TechTrends (2020) 64:248–259
https://doi.org/10.1007/s11528-019-00447-6

ORGANIZATIONAL TRAINING AND PERFORMANCE

Developing Faculty to Teach with Technology: Themes from the Literature

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Published online: 10 December 2019

Abstract
Technology has changed higher education; yet, many faculty are still hesitant to teach with technology. Faculty development might help change this, but questions remain on the best ways to help faculty teach with technology. Given this problem, we conducted a review of the literature to identify some best practices on how to develop faculty to teach with technology in the literature. The purpose of this paper is to present themes of faculty development research in higher education published from 2013 to 2018 where teaching with technology is a central component of the study. The results suggest that mentorship and faculty-teaching-faculty are effective strategies, that online delivery methods continue to grow, that teaching with technology warrants cross-disciplinary collaboration and that faculty motivations vary across rank and discipline.

Keywords Faculty development · Higher education · Teaching with technology

Technology continues to drastically change the world we live in. For instance, wearable technologies are enhancing approaches to modern medicine (Park and Jayaraman 2003; Pevnick et al. 2018), 3D printers are disrupting manufacturing to eliminate inventory overhead (Berman 2012) and augmented reality is blending digital information with the real world across the entertainment industry (Kipper and Rampolla 2012). However, in many ways (except for perhaps the growth of online learning), teaching and learning at colleges and universities have not changed that much compared to the technological advances of modern life (Kukulska-Hulme 2012). Recognizing this problem colleges, universities and faculty developers have increasingly focused on developing workshops, programs and other forms of support to teach faculty not only how to use specific types of technology but more importantly how and why they might effectively integrate technology into their teaching (Bates and Sangra 2011; Epper and Bates 2001; Mishra et al. 2007).

Advances in technology coupled with diverse faculty backgrounds and needs, confronts faculty developers with decisions about how to approach technology-focused faculty development. Previous efforts have focused on using technology-enhanced classrooms (see Fairchild et al. 2016), incorporating mobile devices in instruction (see Power et al. 2016), leveraging learning management systems (see Baran 2016; Sinclair and Aho 2018), developing accessible course content (see Paskevicius and Bortolin 2016; Wynants and Dennis 2018) and so on. However, despite these efforts, research suggests that faculty still do not integrate technology into their teaching as much as they could and many argue they should (Bates and Poole 2003; Koehler and Mishra 2005; Kukulska-Hulme 2012). We contend that part of this problem could be due to the faculty development programs being offered.

Faculty development programs focused on teaching with technology are often short-lived, isolated activities centered on technical proficiency as opposed to informing pedagogical change. Research suggests one-time technology workshops have minimal effect on long-term sustained development (Bickerstaff and Cormier 2015; Bose and Lowenthal 2018) even though research also suggests that faculty tend to prefer one-hour and online training formats more than other formats (Lowenthal et al. 2013). Thus, questions remain as to the best

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ways to teach faculty to teach with technology. The purpose of this review was to synthesize evidence-based practices from the literature that could help other faculty developers teach faculty to teach with technology at their colleges and universities.

Background

Faculty development is not new; institutions have been offering various forms of faculty development for decades (Lewis 1996). However, the increased push for faculty to teaching with technology and the corresponding faculty development programs focused on teaching with technology are relatively new. Advances in technology, though, create new challenges for faculty developers across nearly all educational institutions and organizations.

Problems Facing Faculty Developers

Faculty developers face a considerable number of challenges when rolling out faculty development programs focused on teaching with technology. Most prevalent are competing interests of faculty, concerns and priorities amongst senior leadership and institutional strategic plans (Sorcinelli and Austin 2010). Rollover in academic leadership and in turn changes to faculty development initiatives further complicates faculty development initiatives (Donnelly 2018). Such change combined with differing perspectives on how best to use technology creates a constant push-pull situation for faculty developers. Bates and Poole (2003) described this push-pull tension between various stakeholders as the "technological imperative" (i.e., arguments for and against teaching with and in turn investing in technology in higher education). As a result, faculty developers are often tasked with advocating for using certain technologies in the classroom to not only the senior leadership, but also pitching the use of those technologies to faculty while also incentivizing and training faculty to use those technologies. Despite their best efforts, disagreement among stakeholders can hinder any faculty development initiative.

Defining Terms

There are various terms used to describe faculty development throughout the literature (e.g., faculty development, instructional development, organizational development, academic development, professional development, educational development and so on). Not surprisingly, there does not appear to be a universally agreed-upon definition of faculty development (Taylor and Colet 2010). This is likely due to the fact that faculty development is both highly individualized and extremely localized across institutions. In other words, different institutions and organizations define faculty development in different ways.

The Professional Organizational Development (POD) Network in Higher Education positions faculty development as one of three clusters that fall under the umbrella of educational development: faculty development, instructional development and organizational development. According to Gillespie and Robertson (2010), faculty development emphasizes the individual instructor, instructional development emphasizes the course and curriculum and organizational development emphasizes administration and leadership.

There is an important distinction, sometimes blurred in the literature, regarding teaching with technology and faculty development research that warrants further explanation. There is a difference between using technology for faculty development (e.g., online faculty development initiatives where technology, such as a learning management system, is used to support faculty at a distance) versus faculty development focused on teaching faculty how to teach with technology. Some research focuses on the ways in which faculty development is being offered via technology (see Cohn et al. 2016; Liu and Alexander 2017; Mckenna et al. 2016), while other research focuses on the technology being taught (see Power et al. 2016; Sinclair and Aho 2018; Strawser et al. 2018). In this paper, we are focused on the latter approach, though findings in both types of research are subsequently discussed because the lines of research often overlap.

Method

To conduct this review, we searched the ERIC database using the keywords "teaching with technology," "faculty development" and "higher education." The initial search focused on finding peer-reviewed studies published from 2013 to 2018 that contained a methods section and were conducted at higher education institutions. Each article was then reviewed to determine that it focused on "technology use in teaching" or on"technology use in faculty development." This resulted in a total of 25 studies. These 25 studies were entered into Google Scholar to identify the number of times each study had been cited by others in an attempt to gauge its relevance within the field. We found that only seven studies had been cited in double-digit figures, thus suggesting that this field of inquiry is nascent. To broaden our search beyond subscription-based library databases, we used Google Scholar to conduct an additional search using the same keywords and process; this resulted in an additional 20 articles to include in this review. In the end, a total of 45 articles were read and analyzed. To identify common themes in this literature, the first author used a type of memoing to code recurring findings throughout each article (i.e., incentives, mentorship, time, preferences, etc.). The codes were examined and

grouped into common areas or themes. In the end, four themes emerged as a result of the analysis. The first and second author discussed and came to a consensus that these four themes represent the major themes in this literature. Additional literature published before 2013 was used to support, confirm or dispute the more recent research.

Results of the Review

Four main themes resulted from this review: the role of faculty as learners, delivery methods, the call for increased collaboration and motivations to participate in faculty development. Each theme is discussed in detail in the following section.

Theme 1: The Role of Faculty as Learners

Across every institution, the primary role of most faculty is to teach. However, with faculty development, faculty find the role shifts from being the teacher to being the student or learner. This transition from teacher to student creates a different dynamic in that the perceived balance of power between subject and discipline changes. Faculty developers consider this dynamic by giving special care to the shift of classroom control with faculty as learners. As a result, researchers continue to explore how to leverage different roles in faculty development, such as staff-teaching-faculty, students-teaching-faculty and faculty-teaching-faculty. Further, some faculty developers have used differentiated approaches to support and develop early-career faculty vs. more experienced faculty.

Staff-Teaching-Faculty Staff-teaching-faculty is by far the most common approach to train faculty to teach with technology throughout the literature (see Castleberry et al. 2018; Englund et al. 2017; Fairchild et al. 2016; Parker et al. 2016; Wu et al. 2016). Oftentimes, centers for faculty development (sometimes also referred to as teaching and learning centers) employ staff proficient with technology who conduct workshops on how to teach with technology. Depending on the size of an institution, this responsibility may fall on a dedicated department (whether within the center for faculty development or maybe the office of information technology) or be tasked to a particular individual (e.g., an instructional designer or technology trainer).

The advantages to staff-teaching-faculty are the areas of technical expertise amongst staff (Mohr and Shelton 2017), and centralization (Wright et al. 2018). Staff provide unique insight to technology-focused faculty development as their backgrounds, daily tasks and professional networks expose them to technology from different viewpoints. Simply put, a main part of their job is to research how to use new technologies in the classroom. They are also usually aware of their institution's long term strategic plans and how technology fits into that. Further, these staff members (e.g., instructional designers) can often provide one-on-one support to faculty through drop-in or scheduled meetings, either on campus or virtually.

Disadvantages of staff-teaching-faculty typically are the lack of teaching experience the staff members usually have (i.e., they are often experts with technology but not necessarily with teaching) and their ability to contextualize teaching with technology across multiple and often diverse disciplines. Despite these disadvantages, staff-teaching-faculty remains the most researched and documented form of faculty development (see Castleberry et al. 2018; Englund et al. 2017; Fairchild et al. 2016; Parker et al. 2016; Wu et al. 2016).

Faculty-Teaching-Faculty Faculty-teaching-faculty occurs in a variety of ways across institutions. For instance, it occurs in informal ways (e.g., interdepartmental onboarding and communities of practice) and more formal ways (e.g., classroom observations and through courses, workshops and faculty development programs). Other ways include using early adopters (i.e., those more proficient in teaching with technology) to teach the late majority or laggards (i.e., those more weary of the technological imperative in teaching) as technology facilitators or ambassadors (see Strawser et al. 2018).

Advantages to faculty-teaching-faculty include perpetuating teaching with technology among colleagues in professional development (Castleberry et al. 2018), placing emphasis on individual understanding as well as group learning (Davis et al. 2015) and promoting inclusive technology-focused faculty development (Strawser et al. 2018). Faculty-teaching-faculty encourages active participation among facilitators and helps combat resistance from faculty participants. However, there are some drawbacks.

Disadvantages to faculty-teaching-faculty are a subjective teaching approach, decentralization and varying levels of technical expertise. Faculty facilitators leading technology-focused faculty development can be subjective in their approach, due to the individual contexts in which they have come to understand the use of technology in their own teaching (Outlaw et al. 2017). Informal ways of faculty-teaching-faculty can also lead to decentralization from institutional strategic plans related to technology adoption (i.e., formal approaches stemming from teaching and learning centers). For example, faculty may encourage other faculty to use different syllabus software than the contracted software solution acquired by the institution. Lastly, faculty-teaching-faculty have different technology backgrounds, and Shagrir (2017) found faculty participants prefer to work with more experienced colleagues regarding technology. While facilitators may have experience in teaching with technology, they may be less versed in the technology itself. Davis et al. (2015) noted the importance of training the faculty as facilitators before these faculty teach other faculty. This is a subtle but important distinction

for faculty developers because faculty-teaching-faculty can support organizational development efforts, but may ultimately require more support from technology staff.

Despite these disadvantages, faculty-teaching-faculty continually resurfaces throughout the literature (see Castleberry et al. 2018; Davis et al. 2015; Georgina and Hosford 2009; Georgina and Olson 2008). One assumption could be an overarching faculty need and desire for situational context to incorporate technology in teaching and faculty may find learning from fellow faculty more relatable than learning from internal staff (e.g., instructional designers, faculty developers or technology trainers). In other words, the subjectivity of faculty teaching faculty perpetuates the drive for greater faculty acceptance and adoption.

Students-Teaching-Faculty Students-teaching-faculty to integrate technology in teaching is less common but does occur in higher education. When it does happen, it tends to happen through mentorship models. In one study, Baran (2016) detailed a brief history of faculty development focused on students and mentoring faculty to use technology. In another study, Koehler and Mishra (2005) showcased how graduate students can serve as catalysts within faculty development.

The advantages to students-teaching-faculty are the potential for experiential learning in sharing the classroom experience, the contextualization of student understanding and forming a bigger picture understanding of technology use or disuse in the modern classroom. Experiential learning provides a way for students and faculty to approach teaching with technology collectively, giving students' insight, voice, and experience in the teaching and learning process (see Hickcox 2002). By engaging students in technology-focused faculty development, faculty can pinpoint common challenges faced by students that may have otherwise gone overlooked. Lastly, students become active participants in the technology and curriculum of their classroom (see Gebre et al. 2014; Harris et al. 2009).

The disadvantages to students-teaching-faculty are the motivations for students to actively participate and the hesitation from faculty to learn from less experienced mentors. While some students may find becoming active participants in the technology of their classroom beneficial, others may first require direct instruction to learn how to use technology (see Keengwe 2007). Additionally, faculty may have reservations about non-traditional approaches to teaching with technology (see Sogunro 2017). Despite these disadvantages, students-teaching-faculty has merit in the appropriate settings with close supervision and helps bridge the gap between formal and informal learning amongst student facilitators and faculty participants.

Early-Career Faculty Faculty new to higher education often come to the profession with very little teaching experience (Van Waes et al. 2015); instead faculty are typically hired more for their content area expertise than their teaching experience. As such, early-career faculty, often lacking any formal training in how to teach, often revert to teaching the ways in which they were taught (Englund et al. 2017; Oleson and Hora 2014; Richardson 1996). The exponential rise in technology over the years presents another challenge for early-career faculty, because many of their teaching exemplars over the years likely did not integrate technology into their classrooms, thus leaving early-career faculty without any positive role models. Given this problem, the literature recommends faculty developers to incorporate faculty development interventions very early on with early-career faculty for the most sustained impact (Englund et al. 2017; Wu et al. 2016). This practice suggests that new faculty have the most potential to change or even conform to the institutional culture early on in their career.

More Experienced Faculty Across the faculty development literature, there tends to be certain assumptions regarding experienced faculty teaching with technology. One assumption is that technology-focused faculty development interventions will have minimal impact on experienced faculty. However, Sinclair and Aho (2018) found that more experienced faculty can serve as catalysts and innovation exemplars in effecting change in teaching with technology across an institution. Thus suggesting that while more experienced faculty may be resistant, they also represent an institutional demographic with tremendous potential for influencing and encouraging others to teach with technology, typically through some type of mentorship. Therefore, technology-focused faculty development efforts should often include some form of mentorship (Baran 2016; Behar-Horenstein et al. 2014; Shagrir 2017). Forms of mentorship can include multiyear faculty development programs, pairing new faculty with experienced faculty or certifying adjunct faculty (see Borowicz 2015). Such mentorship seems obvious but is far less realized across educational development initiatives, often reverting to staff taught one-off technology workshops.

Faculty developers need to remain cognizant of the unique dynamic at play as it relates to the roles of faculty as learners. To date, students teaching faculty may be the most innovative faculty development effort to emerge in teaching with technology, however, the approach could be considered one with high-risk, but possible high-reward. Staff teaching faculty has and will most likely continue to be the most prevalent approach to faculty development. Faculty teaching faculty poses the greatest potential for developing faculty in the most meaningful ways and mentorship amongst more experienced faculty and early-career faculty may have the most sustained impact over time.

Theme 2: Delivery Methods

Most faculty development workshops and programs are short (as in an afternoon). Technology, though, enables faculty developers to extend faculty development beyond a day. Some faculty development can last weeks, months, a semester or even a year. However, lack of time is often the most common barrier to faculty development echoed across all institutions (Lowenthal et al. 2013). As a result, faculty developers continue to explore the efficacy of using different methods to deliver faculty development, including in-person, hybrid and online as well as month, semester or even academic year-long faculty development initiatives.

In-Person The most preferred delivery method of technology-focused faculty development at higher education institutions are in-person sessions (Cook and Steinert 2013; Rienties et al. 2013; Wynants and Dennis 2018). This method requires a set time and place for subject matter experts and attendees to meet. Traditionally, in-person sessions are held in a classroom on campus, though there are exceptions (e.g., faculty attending off-campus conferences would be considered in-person faculty development). In-person faculty development sessions range from vetting different technologies for teaching (see Liu and Alexander 2017) to the pedagogy of technology adoption (see Jääskelä et al. 2017). Research suggests that faculty have mixed feelings on the time and modality of in-person sessions. Some faculty prefer to have a scheduled meeting time and place for all faculty development; others find a scheduled meeting time to be more of a burden on an already busy schedule (Lowenthal et al. 2013; Lucas and Murry 2011). This is not that surprising given that general perceptions of teaching with technology also vary between faculty (Azlim et al. 2015). Further, some faculty simply place more value on learning in-person than others do.

Hybrid While not that common, some faculty developers have experimented with using a hybrid approach to faculty development, using both an in-person session and online components. Hybrid delivery methods should not be confused with the practice of providing supplemental resources before, during or after a development session. Hybrid faculty development sessions, according to the literature, are one-time workshops where the online components (i.e., an online course, website or online resource) are purposefully integrated into the design of the in-person session (see Paskevicius and Bortolin 2016). Hybrid sessions can involve learning-by-design where the subject being taught is modeled in the delivery method of the session, faculty can then model their experiences when teaching using a hybrid method (see Wu et al. 2016). Combining the tangibility of in-person sessions with the technology of the online classroom yields longer-lasting faculty development. The prolonged faculty commitment either before or after the in-person session creates a challenge. As a result, more and more faculty development efforts use purely online approaches.

Online Online faculty development continues to grow as the delivery method provides opportunities to expand development efforts over longer periods of time and to larger faculty groups (see Chen et al. 2017; Lowenthal 2008). There are two common approaches used in online faculty development: self-study and instructor-led. Self-study online faculty development typically includes sessions designed to allow participants to complete a training without an instructor being present. Instructor-led online faculty development typically includes sessions led by a faculty developer. The scope of online sessions can vary from promoting awareness (see Wynants and Dennis 2018) to providing certification (see Teräs 2016) to analyzing the impact of mobile technology in instructional design (see Power et al. 2016). Faculty perceptions of online sessions will vary (see Englund et al. 2017), but the approach is growing. Wynants and Dennis (2018) noted the advantages of online faculty development as larger enrollment, pacing, organization, ease of access, clear time commitment and flexibility in timing. Conversely, some disadvantages are the absence of meaningful collaboration online (Good and Schumack 2013; Wynants and Dennis 2018) and the inherent reliance on technology, which some faculty may see as a deterrent to active participation or may lack the technical prowess to take part. Despite these potential setbacks, online faculty development continues to emerge across all institutions.

Interventions Some approaches to faculty development do not necessarily fall within one of the aforementioned delivery methods. In other words, some approaches combine various delivery methods over time; that is, the sessions are strategically placed as a small part of a bigger development effort or the sessions are more informal. As a result, this faculty development represents a more nuanced approach to teaching faculty to teach with technology. Interventions can range from a monthly five-minute video series detailing practical teaching development issues (see Castleberry et al. 2018) to a team training day focused on improving communication among healthcare professionals (see Davis et al. 2015) to a dedicated website focused on developing an online learning community (see Cohn et al. 2016) to micromessaging (see Parker et al. 2016). Interventions are in some ways highly innovative but may inherently lack the ability to measure successes compared to traditional delivery methods.

Time Each of the aforementioned delivery methods and interventions vary in their length of time. For instance, faculty development can be asynchronous and/or synchronous (Premkumar et al. 2017). Regardless of the format, time continually emerges as a detriment to faculty participation and

commitment (Castleberry et al. 2018; Lowenthal et al. 2013; Parker et al. 2016; Paskevicius and Bortolin 2016; Strawser et al. 2018; Wynants and Dennis 2018). The various approaches to faculty development suggest a best practice is to situationally contextualize teaching with technology in terms of modality and incorporate the approach across all educational development contexts (i.e., the instructor, the course and the institution).

Throughout the literature no one modality supersedes another in terms of effectiveness. However there are two key considerations: faculty preferences toward one modality over another will vary, and when faculty developers model training in the intended modality (e.g., a training on developing hybrid courses offered as a hybrid course) the training can be more impactful to teaching and learning among faculty participants. Attempting to analyze the effectiveness of technology interventions in faculty development in one modality or another is essentially a media comparison study that would elicit a finding of no significant differences. However, further research is needed to better understand each modality in the context of faculty development and teaching with technology. Time tends to be a recurring limitation to faculty development because teaching with technology fails to move beyond the individual. When such approaches move beyond the individual into a larger community of practice, into a larger drive for course design and curriculum change or into a larger commitment from senior leadership time becomes less of a hindrance.

Theme 3: The Call for Increased Collaboration

Effectively teaching with technology generally requires support and collaboration from various stakeholders. While learning how to use new technology is a highly individualized activity, teaching with technology requires interaction and support from faculty, students, staff and administration. Therefore, while faculty developers often intentionally design faculty development as one-on-one (Wynants and Dennis 2018) or pairing faculty with a mentor (Baran 2016), there are inherent limitations to the one-on-one approach. For instance, while learning how to use a specific technology may be relatively straightforward and easy to do one-on-one, faculty operating in a bubble may not see different ways of using the technology in their teaching. As a result, greater collaboration is needed to explore new and different ways of using technology as a catalyst toward more interactivity and engagement (see Madson et al. 2017). Consequently, the literature details a pattern of faculty desire to collaborate with other faculty as a way to share ideas, demonstrate principles in practice and form communities. A resounding sentiment in many faculty development studies is a desire from participants for greater collaboration with the larger community (see Davis et al. 2015; Paskevicius and Bortolin 2016; Wu et al. 2016; Wynants and Dennis 2018). The larger community is used loosely to represent any entity, local or abroad, larger than the study population in which the participants took part such as other departments, other institutions and different disciplines.

Preferences Preferred collaborations with different communities vary from institution to institution due in part to the preexisting teaching culture of each institution. However, preferences from the literature are an important consideration for faculty developers. Price and Kirkwood (2014) found faculty prefer conferring with fellow practitioners or faculty developers for guidance in teaching with technology over reading journal articles. Shagrir (2017) found faculty prefer departmental staff meetings and informal hallway conversations more than internal professional development courses or workshops. Similarly, faculty prefer collaborating with colleagues abroad on academic research and publications more than taking part in activities centered around an external professional association (Shagrir 2017). While faculty tend to resist collaboration, many find collaboration to be an effective tool to conduct professional development (Teräs 2016). Thus, faculty developers may consider offering guidance in small groups, presenting at departmental meetings or collaborating with faculty on academic research. Purposefully embedding scholarship in faculty development efforts may be a best practice. Faculty developers should strive for a reconceptualization of teaching among faculty participants as opposed to technical competency (see Kirkwood and Price 2013), and embedded scholarship represents one way to collaboratively develop faculty to teach with technology, though there are other ways.

Learning Communities Professional and virtual learning communities tend to be common approaches to encourage cross-disciplinary collaboration (see Cohn et al. 2016; Liu and Alexander 2017; Mckenna et al. 2016; Parker et al. 2016). Trust et al. (2017) found professional learning networks support growth in teaching and learning among higher education faculty, and Bostancioglu (2018) found faculty participation and collaboration in online communities of practice to ultimately support teaching with technology in professional development. Collaboration across communities help faculty answer important questions about teaching with technology and stress a desire to conceptualize how others are approaching the incorporation of technology in their teaching; however, cross-disciplinary collaboration is an important, differentiated finding. The finding suggests using technology in teaching is not discipline-specific, rather contextual.

Faculty developers should expand upon collaborative approaches to teaching with technology. While one-on-one approaches have merit, faculty may not prefer such isolated activities. Professional learning communities and networks provide an avenue for larger faculty development across institutions and disciplines. As a result, faculty motivation to

participate in technology-focused faculty development is threaded throughout the literature.

Theme 4: Motivations to Participate

Faculty participate in faculty development for different reasons. The motivation to participate can include a willingness to learn new technology (Niebuhr et al. 2018), collaborate with colleagues (Shagrir 2017) or to receive some form of compensation (Phuong et al. 2018). Other motivations may stem from wanting to do a good job by lending a helping hand, meeting a top-down administrative mandate or being volunteered to participate. Whatever the reason, participation in technology-focused faculty development has shown to positively influence pedagogy (Holmes and Kozlowski 2015) and technology adoption (Hirsh 2001; Kenney et al. 2010). Faculty developers should be familiar with such varying motivations because knowing an audience will ultimately serve faculty developers in the long term.

Incentives Institutions have experimented with different ways to incentivize and motivate faculty to participate in faculty development. Voluntary participation in technology-focused faculty development initiatives was noted in several studies as a differentiating characteristic (see Baran 2016; Davis et al. 2015; Jääskelä et al. 2017; Teräs 2016; Wynants and Dennis 2018). Involuntary participation was noted less frequently (see Wu et al. 2016). Conversely, feedback from participants suggests volunteering is somewhat of short-lived activity and faculty would require incentives for continued participation. Various incentives and reward structures are threaded throughout all educational development initiatives including stipends, course release, grants, scholarships, certifications, professional development credit and so on. Lowenthal et al. (2013) found receiving a stipend was the most motivating incentive for faculty to attend formal faculty development.

Grassroots Efforts A common theme throughout the literature is the lack of bottom-up approaches to teaching faculty to teach with technology. A bottom-up approach is one where a faculty member, or a faculty collective, elects to incorporate technology into their teaching that encourages innovation and pervasive use across an institution (Singh and Hardaker 2017). The bottom-up approach to faculty development emerges when no formal training on the technology tool is offered by the institution and faculty lead the tool adoption organically (see Pacansky-Brock 2017). It could be though that bottom-up, grassroots efforts, are happening more than we realize but that these experiences are not captured in the literature. Either way, faculty and faculty developers should continually search for new and innovative ways to incorporate technology in teaching and in-turn share their experiences with others.

New Tools The decision to procure new technology often fails to incorporate faculty early on in the process and is fueled more by operational business decisions (i.e., contract terms and cost) as opposed to benefits to teaching. Data analytics help decision-makers better understand usage though falls short of recognizing considerations such as: marketing the tool across the institution, effective communication of the affordances of the technology and sustained faculty training and development. The impact of technology tools revolves around relevance and frequency within everyday work and some technologies are more impactful than others in higher education. Using a specific web browser (e.g., Chrome, Edge, Firefox, etc.) may be considered less impactful in faculty development compared to using a different learning management system (e.g., Blackboard, Canvas, Desire2Learn, etc.) though both may be used every day. Including faculty from start-to-finish in the procurement of new technology is easier said than done, but efforts should be made as faculty voice is paramount to rolling out technology effectively (Fathema et al. 2015; Sinclair and Aho 2018; Strawser et al. 2018).

Teaching with technology initiatives need to move away from carrots and sticks. Faculty developers should be sensitive to different power dynamics at play and recognize the inherent value of providing incentives, but should also be wary not to provide these at a detriment to the development endeavor. By far, the most motivating factor is stipend provision (Lowenthal et al. 2013). While exploring emerging technology (Pacansky-Brock 2017) and collaboration amongst colleagues (Koehler and Mishra 2005; Strawser et al. 2018) are common motivations, improving the student experience by teaching with technology is not the most motivating factor and, while highly idealistic, it should be.

Discussion

The aforementioned themes from the literature provide faculty developers opportunities to expand upon teaching with technology in faculty development. While these themes provide a general overview of more recent technology-focused faculty development, there are also more nuanced approaches requiring greater research. As a result, we present an analysis of the situated learning context, the cross-section of technology and pedagogy and the gaps in the literature.

Contextualization

Faculty development efforts focused on teaching with technology require context. Far too often there is a disconnect between the technology, theory and practice. The disconnect occurs because “many teacher educators seem to forget that educational knowledge cannot be simply ‘transmitted’ to teachers, and thus improve their actions” (Korthagen 2010,

p. 99). Research efforts should continue to explore situated learning theory, as collaboration and context are key components of teaching with technology. Lave and Wenger (1991) defined situated learning as legitimate peripheral participation where learning stems from the social context in which the learning takes place. In situated learning theory, participants move from novice to expert by assimilating to a community of practice. Thus, the situational context should be emphasized throughout faculty development where teaching with technology is the ultimate goal. Throughout the literature, contextualization of technology in teaching is key to long-term sustained development (Bostancioglu 2018; Koehler and Mishra 2005; Fairchild et al. 2016; Parker et al. 2016). Faculty development needs to remain relevant. Communities of practice, collaboration and developing expertise can perpetuate the relevance of teaching with technology. Since technology continues to evolve, such social approaches to technology adoption may serve to support the individual as part of a larger group.

Where Technology and Pedagogy Intersect

Research suggests that faculty development focused on teaching with technology has a limited-to-no impact if pedagogy is not considered. Kirkwood (2014) differentiated technology-focused faculty development as either supplementing existing practices via technology or as advancing teaching approaches with technology, and the latter is scarce. Ertmer and Ottenbreit-Leftwich (2010) posited self-efficacy, pedagogical beliefs and culture are key variables to faculty development and technology reform. Faculty developers should recognize that building confidence is an important consideration when teaching with technology because uncertainty is an unfamiliar space for faculty (see Holmes and Kozlowski 2015).

In addition, faculty developers should provide ways to achieve individual mastery, foster collaboration and group learning and showcase technology being used in relatable contexts. Studies that indicate a change in pedagogy are few and far between though Castleberry et al. (2018) detailed how faculty indicated a change in teaching practice through a professional development video series. Other research has shown when teaching with technology, faculty either tried new things or reverted to old and familiar ways of using the technology, and resistance to change yields little change (Fairchild et al. 2016). Conversely, Teräs (2016) found that overcoming technology obstacles potentially yields the most impactful changes in faculty development and faculty naturally resist collaboration but feel it is an effective professional development tool. Faculty development studies rarely, if ever, indicate a change in participant pedagogy. As a result, faculty developers should broaden the scope of teaching with technology to be fewer nuts-and-bolts and more hands-on group experiences detailing the principles in practice.

Gaps in the Literature

Some more prominent and recurring gaps in the teaching with technology literature are needs assessments (i.e., pretests), closing the loop (i.e., posttests), and holistic approaches to faculty development. Faculty development research would benefit from the inclusion of needs assessments as faculty input creates a professional dialogue vital to enacting change (Behar-Horenstein et al. 2014). Further, faculty development efforts often fail to close the loop by not analyzing approaches after faculty have had time to integrate technology in teaching (Beach et al. 2016). While Kirkwood (2014) suggested evaluating the intended use of learning assessments as meeting acceptable standards, other researchers suggested a need for longer lasting and sustained faculty development to truly study the impact of technology in teaching (see Bali and Caines 2018; Liu and Alexander 2017; Wynants and Dennis 2018). In either case, faculty development research would benefit from greater follow up with participants to close the loop.

Holistic approaches in teaching with technology that encourage synergies across the individual, the course and the institution are also lacking. Lockhart and Stoop (2018) found including scholarship and strategic planning to be more holistic ways to approach faculty development. Currently, most individual or group faculty development sessions are highly localized activities (see Baran 2016; Davis et al. 2015; Fairchild et al. 2016; Parker et al. 2016; Paskevicius and Bortolin 2016). Broadening the scope to instructional development by focusing on the course or curriculum can also be an isolated activity (see Koehler and Mishra 2005). Going further, organizational development focusing on the roles of senior leadership may be too disparate an inclusion (see Sinclair and Aho 2018; Strawser et al. 2018) though findings differ across studies regarding the need for senior leadership support with technology adoption. Azlim et al. (2015) found faculty did not perceive administrative support as a barrier to adopting technology, whereas Shagrir (2017) found faculty required administrative support. Since these approaches are often considered separate to one another (i.e., the individual, the course and the organization), a best practice would be to incorporate teaching with technology across all areas of educational development as part of a comprehensive strategic plan.

Implications for Practice

Faculty developers can incorporate these findings into faculty development initiatives across all institutions–though special attention should be given to advancing approaches, the feedback received, the culture of an institution and future research efforts.

Advancing Approaches

Research surrounding teaching with technology provides faculty developers opportunities to advance faculty development beyond familiar constructs. This review detailed themes from the literature that open up opportunities for both expansive and focused studies. Faculty developers and researchers can narrow the focus to the situational context of faculty-teaching-faculty as a "process of attuning, constructing, and negotiating" (Baker et al. 2018, p.271) at their respective institutions, or explore faculty-teaching-faculty through cross-disciplinary collaboration over time (see Beaumont 2018). Further, faculty developers should cross-examine different faculty populations, institution types and demographics against these themes as results may vary. Lastly, the student experience should be purposefully integrated in faculty development efforts regarding teaching with technology (e.g., the intersection of professional learning networks among online students and faculty).

The Devil's Advocate Paradox

Participant feedback in faculty development efforts tends to counter the delivery method used to conduct a study and should be carefully considered as an implication for future practice. Within the limitations, discussion of findings, implications or conclusions presented in the studies reviewed it is common for participants of an online faculty development workshop to suggest online workshops would be better served as in-person and vice versa. Faculty developers should give special care when disseminating these findings as to avoid biases and present misleading information about one modality over another.

Institutional Culture

Faculty developers need to consider the campus culture surrounding technology. Every institution has a unique faculty body and technological history. There will be nuanced differences, from the terminology and acronyms to broader differences such as position responsibilities, educational development approaches and technologies in use. What may work well for one institution may not work well for another and it is important to gauge the climate before rolling out new technology or new teaching with technology initiatives. Incorporating needs assessments, developing communities of practice and continued follow-up can help faculty developers better understand the institutional culture. In addition, the current technology used around campus may have resulted from decisions previously made many years ago and the justification (i.e., cost-benefit analysis) of such tools may have since changed.

Research Efforts

Further research is needed to explore faculty development focused on teaching with technology. Studies should explore institutional roles (i.e., staff-led versus faculty-led development) as many faculty prefer working with colleagues compared to institutional staff regarding technology (Shagrir 2017). Moreover, additional research should place a greater commitment to conducting studies over longer periods of time (see Englund et al. 2017; Jääskelä et al. 2017) as most faculty development is short-lived. Going further, researchers should explore the social dynamics at play in situated learning theory through more qualitative and mixed methods research as teaching with technology is a social science focused on human behavior. Lastly, researchers should avoid comparing delivery methods and continue to explore online faculty development as there are apparent opportunities for innovative approaches to addressing time constraints.

Conclusion

Teaching with technology will continue to evolve in higher education and faculty development should support the progression in equally innovative ways. The following review highlighted four emergent themes in the literature for faculty developers to consider in their development efforts. Faculty-teaching-faculty may have the greatest potential for high impact practices though research on faculty developers (i.e., staff-teaching-faculty with teaching experience) could spark academic debate. Mentorship is a highly effective practice, especially between more experienced faculty and early-career faculty, and one-on-one technology teaching may be more appropriate in certain situations but less effective overall. Further, teaching with technology is not discipline-specific as varying applications can be applied in different ways across disciplines.

Faculty developers should continue to explore new ways of approaching technology in teaching. Striving for greater collaboration between larger communities of practice while encouraging grassroots efforts and enhancing the student experience while maintaining faculty motivation are different approaches worth exploring. Further, when technology and pedagogy intersect in relevant ways for faculty the student experience will ultimately improve. There are many potential solutions for the problems faced by faculty developers throughout the literature, but there is no catchall solution.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with animals performed by any of the authors.

Informed Consent This article does not require informed consent.

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