

A Professional Development Manual for Technology-Based Curricula

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Introduction

School districts across the United States are being guided by nationwide goals and mission statements that aim to include national and local standards. These standards include the International Society for Technology in Education (ISTE) and Learning Forward's Standards for Professional Learning. These initiatives encourage teachers to implement technology into their classroom instruction along with the integration of technology into mandated school professional development (Ebersole, 2017). Implementing educational technology into teacher professional development encourages them to utilize technologies into their classrooms and instruction, as well as prepare students with the technological awareness, abilities, and dispositions to be efficacious in collaboration, communication, critical thinking, and creativity (Blanchard, LePrevost, Tolin & Gutierrez, 2016). However, the research indicates that implementing educational technologies into everyday instruction requires that teachers to partake in professional development due to their inadequate training in implementing technology use in the classroom. Despite the improved connectivity of technology in schools, many teachers are not as effective as others in transforming the way they teach with technology and are not efficiently prepared to incorporate technologies into their instruction.

A frequent pattern is often seen in school districts that implement new technology. Only a handful of teachers will embrace it and its innovative uses, while their colleagues either make incremental modifications or no modifications at all in their instruction. As a result, the U.S. Department of Education has acknowledged the strong need for technology-related professional development in school districts. Shriner, Clark, Nail, Schlee and Liber (2010) denote that educational technology professional development sessions increase both the confidence and competence in teachers' utilization of technology. Not only must the integration of technology be implemented in teacher professional development, but pedagogical and content knowledge.

Beriswill, Bracey, Sherman-Morris, Huang and Lee (2016) indicates that the greatest features of educational technology professional development are those that integrate subject-area content, a variety of pedagogies, and methods that efficiently incorporate the latest and effective classroom technologies. However, most teachers have not had professional development sessions that are designed to help them use technology in transformative ways that modify their instructional practices and the ways in which students are learning in the classroom.

Perspectives on Professional Development

The job of a teacher is multidimensional, and teachers require development in many areas throughout their careers. Ahuja (2015) offered several facets which need to be covered in professional development programs for teachers. First, the knowledge base of each discipline is rapidly changing, and teachers must have the latest information to present current thinking to students. Teachers must hone their presentation skills, especially as they relate to diverse groups of learners. Teachers must focus on their verbal and written communication skills, and must be proficient with technology. Teachers must also be taught to develop their creative skills, so they can bring this dimension into the classroom. In short, teachers must become lifelong learners.

Many professional development programs in technology focus on learning to use specific tools in the classroom. Ertmer (2005) characterizes teachers' beliefs about pedagogy as the "Final Frontier" of technology integration. She conducted a review of the literature regarding the beliefs that teachers hold about their students, their teaching and technology. In order to effect change, those fundamental beliefs must change. She suggests that the most effective professional development programs will begin this process of change by making small changes which result in personal experience. In other words, once the teacher sees the utility in a tool, they are more likely to use it in other settings. Another factor is vicarious experience, exposing teachers to

other colleagues who use a technology effectively. This type of observation provides both information and motivation. The final strategy mentioned was the development of professional learning communities with similar values and goals. Teachers can interact with peers, as well as offer and receive assistance and ideas in such a network (Ertmer, 2005; Peterson, 2016).

The ultimate goal of any professional development program is to enhance student learning and outcomes. Gerard, Varma, Corliss and Linn (2011) reviewed the body of research regarding professional development programs for K-12 technology-enhanced science education. One of their goals was to understand how professional development can improve teachers' practice and students' inquiry learning experiences. One of their findings was that just introducing ideas without giving learners the opportunity to test and refine the ideas did not change the learner's knowledge of the content. They suggested four processes needed for knowledge development: eliciting ideas from the learners prior to introducing the new concepts, adding new ideas with connections to the prior ideas held by the learners, distinguishing between new and existing ideas, and reflection and integration of the ideas. They propose that professional development activities which focus on each of these four processes improve both teacher and student learning (Gerard, Varma, Corliss, & Linn, 2011).

Learning to use an emerging technology is complex, and must go beyond learning to use technological tools. Gerard, Varma, Corliss and Linn (2011) found that tool-focused professional development is often ineffective, because its primary focus is the operation of the tool. Generally, these sessions do not go far enough in helping teachers use the new tool effectively and design technology-enhanced lessons for students. They found that the most successful of these programs provided long-term support to help teachers design and implement new lessons using the new tools.

Technology in the classroom comes in many forms, some of which are just substitutes for non-technological solutions. Despite a focus on the use of technology in the classroom, Lawless and Pellegrino (2007) report that word processing and basic skills programs are the used most frequently. They note a lack of integration of technology into other classroom activities involving critical thinking and problem solving. They also point to a need for rigorous research to understand the types of professional development for teachers that will be impactful on teachers and students alike.

A professional development program can only be considered truly effective if it leads to improved student outcomes. Polly and Hannafin (2010) proposed their Learner Centered Professional Development framework based on an extensive review of the literature regarding student outcomes and professional development. Under this framework, teachers become active participants in lessons, and learn to model and use questioning effectively to assess student learning. Using an online format for these activities promote teacher ownership of their own learning, as they can choose activities at times that are convenient for them. Communities of educators on the Internet provide information and share resources, as well as provide ongoing support to members. The authors suggest that further research be conducted to test this framework.

Many traditional professional development programs are delivered in a one-time, workshop format, with a facilitator who demonstrates the new technique. Hew and Brush (2007) reviewed ten years of literature regarding the integration of technology into the curriculum. They discovered many barriers to effective adoption of technology, and made recommendations for strategies to overcome these barriers. One of the recommendations concerned using professional development to change teachers' beliefs and attitudes toward technology. They concluded that it

was more important to focus on the features of the professional development program, as opposed to the structure of the program. They found that effective professional development focused on content, is hands on, and is aligned with teachers' needs. They advocate a "just in time" approach, which addresses teacher needs immediately, rather than focusing on one-time, formal training prior to implementation (Hew and Brush, 2007).

An important part of teaching with technology is designing appropriate activities for student using that technology. Walker, Recker, Ye, Robertshaw, Sellers and Leary (2012) studied professional development for teachers learning to use technology in the science and math classroom. Their quasi-experimental research involved 51 teachers in 5 schools in a large district. They compared TPACK-based survey results from teachers who received technology only professional development versus teachers who received technology plus problem-based learning training. In addition, students of participants in the study groups completed brief surveys with items designed to assess their behavior, knowledge and attitude. The researchers found that both types of professional development were helpful for teachers, and students benefited from the teachers' new practices. The study also noted that teachers who were in the technology plus problem-based learning groups were more likely to modify their courses to a student-centered design. Students in these groups showed gains in all three dimensions measured in the student survey (Walker, Recker, Ye, Robertshaw, Sellers & Leary, 2012).

Today's digital world opens doors to new platforms for professional development. Dede, Ketelhut, Whitehouse, Breit and McCloskey (2009) advised that online teacher professional development can effectively meet the needs of teachers. The online programs fit into teacher schedules, offer access to resources that are only available at a distance, and provide a real-time support mechanism. They point to virtual worlds where teachers become digital persons, the use

of augmented reality, and academic networking on social media as three examples of innovative uses of online professional development.

Many teachers today rely on professional learning networks on various social media platforms to support their use of technology. Tondeur, Forkosh-Baruch, Prestridge, Albion and Edirisinghe (2016) examined professional development in technology across several different countries, each with their own educational systems and beliefs. They found that there were similarities in the effective professional development schemes across the nations. One factor they noted was that professional communities and networks promote sharing of projects and refinement of ideas. They also identified problem-based learning as an effective technique for professional development and student learning using technology.

The TPACK Framework

The widespread introduction of technology into education has changed what teachers need to know to become effective educators. It is no longer enough to be a content matter expert and to understand how students learn. Today, it is also important to know how to use technology in this new environment to enrich the student experience. Faced with a lack of research in this area, Mishra and Koehler (2006) spent over five years developing a framework to understand professional development and uses of technology in education. This framework focused on the technological knowledge, pedagogy knowledge, and content knowledge that teachers must develop. This framework, commonly known as TPACK, envisions each of these domains of knowledge as a circle in a Venn diagram. There is significant interplay between the three domains, which results in overlapping areas on the Venn diagram. This results in an additional four combination domains which must also be considered (Mishra & Koehler, 2006).

To develop the TPACK framework, the authors conducted a series of design experiments to examine the introduction of the framework from perspectives of theory, empirical research, and practical applications (Mishra & Koehler, 2006). They noted that pre-service teacher preparation must now focus on all three of the primary domains, as well as their intersections. They also noted the evolving nature of technology, and the need for constant development activities if teachers are to be able to employ the latest techniques.

The authors also developed an approach to professional development based on TPACK, which they call “learning technology by design.” This approach is hands-on and interactive, not based on lecture. It lives in the space between theory and practice, and involves activities such as course design, making videos, and other educational artifacts. The authors offered several examples of this approach, from learning to make videos to enhance courses, to designing websites, to creating online courses. Participants learn many different techniques and are able to teach each other, rather than rely on the instructor as the expert. In addition to the activities described above, the participants share experiences in an online forum, and write critiques and reflections about their work (Mishra & Koehler, 2006). This type of course approach could revolutionize teacher professional development.

Learning Forward’s Standards for Professional Learning

According to ISTE standards, teachers should be expected to engage students in exploring practical matters and solving realistic problems using digital tools and resources. They also need to develop technology-enriched learning settings in their classrooms that will permit students to become active participants in establishing their own educational objectives, handling their own learning, and evaluating their own growth (Crompton, 2014). In order to help nurture

students' new literacies, school districts need to ensure that their teachers are prepared to teach, learn, and solve realistic problems with educational technologies.

Research has revealed that continual, content-specific professional learning that is aligned with student content standards and supplemented by technological resources to support implementation does indeed improve overall student learning. For example, university faculty ran a three-year teacher professional development project in order to effectively incorporate educational technology into the instruction of two rural, high-poverty middle schools. The professional learning in this project was strongly aligned with Learning Forward's Standards for Professional Learning: Resources, Learning Designs, Implementation, and Outcomes. Standards for Professional Learning form the features of professional learning that leads to efficient teaching practices, encouraging leadership, and improved student results (Learning Forward, 2017). The schools purchased technology tools, which included teacher stipends and workshop materials (Resources), while the professional learning engaged various designs in realistic locations to support teacher learning and the use of the new technologies (Learning Designs). During Implementation, teachers were exposed to recurrent online sessions and increased access to the new educational technologies. These new educational technologies were aligned with state standards and teachers had the freedom to apply them to their own lessons (Outcomes) (Killion, 2016).

Learning Forward's Standards for Professional Learning taught teachers that professional development should be embedded into their daily workday routines and tied in to their specific classroom instruction, rather than isolated sessions often seen in teacher contracts. Herold and Smith (2015) state that when teacher-learning experiences in professional development sessions are centered merely on the technology itself with no association to grade-level or subject content,

teachers are unlikely to integrate the technology into their instruction. As teachers work together with those who have already adopted the technology into their instruction, school districts can transform their classrooms into innovative, student-centered classrooms.

Online Professional Development in School Districts

Professional development provided by school districts can be expensive, often taking away time from teachers' classroom instruction during the day requiring substitutes to cover their classes. As a result, many districts are enabling district-created online professional development programs in order to provide teachers with choices to improve subject-related specific skills, flexibility, and freedom. Teachers desire applicable professional development to be accessible when they have time (Weaver, 2017). With school provided online professional development programs, teachers can choose from a variety of topics, in addition to their school-mandated assigned topics, and attain a variation of skill sets.

The variations of topics in online professional development programs are taught via instructional videos, content modules and/or lessons, professional readings, manuals and classroom strategy practices. Many of the online programs require teachers to complete course content and take quizzes to earn badges and points. Each module or lesson can contain how a certain educational technology can be implemented in classroom use, along with supplemental resources (Berry, 2017). Online professional development for teachers should entail a user-friendly design and navigation, convenient, and accessible at all times. It can also support school administrators when creating annual, individualized professional growth plans for teachers on integrating technology into classrooms (Weaver, 2017). For example, Kyte Learning, is an online professional development program that delivers on-demand technology training created by educators from around the country who share their best practices for implementing technology in

the classroom. Kyte Learning has hundreds of videos available for teachers of all grades and was just recently awarded ISTE's official Readiness Seal of Alignment. ISTE's Readiness Seal of Alignment recognizes products that are dedicated to encouraging the use of technology to assist in teaching of K-12 students and teachers ("ISTE seal of alignment", 2017). The number of online professional development websites, such as Kyte Learning, are efficient in meeting with today's current educational technological needs and demands.

There are three types of online professional development programs: synchronous, asynchronous, and hybrid. Synchronous online learning occurs in real time, such as live webinars on particular topics of interest to teachers and virtual technology coaching. These types of technologies are not transforming the learning experience(s), but resembling in-person professional development in a virtual environment. Asynchronous online learning occurs at different times for different teachers, such as social networks, discussion threads/boards, self-paced online courses, and resource-sharing websites. These activities are regularly self-directed by the teacher. Hybrid learning occurs in blended learning opportunities, such as courses that require in-person and virtual collaboration (Regan et al., 2012).

In terms of choosing between synchronous, asynchronous, and hybrid online professional development programs, school districts must consider their teachers learning goals and styles. Goals could include certifications or course credits, resource sharing and ideas, or collaborative opportunities on specific topics. School administrators should also take into consideration if their teachers benefit from either structured experiences with formal learning goals or self-directed, convenient times and choice of topics (Bates, Phalen, & Moran, 2016). Most of all, school districts should consider if online learning will truly benefit from in-person professional development for educational technology implementation.

Online professional development for educational technology integration works well when teachers require particular learning that is not mandated by the school's district professional development plan that year. It also works well when specific proficiency is unavailable in schools but available online, when colleagues who are knowledgeable in a particular topic are not available in their home school to help/mentor other teachers, or when online professional development is considerably inexpensive or more achievable than in-person. School districts should also take note that relying on online professional development can become precarious when the learning is too secluded and independent (Bates, Phalen, & Moran, 2016). However, effective online professional development occurs when teachers share resources they have discovered online with other teachers and discuss them and how they can be integrated into the curriculum. Teachers who view online learning together as a group can encourage each other to consider important features of pedagogy ("Teaching with technology", 2017). Online learning can both meet teachers' professional and personal needs, but they must discover methods to take that learning and collaborate in-person with other teachers in the school.

Conclusion

Many teachers lack an understanding on how educational technology can be integrated into their everyday teaching practices. Their level of comfort and confidence is also varied as some are proficient incorporating it into their lessons, while others require training and assistance from others (Beriswill, Bracey, Sherman-Morris, Huang, & Lee, 2016). If they do not see it take place in actuality and believe that it can transform their classroom instruction, they will unlikely attempt it. Their pedagogical principles need to play a principal part in their readiness to implement educational technology. Teachers' use of technology needs to proceed from

replacement to transformation. Those who are exposed to continuous professional development will display an increased familiarity and comfort with technology (Killion, 2016).

A long-term, school wide, teacher professional development program that integrates technology into their sessions can have an influence on teachers' attitudes about both teaching and student affect, which can ultimately result in increased student achievement (Blanchard, LePrevost, Tolin & Gutierrez, 2016). Based on the literature discussed above, it is clear that designing effective professional development opportunities to encourage teachers to incorporate technology into their classrooms is a significant task requiring much thought and effort. The literature suggests that the most effective offerings involve a long-term approach, rather than a single session approach. The sessions should be active, and teacher driven. Opportunities to design actual lessons, submit them for the review of peers, and to see techniques in action demonstrated by more experienced teachers are strategies which promote learning and the incorporation of technology in the classroom. Professional development that has an online component, such as distance education, professional learning networks, and long-term support networks, are frequently noted as effective techniques.

Recommendations for Effective Professional Development Implementation

Based on the literature, a review of best practices, and a review of practices by peer districts, it is the desire of the authors to unite the diverse approaches in place around this district under one set of principles. The end result is that while various subunits of this district will still retain the autonomy to structure professional development as they see fit, fundamental approaches to these designs should be synchronized.

Professional development opportunities should be structured across the TPACK spectrum.

Technology-themed professional development in particular needs to incorporate not simply theoretical knowledge, but also practical and reflective components. Participants should take away pedagogical, “how can I do this tomorrow” practices that will lead to short and long-term efficacy (Stein, 2007). That is, any technology training must not simply address the technology itself, but rather practical pedagogical techniques such that attending stakeholders can implement the technology effectively.

Define the roles in professional development.

Educators can be an inherently stubborn population upon which to effect change. Thus, a clear set of goals must be established prior to the implementation of any new professional development program (Miyazaki, 2016; Peterson, 2016; Semadeni, 2009; Wilkerson, Andrews, Shaban, Laina, & Gravel, 2016). What are the needs and intended outcomes? Who are the stakeholders? How will trainers be selected? How will the offerings be evaluated?

Recognize the differentiation between training, development, and growth.

These terms are not interchangeable. Engelbrecht & Ankiewicz (2016) stress that *training* is the acquisition of a narrow band of factual, specific content or skills, whereas *development* seeks to modify behaviors. *Growth*, meanwhile, refers to the overall transformation of an individual both inside and outside the context of professional development offered in the workplace. The model around which an opportunity is designed should be well understood prior to implementation. There is a time and place for each of these protocols; however, professional development should be focused on providing rich, in-depth experiences for participants.

Differentiated professional development is critical.

Professional development opportunities should be based on data-informed needs, including student assessments in areas of technology. These can be done through a variety of

assessments. For teachers, professional learning opportunities must take into account personal, professional, and experience-based scenarios, recognizing that all participants are not going to engage in the opportunity with the same needs (Day & Gu, 2007).

Ensure that participants are carefully selected for the prescribed professional development opportunity.

Few opportunities are one-size-fits-all, and only those who have the need for the training and who would be most motivated to use it in their classrooms should be recruited for the professional development (Engelbrecht & Ankiewicz, 2016). Educators, generally, do not respond positively to professional development from which they cannot directly benefit.

Careful consideration should be given as to the timing of in-person Professional Development opportunities.

Educators can be sensitive to the day, time, and position within the school year in which an opportunity is offered, which can have significant ramifications on the long-term efficacy of the training (Engelbrecht & Ankiewicz, 2016). Districts should consider a variety of online offerings which teachers can attend at a convenient time, which will increase compliance and will generally result in more positive feelings towards the opportunity (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009).

Professional development can, but need not, consume large amounts of financial resources.

Professional development can be a significant portion of a school district's annual budget, both in terms of bringing in outside consultants as well as sending educators to workshops and conferences (Semadeni, 2009, p.69). An examination of professional

development opportunities available online and free of charge, for example, could make offering effective learning opportunities far more cost efficient for districts.

Consider the diverse resources and experiences of the participants.

All participants are not likely to have equivalent technological resources at their professional disposal, nor are they likely to have had the same professional development experiences. Thus, the design of a professional development opportunity must recognize the diversity of its participants in its participant selection and in the level of content offered. This can emphasize the need for differentiation within the opportunity as well as between opportunities (Engelbrecht & Ankiewicz, 2016). Particularly in the realm of technology, teacher experiences will be diverse, and any professional development opportunity must reflect that reality.

How it's taught can have just as big an impact as what is taught.

A common flaw in many professional development opportunities, but particularly those involving technology, is that while a trainer can be skilled and show every facet and permutation of TPACK expertise, this is often insufficient. The trainer must also have the ability to communicate effectively, as well as motivate and engage their audience (Engelbrecht & Ankiewicz, 2016). Otherwise, the efficacy of professional development, and the application of the skills and resources offered, can drop dramatically.

Consider inquiry-styled opportunities where participants learn by doing.

Much research has been dedicated to the concept that students learn best by discovering concepts and by engaging in hands-on activities. Teachers are no different. Rather than presenting slideshows, professional development opportunities should engage educators in the very practices that they are being taught, thus engaging participants in problem-based learning, a

noted best practice (Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016; Walker, Recker, Ye, Robershaw, Sellers & Leary, 2012)

Encourage collaboration and the sharing of newfound skills and knowledge within the workplace.

Effective professional development generates enthusiasm for the subject, which can have a cascade effect on the learning community by generating “buzz” and excitement which encourages teachers to share information and skills with peers, colleagues, administrators, and students (Engelbrecht & Ankiewicz, 2016).

Allow educators the opportunity to apply their knowledge, and to reflect on those newfound skills and resources.

Technology-related skills and practices can be difficult for some to implement. And for a given set of practices, there can be no certain outcomes. Thus, teachers should be encouraged to experiment and to reflect on the results in a no-fault, collaborative atmosphere. In this manner, best practices for the school and for the district can be established (Gerard, Varma, Corliss, & Linn, 2011).

Online PLNs (Professional Learning Networks) encourage collaboration beyond an educator’s school.

Online discussion boards and social networking sites are forums where individuals can easily join groups dedicated to technology use in the classroom, where professional development can occur asynchronously (Cook, Jones-Bromenshenkel, Huisingo, & Mullins, 2017).

Social media use, including Twitter, is an especially valuable technology for creating or joining a Professional Learning Network.

Social media use should be encouraged to promote professional networking, as well as the ability to curate hashtag-linked conversations with fellow practitioners. This means of professional development can be especially useful for faculty teaching at small institutions (Llopis, 2013; Martell, 2014; Nadji, 2016).

Incorporate a formal reflection component into all professional development opportunities.

Reflection enables participants to examine the activity offered and construct personal meaning, allowing them the opportunity to integrate the newfound skills and ideas into their personal pedagogical paradigms in their own way (Engelbrecht & Ankiewicz, 2016). Integrating regular faculty surveys throughout the year can also inform what types of professional development opportunities are desired, thus making better usage of district resources.

Utilize Web 2.0 tools to redefine professional development.

Tools such as the Google Suite products educators can host and share helpful professional development sessions and events that are happening throughout the year for continuous learning. Google Hangouts could also be beneficial as a web conferencing tool, and Google Forms can be able to help educators be able to gather data when it comes to overall feedback. Student achievement has been shown to increase when educators are familiar with and integrate these tools into their professional practice (Archambault, Wetzel, Foulger, & Williams, 2010).

Concluding Thoughts

Every educational institution is different. Each has different values, resources, and needs. Thus, a thorough needs assessment will be critical to ensuring that the path forward in establishing an effective professional development is on solid ground. It is the hope of the

authors that these recommendations are taken in the spirit in which they are given, and applied in a context in which they motivate and excite educators to grow like never before.

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