occur.

References


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