Practice-based Technology Teaching Assistantship Program: Preparing Teacher Educators to Support Teacher Candidates' Integration of Technological, Pedagogical, and Content Knowledge

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Abstract

This exploratory study focused on the Technology Teaching Assistantship (TTA) Program at the College of Education in a Midwest university as a strategy tool to improve the preparation of teacher educators to coach teacher candidates in and model design and implementation of technology-enhanced learning experiences; emphasizing discipline-specific content standards and student technology standards. The purpose of this study was to analyze the TTA Program's features and impacts on teacher educators' development of technological, pedagogical, and content knowledge (TPACK). The results were used to enhance teacher educators' professional development to support teacher candidates' integration of technology. The problems and goals of this work-in-progress TTA Program are discussed to gain feedback and to establish contact with similar projects for improvement and extension.

Keywords: teacher preparation, technology integration, faculty professional development

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Introduction

Standards

As per the Council for the Accreditation of Educator Preparation's (CAEP) website, CAEP creates "standards to ensure educator preparation providers impart future teachers with knowledge and skills to support the development of all students" (2015, para. 1). Standard 1: Content and Pedagogical Knowledge, for instance, addresses that, "[t]he provider ensures that candidates develop a deep understanding of the critical concepts and principles of their discipline and, by completion, are able to use discipline-specific practices flexibly to advance the learning of all students toward attainment of college- and career-readiness standards" (CAEP, 2015, para. 1). In particular, Standard 1.5 emphasizes that, "[p]roviders ensure that candidates model and apply technology standards as they design, implement and assess learning experiences to engage students and improve learning; and enrich professional practice" (2015, para. 6).

Problems

Not all teacher educators (TEs) are systemically prepared to support teacher candidates' (TCs) integration of technology. Many TEs have not ever received or continued receiving proper training on up-to-date digital tools for 21st century learning. Besides, many TEs have limited or no time to coach TCs on technology-enhanced learning experiences. Though many TEs believe they are preparing TCs to apply technology, evidence to support this is lacking. Additionally, K-12 administrators show different perceptions. A school principal's comment, collected in the 2015 - Spring 2018 Employer Satisfaction Survey (ISU, 2018) indicated:

> Young graduates continue to struggle to effectively integrate emerging technology tools and resources to create digital-age learning experiences maximizing the learning of all students. Also, it is extremely hard to special education teachers, let alone when we require them to integrate technology for differentiated instruction to be highly qualified in

areas in which they did not focus in college. This is unfair and places too high of an expectation on a population of teachers that are in great need already.

Furthermore, one of the answers to the open-ended question, *Are there any areas that you believe the University did not prepare you for?* (ISU, 2018) indicated that, "I believe that the University did not prepare me for some of the realistic aspects of teaching, especially in terms of the vastness of technology being used within the classroom" (ISU, 2018).

Possible Supportive Programs

Universities in the Midwest use professional development tools such as instructional design certificates, teaching strategy training sessions, and instructional designers to evaluate new technologies to discover innovative and better ways to enhance instruction and assist faculty in discovering methods of improving their instruction with or without technology (The Instructional Technologist's Blog, 2008; Syberworks, 2018), as well as to model the technological, pedagogical, and content knowledge (TPACK). Other external resources (e.g., conferences, workshops, and webinars) are also accessible to TEs for inspiring and sharing a vision of the comprehensive integration of technology to promote excellence in the instructional environment. However, these programs are often optional, not mandatory. Moreover, there is no clear line of responsibility and accountability for the decisions TEs make after participating in these programs.

Technology Teaching Assistantship (TTA) Program

This study explored the Technology Teaching Assistantship (TTA) Program which was initiated in Spring 2016 at a College of Education in a Midwest university. The TTA arose in response to the CAEP Standards that providers ensure candidates model and apply proper technology standards as they implement learning experiences and improve K-12 students' learning. Since TTA Program's inception, the objective of the TTA Program has been to

contribute to the capacity of the TEs, through multidisciplinary, practice-based faculty professional development, to support TEs in hands-on TPACK, to work with TEs in the development and dissemination of innovative uses of technology in teaching and learning, and to prepare TEs to support TCs' integration of technology in K-12 settings.

The College of Education's Instructional Technology Director, Dr. Li-Wei Peng (the author) designed the TTA Program's contents and delivery formats. The author held a series of informational consultations with the College of Education's Instructional Technology Committee members and faculty development program leaders on campus. These key informants provided comments about what they perceived to be effective practices in faculty development to enrich the quality of the TTA Program. The plan of the TTA Program and the TTA Recruitment Application including guidance on recruitment priorities, selection criteria, and application requirements was reviewed and approved by the Dean of the College of Education.

The College of Education launched the TTA Program in 2016 with funding from the state government focused on faculty development. The stated aims were:

- To share a common constructivist vision for learning using instructional technologies;
- To brainstorm strategies to make instructional practice dynamic and purposeful;
- To apply the Substitution, Augmentation, Modification, and Redefinition (SAMR) Model as a guide to aid TEs integration of technology into teaching and learning;
- To provide TEs with extensive and sustained support;
- To build a successful iPad/technology-enriched community at the College of Education (TEs & TCs) and reap the benefits of iPad/instructional technologies; and
- To create a technology professional development model for in-service teachers in K-12 Professional Development Schools.

Recruitment and Selection of Technology Teaching Assistants

The Technology Teaching Assistants were recruited through a TTA Recruitment Announcement and Application distributed to all College of Education students via posters, emails, e-newsletters, websites, and social media (i.e., Facebook and Twitter). Faculty members in the College of Education were also contacted to promote the program within their courses and to nominate applicants. In addition to an application form containing biographical questions and answers, applicants needed to submit a resum*é*, a transcript of current study program, a statement of interest, and three letters of professional recommendation.

Application packages were judged based on the following criteria:

- Capacity of applicant to carry out the assigned TTA tasks;
- Alignment of interest with the intersection of instruction and technology integration;
- Potential for working independently and in a team; and
- Readiness to follow direction and take responsibility to meet high expectations.

Applicants also needed to pass a timed, hands-on assessment addressing the range of issues related to the intersection of instruction and technology integration. Therefore, an applicant with a well-balanced application package and assessment performance would be selected as a Technology Teaching Assistant.

Four Technology Teaching Assistants were selected from a pool of 12 applicants. They included one male and three females. One of the Technology Teaching Assistants was completing a Master of Arts in Education with a track in Technology Integration. One was a senior majoring in Secondary Education with a minor in Mathematics Education. Two were Elementary Education majors in their junior year. In common, they all received the highest possible grades in their instructional technology related courses.

Program Structure and Activities

The four Technology Teaching Assistants served in the TTA Program for 2 years during which time they took part in a five-day intensive orientation and professional development training offered by the author in order to continue to grow their skills in practice-based TPACK. Afterwards, under the close supervision of the author, the Technology Teaching Assistants demonstrated their proficiency in technology application operations and troubleshooting. They also provided their assigned TEs with one-on-one assistance on a fixed, three-hour weekly schedule or call-out basis according to the TEs' needs. The Technology Teaching Assistants were made aware that their responsibilities included:

- To meet with their assigned TEs on time to provide technological, trouble-shooting support for instruction and assessment tools required across university departments (e.g., Sakai, LiveText, Google Sites);
- To help their assigned TEs advance their TPACK, as well as to assist them in learning at least one tool on the SMART Board/Intelliboard and at least one iPad app that their assigned TEs could integrate into their lessons every week;
- To facilitate the integration of technology in TEs' class sessions as needed;
- To submit a weekly journal of activities with specific descriptions and associated photos/videos to the Instructional Technology Committee for effectiveness and quality verification; and
- To participate in the annual regional iTeach and iLearn Showcase Conference hosted by the College of Education to present their TTA work with their assigned TEs in a 25-minute, hands-on technology workshop to TEs, TCs, undergraduate and graduate students, in-service teachers, and friends from the community.

Not only had this TTA Program built a technology-enriched community in the College of Education for the TEs, but it also supported an ecosystem designed to empower undergraduate and graduate students while allowing them opportunities to shine and receive a scholarship for tuition. Most importantly, the TTA Program addressed the problems of TEs' optional attendance and limited accountability.

The TTA Program Support System had been developed and was tested with, and applied to, a number of formats as follows:

- hAPPy Friday Tools/Apps Learning – Every Friday, TEs and TCs were introduced to one instructional technology tool/app through the RSS feed College of Education website. These materials accommodated interpersonal learners. TEs and TCs watched and followed five-minute tutorial videos created by the Technology Teaching Assistants as many times as needed for a quick how-to;
- Technology Workshops – All TEs and TCs were invited to attend the technology workshops conducted by the Technology Teaching Assistants. Every month, TEs and TCs could receive 50 minute face-to-face, team-based training in instructional technology tools/apps introduced by hAPPy Friday or any other technology-related queries. Each workshop session was recorded for study at a later date;
- One-on-One Technology Assistance – To accommodate TEs' schedules and to meet their particular needs, all TEs in the College of Education were equipped with Technology Teaching Assistants for one-on-one assistance;
- Showcases – The annual regional iTeach and iLearn Showcase Conference was an opportunity for TEs, TCs, and Technology Teaching Assistants to showcase lesson ideas and examples of how curricula were infused with technology effectively to broad audience.

Conceptual Framework and Theoretical Underpinning of the TTA Program

Practice-based learning is the key conceptual framework or theoretical underpinning that informed the design of the TTA Program.

Practice-Based Learning

This study utilized Practice-Based Learning (PBL) as its theoretical framework. The term 'practice-based learning' is often used interchangeably with 'experiential learning', which is simply learning by doing (Eyler, 2009). Gherardi (2001, 2008) explains that people create knowledge by negotiating the meanings of words, actions, situations, and material artifacts; practicing the information gained; and actually using it in different contexts. The PBL approach strives for greater learner participation, increased collaborative decision making, and a shared commitment to an interconnected community (Weber, Belsky, Lach, & Cheng, 2014).

PBL can be utilized in classrooms and professional development experiences alike. According to Munkvold (2010), PBL emphasizes the active and productive process of knowledge. Practice-based knowledge is gained by experience in the learner's chosen field. Practice-based knowledge can be developed using many methods. Regardless of the method, the learning always begins with the instructor or expert leading learners in PBL activities. These activities or methods can include modeling, explanation, coaching, scaffolding, exploration, articulation, and reflection (Dennen, 2004). In this proposal's study, the Technology Teaching Assistants guide TEs through technology-rich instructional design experiences. The Technology Teaching Assistants usually begin with modeling, explanation, and coaching through a combination of experiences including hAPPy Friday Tools/Apps, Technology Workshops, and One-on-One Technology Assistance. Once scaffolded learning occurs, the Technology Teaching Assistants encourage TEs to explore, articulate, implement, and reflect on their technology-enriched instruction in their classrooms where, most importantly, TEs simulate the PBL strategy

modeled by the Technology Teaching Assistants to support TCs' integration of technology in K-12 settings.

PBL allows learners to make decisions during the experience, but then to also reflect and review actions later (Reichelt & Skjerve, 2012). The authors suggest that reflecting and sharing these practice-based experiences help to "provide new, important, and scientifically sound contributions to our knowledge base" (p. 3). Considering their findings, the TTA Program fosters reflection and sharing. Prior to the end of the semester, TEs, TCs, and Technology Teaching Assistants present best practices in the annual showcase event.

Develop Practice-Based TPACK

The TPACK model is related to the demand for ICT (information, communication, and technology) integration into classrooms. This is an important progression as it greatly contributes to technology-enriched student-centered learning (Chai, Koh, & Tsai, 2010). TEs and TCs have faced challenges for learning and enhancing TPACK. Creating new knowledge bases built on different teaching components can be difficult for TEs and TCs because it requires a deep understanding of core knowledge and interpretation (Pamuk, 2011). Pamuk's point suggests that TEs and TCs often lack required foundational knowledge to introduce more technical skills, especially technological aptitude. This happens, in particular, when educational training focuses more on classical pedagogical practices, which are helpful in the traditional lesson planning, but provide little preparation for the advancement and integration of TPACK.

The research questions that guided this exploratory study were:

- RQ1: What are teacher educators' perceptions of practice-based TTA Program with regard to developing and applying their TPACK?
- RQ2: How effective is the practice-based TTA Program preparing teacher educators to support teacher candidates' integration of technology?

Participants

This study's participants were 12 TEs from the College of Education who participated in the TTA Program for 2 years. The TEs' participation was mandatory. Two TEs were in the Early Childhood Education Program, four were in the Elementary Education Program, three were in the Secondary Education Program, two were in the Special Education Program, and one was from the Community Education Program. Nine participants were female and three were male. One TE was ranked as Full Professor, three were ranked as Associate Professor, five were ranked as Assistant Professor, and three were ranked as Instructor. Two TEs had more than 20 years of teaching experience in the Teacher Education Program, two had 10-15 years, and eight had 2-5 years. According to Rogers' Diffusion of Innovations (1962), five were laggards, three were late majorities, two were early majorities, one was an early adopter, and one was an innovator. The participants received PBL experience through TTA Program's hAPPy Friday Tools/Apps, Technology Workshops, One-on-One Technology Assistance, and Showcases for approximately 48 hours (3 hours per week for 16 weeks) per semester, and 4 semesters in total.

The Study

A survey containing 10 five-point Likert Scale questions (5 = strongly agree; 1= strongly disagree) and one open-ended question was applied to investigate the first research question. Answers collected from the open-ended question were examined through a general inductive approach for qualitative data analysis (Thomas, 2003). As defined by Thomas (2006), "inductive analysis refers to approaches that primarily use detailed readings of raw data to derive concepts, themes, or a model through interpretations made from the raw data by an evaluator or researcher" (p. 238).

The five-point Likert Scale prompts were:

- hAPPy Friday Tools/Apps improved my TPACK;
- hAPPy Friday Tools/Apps prepared me to apply my TPACK in teaching;
- Technology Workshops improved my TPACK;
- Technology Workshops prepared me to apply my TPACK in teaching;
- One-on-One Technology Assistance improved my TPACK;
- One-on-One Technology Assistance prepared me to apply my TPACK in teaching;
- Showcases improved my TPACK;
- Showcases prepared me to apply my TPACK in teaching;
- Participating in the practice-based TTA Program improved my TPACK; and
- Participating in the practice-based TTA Program prepared me to apply my TPACK in teaching.

The one open-ended prompt was:

- What are your perceptions of practice-based TTA Program with regard to developing and applying your TPACK? Please provide specific explanation and example(s).

Content analysis was utilized to answer the second research question. Hsieh and Shannon (2005) stated, "qualitative content analysis is defined as a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (p. 1278). Qualitative data collected for analysis included: Technology Teaching Assistants' weekly journal reports, TEs' responses to a semi-conducted interview, and classroom observations of TEs and TCs. In total, 38 entries of information from the three resources were triangulated to maximize the validity and reliability in the content analysis process (Rourke & Anderson, 2004). This study followed Prasad's (2008) six-step

content analysis process "to convert recorded raw phenomena into data, which can be treated in essentially a scientific manner so that a body of knowledge may be built up" (p. 182).

Findings

The four instructive approaches (i.e., hAPPy Friday Tools/Apps, Technology Workshops, One-on-One Technology Assistance, and Showcases) in the TTA Program demonstrated the usefulness of the PBL framework in the formation and augmentation of TEs' TPACK development and application for supporting TCs' integration of technology. Data analysis revealed that the implementation of the TTA Program benefits TEs and TCs in four main ways.

First, hAPPy Friday Tools/Apps' *3-Minute Teaching with Tech Tip Video Series* stimulated TEs and TCs, identified as early majorities or early adopters, to think about ways to integrate new technology tools/apps for blended/online instruction, flipped classrooms, or other teaching and learning applications. Each technology tool/app was selected and recommended based on national awards and its accreditation for effectiveness and age appropriation. The subject-based videos were organized systematically to save TEs and TCs time. Each video included audiovisual and printed step-by-step instructions to increase self-learners' retention and ability to transfer information (Mayer & Moreno, 2003) and to enhance learner engagement with videos (Thomsen, Bridgstock, & Willems, 2014). The participants reported that lesson examples introduced in the videos were most inspirational. The TEs stated:

> I looked forward to receiving the College of Education e-newsletter every week because I found the hAPPy Friday Tools/Apps was very helpful for me to keep on top of the emerging educational tools in a timely manner. The tools were organized by subjects, grade levels, and content areas. I did not have time to search tools for my class. The hAPPy Friday Tools/Apps was a trustworthy place for me learn new tools that I could use in my class immediately.

> I liked hAPPy Friday Tools/Apps which used a variety of media. I am a professor and I know using pictures, narrations, and texts could help prevent learner's cognitive resources from becoming overloaded and improve learning transfer. Diverse media helped students with different learning styles retain more information.

> I never imagined using Minecraft to teach social studies concepts. These lesson examples blew my mind! I feel like this program could be used in many different classrooms in a variety of ways. I am already thinking of ways to incorporate that sort of technology into my science curriculum.

Second, team-based instructional strategies (Michaelsen, Knight, & Fink, 2002) from the monthly Technology Workshops helped late majority or early majority TEs to identify partners for peer-cooperative learning and projects for collaboration. Marcinek (2014) observed that finding time to integrate technology is an overwhelming task for anyone. In the Technology Workshops, the TEs worked together in a small group setting to accomplish a shared goal – maximizing their competence or mastery in the technology tools/apps and TPACK being studied. In addition, the TEs co-designed intradisciplinary or interdisciplinary lesson plans to co-teach the integration of technology collaboratively. They found that integrating technology helped save time and paper. One TE stated:

> I felt a bit overwhelmed with the workload every week and to top it off I had to learn a new program! But, truthfully, once I got started, I found the structure of this workshop was extremely user-friendly as it had a relatively low learning curve and incredible outcomes. I wish that I could co-teach the integration of technology with my colleagues more because it would be a delightful way to enhance what my students know about a particular concept or skill.

Third, one-on-one technology assistance strengthened technology integration among the laggard TEs by giving them strong face-to-face attention and high levels of personal control over when, where, and how they would integrate technologies into their teaching and letting them see exactly how other laggards have successfully adopted the innovation of technology in teaching (Robinson, 2012). One TE noted:

> I have been teaching reading literacy for more than 20 years. I have had my students create handmade books every semester in the past. I truly believe it is the way to teach. The Technology Teaching Assistant's one-on-one technology assistance really let me feel safe to try new technology tools. She could help me immediately since sometimes I did not even know what I was doing. I am using the Book Creator app to write my first eBook. You should be proud of me.

Lastly, the early adopter and innovator TEs were the first group of registered presenters for the iTeach and iLearn Showcase Conference. They were excited and committed to spend time, energy, and creativity on developing new ideas and projects in the field of technology integration (Robinson, 2012). Most importantly, these TEs loved to present and share. They found that real learning occurs when the showcase events gave them an opportunity to review and reflect on their experiences in the TTA Program and then to train and recruit other educators. One TE indicated, "The best part of the program is the showcase. I can engage my audience with the work I have accomplished." The learning circle supported TEs in expanding and deepening their technology integration approach to teaching, thereby increasing the participation and quality of TCs in model and apply technology standards in their classrooms.

All that being said, there are critical limitations and challenges to consider for the TTA Program. For example, even though the TTA Program was mandatory for all TEs, it lacked consequences for those who refused to participate or faded out during the semester. Additionally,

the funding to support the TTA Program could be affected by state government budgets. Also, the high ratio of Technology Teaching Assistants to TEs could have negatively impacted the quality of program outcomes. However, considering the positive effect TEs recognized the TTA Program had on themselves and TCs, the author perceived that the program model and evaluation data about its influence, as well as key insights and perspectives gained through participation, should be broadly disseminated. Further studies to examine and establish alternative technique, sustainable funding, opportunities, and administrative support for TE's assistance in TC's integration of TPACK will be conducted.

Conclusion

This study aimed to contribute to PBL research and practice through exploring the design and implementation of TTA Program to prepare TEs to support TCs' integration of technology. The TTA Program is a multidisciplinary, practice-based program offering a supportive TTA-mentoring network paired with financial support for faculty professional development in TPACK. The long-term goals of the TTA Program are to build individual TE and TC capacity for TPACK in the College of Education, catalyze institutional support, and further benefit TCs and school-university partnerships (e.g., professional development schools). The key in all of this is sustainable funding along with a consistent vision built by the administration. Ntuli and Suh (2019) noted that administrative support in policy and funding process is the first critical factor for success in TPACK learning and practical applications to education. Because Ntuli and Suh (2019) found that when university policies and administrators are unsupportive, TEs cannot insist on modeling or coaching TCs' integration of technology when they have limited or no access to the type of technology tools or resources that should be implemented in the curriculum. In addition, it is vital for the administrators, TEs, and TCs to promote a culture that values the importance of TPACK. They must encourage technology integration along with an approach and

pace following the Substitution Augmentation Modification Redefinition (SAMR) Model that is comfortable for every level of user. Technology skills and motivation have been evidenced to be the causes that influence most educators' decision to maximize the integration of technology in the classroom (Herner-Patnode & Lee, 2009). The use of the TPACK and SAMR models as reflective tools for the integration of technology into learning activities increases educators' motivation and technology skills (Hilton, 2016; Robson, 2002). Without TPACK and SAMR, most educators, in spite of administrative encouragement, may not succeed in supporting TC's technology integration (Ntuli & Suh, 2019). Future research and practice in this area may include formal assessments and evaluations of the TTA Program from the perspectives of diverse stakeholders (e.g., teacher candidates, technology teaching assistants, teacher preparation program administrators, K-12 educators). This research would draw upon preparing TEs to support TCs' integration of technology so that the researcher may continue to improve both the framework and program.

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