Technology and Teacher Candidates: Setting the Bar Higher

Jukes Pamela
Stobaugh Rebecca
Murley Lisa
Western Kentucky University

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Abstract: This paper reports the findings of a research study designed to assess teacher candidate use of technology in the teacher education program at a large comprehensive university. The study examined data related to technology integration in the teacher candidate capstone project, the Teacher Work Sample (TWS). The TWS is a unit of study serving as a summative authentic assessment by which teacher candidates demonstrate proficiency in designing, implementing, evaluating and reflecting upon instruction Data from a recently revised version of TWS were compared to a prior version of the TWS. The revised version includes higher expectations than in the past; requiring teacher candidates to include student use of technology, facilitate critical thinking, and for real-world tasks. The results of the study include areas for improvement in program design.

Introduction

Technology is rapidly changing the way education is delivered. It is seemingly impossible for education institutions to implement new technological advances as fast as they

become available. Gone are the days of isolated classrooms where educational television programs and a chalkboard are the most exciting supplementary teaching and learning devises available. Enter today's classroom where a plethora of innovative technological tools and methods are available to students and teachers.

Smartphones help students study more effectively and even more often. Interactive whiteboards connect classrooms to the world and replace the chalkboards of the past. Ipads, laptops, and desktop computers are usual finds in most classrooms. Once the hardware is the hands of students, then teachers can direct them to social learning tools such as wikis, blogs, discussion boards, live chats, or webinars. Among a few of the technology tools that make lessons effective and interesting are Skype, Animoto, Twitter, Dropbox, Google Earth, and YouTube just to name a few. Clearly, there is no shortage of technology hardware, software, or websites that can be utilized to enhance learning experiences for students.

The Study
Review of Related Literature

Why should teachers use technology in the classroom? According to the National Education Technology Plan (United States Department of Education, 2010), intentional use of technology in the classroom can increase student engagement and support the thought processes of students. In addition, technology can increase motivation, resulting in a positive impact on student achievement. It can increase educational equity, as it can be used to address learning needs of students not served by other methods. It will also help prepare students for the future as technology continues to be an integral part of the real world they will face upon graduation.

A common barrier to effective integration of technology in the classroom often lies with the teacher. According to Gorder (2008), while many teachers are at ease teaching technology skills, they are not comfortable using technology to promote active learning and to meet the individual needs of students. Prensky (2010) states, "And these teachers are right to be concerned, since depending on how it is used, technology can either help or hinder the educational process" (p.3). Presenky maintains that technology deepens and enhances the learning process when students use technology in meaningful ways - not when teachers simply use it themselves. This paradigm shift from teacher as disseminator of knowledge to guide and facilitator enables the students to be actively engaged in their own learning, which enhances the learning process.

The National Council for Accreditation of Colleges (NCATE) requires professional education units, those responsible for managing and coordinating programs for the initial and advanced preparation of teachers, to include in the unit's conceptual framework a commitment to preparing teacher candidates who are able to use educational technology to help all students learn (NCATE, 2010). The NCATE Standards require that candidates use technology to facilitate student learning and have opportunity in field and clinical experiences to use technology to support teaching and learning (NCATE, 2008).

The use of technology to actively engage learners is supported by National Education Technology Plan (United States Department of Education, 2010). This publication outlines a

plan that consists of five goals for transforming the U.S. education system; the first goal is to provide students with learning experiences that are engaging and empowering. The authors state, "The challenge for our education system is to leverage technology to create relevant learning experience that mirror students' daily lives and the reality of their futures" (p. 9). In order to achieve this, teachers must use 21st century technology to support students in mastering content, skills, and themes of the 21st century in ways that inspire, engage, and motivate learners (International Society for Technology in Education, 2008).

While the use of technology in the 21st century classroom is expected, Kay (2006) found that even with the readily available technologies for instructional use as well as the mandates for teacher technology proficiency, teachers are minimally using technology to enhance student learning (United States Department of Education, 2010). According to Kay, most preservice teachers are not receiving adequate preparation before entering the classroom. Consequently, preservice teacher preparation programs are eagerly seeking ways to prepare teacher candidates for the progressive 21st century technology-rich classroom that must be an experiential, collaborative, and participatory learning environment as well as one that engages students in technology supported instruction to improve student achievement. And, there must be a teacher in that classroom that possesses the knowledge, skill, and experience to facilitate that environment.

Purpose of the Study

Along with the NCATE standards for college accreditation, there are many state, national, and international organizations that attempt to define rigorous and relevant technology goals in relation to education and classroom instruction. The International Society of Technology in Education (ISTE) developed technology standards, the National Educational Technology Standards (NETS), for teachers and students in 1998. In 2008, the NETS for Teachers were revised (ISTE, 2008). The student technology standards, NETS for Students revised in 2007, promote primary through grade 12 (P-12) students using technology to demonstrate creative thinking, develop innovative products and processes, and to increase critical thinking, problem solving and decision making skills (ISTE, 2007).

In one U.S. state, teaching standards outline the initial expectations for teachers to demonstrate their skills and knowledge about technology. The state Education Professional Standards Board (EPSB, 2008) creates and maintains the standards that must be met by state teacher education programs to license practicing teachers. Standard 6 outlines the goals and expectations for technology:

The Teacher Demonstrates the Implementation of Technology: The teacher uses technology to support instruction, access and manipulate data enhance professional growth and productivity; communicate and collaborate with colleagues, parents, and the community; and conduct research.

Standard 6 Proficiency Indicators are:
6.1 Uses available technology to design and plan instruction
6.2 Uses available technology to implement instruction that facilitates student learning
6.3 Integrates student use of available technology into instruction
6.4 Uses available technology to assess and communicate student learning

6.5 Demonstrates ethical and legal use of technology. (EPSB, 2008)
Considering these technology requirements mandated by the state EPSB, this study is designed to examine the results of the teacher candidate capstone project, the Teacher Work Sample (TWS), and investigate teacher candidate use of technology.

Teacher Work Sample

Developed by the Renaissance Partnership, a consortium of 11 universities, the TWS was created as an instrument that teacher education programs could use to measure teacher candidate ability to impact P-12 student learning (Renaissance Partnership for Improving Teacher Quality, 2001). The TWS is used by universities across the nation as an assessment tool to measure and document teacher candidate preparation and performance on teaching processes critical to improve student learning. The state teacher standards are used as criteria for the measurement of the TWS and are the foundation of the scoring guide used to measure teacher candidate performance. As a capstone experience, teacher candidates at this university are required to complete a TWS to demonstrate their capacity to positively impact student learning as they plan, deliver, and assess a standards-based unit of instruction, analyze the results of student assessments, and reflect on the effectiveness of their instruction and student learning to improve instruction.

Teacher Work Sample Fall 2009-Spring 2010

This university was one of eleven teacher preparation institutions in ten states that participated in the federally funded Renaissance Partnership Project, which implemented the TWS as an assessment tool focused on improving the quality of their graduates. Across all disciplines, education students constructed a unit of study that included
1. Contextual Factors: Investigates the learners and the environment within which they learn.
2. Learning Goals: Goals are developed and aligned with local, state and national standards.
3. Assessment Plan: A formative and summative blueprint that aligns with learning goals and includes a pre and post assessment.
4. Design for Instruction: Learning activities that align with the learning goals and assessment.
5. Instructional Decision Making: Revisions based on the analysis of student learning.
6. Analysis of Student Learning: Assessment data from the pre and post test.
7. Reflection and Self Evaluation: Examination through self-reflection on how the TWS promoted student learning as well as a reflection on teacher candidate professional development needs (College of Education and Behavioral Sciences, 2009).

The TWS data is used to evaluate the proficiency of the teacher candidates' abilities to develop learning outcomes, analyze assessment results, and reflect on their teaching.

There is only one indicator within the TWS related to technology use and based on a review of the 2008-2009 TWS scores the passing rate for the "Use of Technology" indicator was at 65% for a Level 3 Proficient score, and at 33% for a Level 4 Exemplary score (College of Education and Behavioral Sciences, 2010). Although this score seems relatively high, teacher

candidates could receive a passing score by stating an appropriate rationale for *not* including technology. A major concern was that expectations of student performance were low and did not align with the high goals of the International Society for Technology in Education (ISTE), in particular that students use technology innovatively to solve real-world tasks (ISTE, 2008). Teacher candidate narratives noted repeatedly that technology use consisted mostly of developing PowerPoints, using a word processor to type the unit, or occasionally the use of a website for planning a lesson. Very little information was documented about P-12 student use of technology. With virtually every school possessing at least one computer per class and schools expecting higher levels of technology use, revisions to the TWS needed to include higher expectations for technology use.

McDonald, Tassell, and Stobaugh (2011) examined the level of technology implementation in the TWS at this same institution. When examining technology 95% of teacher candidates used technology to "Present concepts to students."   The only other two items with more than 50% of the TWS samples using technology was to "Develop curricula or assignments" with 65%, and "Do research and lesson planning using the Internet" with 58%. Thus, when technology was used teacher candidates were only using technology to present or plan lessons. In various subject areas there were varying levels of technology integration in the three main categories: "Teacher Use of Technology" (8 to 65%), "Student Use of Technology" (0 to 38%), and "Students' Use of Technology for the Critical Thinking and Decision-Making Skills Related to Technology Literacy" (0 to 5%). Clearly, the data reveals a decline of technology use when referring to student use of technology for critical thinking and decision-making skills.

One teacher candidate commented on the institutional student teacher survey regarding technology: "One thing that was engraved in our heads was to let the students use the technology in the classroom. The problem is we were never taught the technology! Again, how can we have our students do it when we can't?" Another teacher candidate more specifically expressed concern about hands-on experiences with hardware: "Our university classrooms need to have smart boards so that college students have experience using the boards before going into the elementary classroom."   And, yet another teacher candidate expressed frustration with technology preparation: "The university limited the definition of technology when it came to education. It was very limited to PowerPoint presentations and Internet use. I would have liked to have experienced more diverse ways to integrate technology into the classroom as well as ways that my students could use technology" (College of Education and Behavioral Sciences, 2009). Clearly, the institution needed to focus on student use of technology in settings that prepare teacher candidates for the 21st century technology-rich classrooms.

Revised Teacher Work Sample Fall 2010-Spring 2011

After analyzing data on teacher candidate performance on the TWS, this university identified areas needing improvement. Among those areas for improvement are a better alignment of the TWS with state teacher standards and a need to increase the rigor and higher levels of performance required of teacher candidates. To strengthen this capstone experience, the university formed a task force to improve alignment of the TWS with state standards and improve the TWS components, which are:

· Contextual Factors: Use of student and classroom context to design instruction.

- Learning Goals and Pre/Post Assessment: Use of instructional unit learning goals that addressed local and state content standards and an aligned pre/post-assessment.
- Design for Instruction: Design of instruction for all students that addressed unit learning goals and were aligned with concepts and processes assessed.
- Analysis of Student Learning: Analysis and reporting of learning for all students and significant groups.
- Reflection and Self-Evaluation: Reflection and evaluation of teaching and learning.

The university faculty uses a scoring rubric to analytically score each component of the TWS. The analytic scoring rubric is based on a 4-point scale (1= beginning; 2= developing; 3 = proficient; 4 = exemplary). In addition, each TWS is assigned a holistic score using the same scale (WKU School of Teacher Education, 2011). Although there were many discussions about the inadequacies of the TWS, institutional data began the drive to change and several weak areas were identified including that of technology.

During the Fall 2010 semester, all program areas implemented the revised TWS. During that semester, data from teacher candidates, university faculty, and P-12 practitioners were collected to determine any additional changes to be made. The task force met late in the semester to work through final revisions based on stakeholder feedback. Full implementation of the revised TWS began Spring 2011.

Research Questions

In an effort to better prepare teacher candidates for the classroom, one university collects teacher candidate data submitted to demonstrate proficiency on state standards, with this study including an intentional focus on Standard 6, the technology standard. To evaluate the extent of technology skills as well as the abilities of teacher candidates, the following research questions were developed:

1. In what ways does the institution document technology skills and knowledge within the teacher candidate capstone project?
2. How do data within the teacher candidate capstone project, the revised TWS, confirm or refute the premise that teacher candidates use technology in high level and rigorous ways to improve student learning?

Methodology

In an effort to answer the research questions, this study reviews the areas of the TWS dealing specifically with the ways teacher candidates describe use of technology to enhance teaching effectiveness. The state standards and indicators are scored based upon the teacher candidate performance on the TWS. The university collects these teacher candidate TWS scores and enters them into a database to document demonstration of the state teacher standards. This study examines the performance of 375 teacher candidates from fall 2009-spring 2010 and 325 teacher candidates from spring 2010-fall 2011. To achieve proficiency in technology, the teacher

candidate must score a three on the technology indicator, Standard 6. Scores are converted to percentages for more accurate comparisons.

Data from the six teacher certification programs are selected for the study: (1) elementary, certified in grades primary through five, (2) middle grades, certified in grades 5-9, (3) secondary, certified in grades 8-12 in Social Studies, English/Language Arts, Mathematics, Biology, Chemistry, Earth and Space Science, or Physics (4) P-12, Secondary Education Majors certified for Grades Primary-12 in Art, French, German, Music, Physical Education, or Spanish, (5) 5-12, Secondary Education Majors certified in Grades Five-12 Agriculture, Business and Marketing, Family and Consumer Sciences, or Industrial (Vocational, Career, Technical), and (6) Interdisciplinary Early Childhood Education, certified to work with children ages birth through five years.

It is purposeful that the researchers chose to examine data from two versions of the TWS, the 2009-2010 version and the revised TWS 2010-2011 as the comparisons focus on the teacher candidate abilities to demonstrate proficiency on the standard. Furthermore, it is intended that this examination will reveal insights relating to the revisions that require more a rigorous and high level evidence of use of technology.

Findings
Research Question #1

The TWS technology indicator in the Design for Instruction section requires teacher candidates to "Demonstrate technology integration in planning and instruction and how P-12 student use of technology will be integrated in unit for higher level thinking activities and in a real world context" (WKU School of Teacher Education, 2011, p. 16). In the previous version of the TWS, the technology indicator was "Teacher integrates appropriate technology that makes a significant contribution to teaching and learning *or* provides a strong rationale for *not* using technology" (Renaissance Project, p. 15). The term "significant" is a very vague term. In addition, with the rationale included teacher candidates could choose not to include technology at all and still pass the indicator.

The revised TWS requires several new elements for technology integration including: (a) student use of technology, (b) technology used for higher level thinking tasks, and (c) technology embedded in real-world contexts. These indicators move away from simply teacher use of technology for planning instruction and more closely mirror the NETS for Students (2007) which includes a standard stating: "Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions" (p. 1). The revised TWS is a now a more rigorous document with higher standards for teacher candidates to integrate technology in a meaningful and engaging context.

Research Question 2

Each year this institution measures teacher candidate performance on the TWS. Each TWS indicator is related to a state teaching standard. Prior to Fall 2010, the institution had been using the Renaissance version of the TWS. The fall 2009 and spring 2010 data represent results when the indicator was "Teacher integrates appropriate technology that makes a significant contribution to teaching and learning <u>or</u> provides a strong rationale for *not* using technology" (Renaissance Partnership for Improving Teacher Quality, 2001). Beginning Fall 2010 the revised

technology indicator stated: "Demonstrate technology integration in planning and instruction and how P-12 student use of technology will be integrated in unit for higher level thinking activities and in a real world context" (WKU School of Teacher Education, 2011, p. 16).

As shown on Table 1, there were declines across all program areas with the implementation of new rigorous standards. Secondary Education (40%) and P-12 (43%) had the highest levels of teacher candidates not meeting the technology standard. Elementary Education (15%) and Middle Grades Education (18%) present the lowest level of percent change. Clearly, the rigorous standards in the new TWS negatively impacted teacher candidates passing the technology indicator.

Table 1: Percentage of Program Candidates "Passing" Kentucky Teacher Standard 6 Technology

Major	Fall 2009/Spring 2010	Fall 2010/Spring 2011	Percent Change
Elementary Education	94 %	79%	-15%
Middle Grades Education	96%	78%	-18%
Secondary Education	95%	55%	-40%
P-12 Education	100%	57%	-43%
5-12 Education	100%	82%	-17%
Interdisciplinary Early Childhood Education	95%	75%	-20%
Total	96%	73%	-20%

Note: Number (N) of scores included in the percentage: Fall 2009-Spring 2010, N=375;
Spring 2010-Fall2011, N=325

Conclusions

Previously the institution supported low expectations of technology integration by allowing teacher candidates to offer a rationale of *not* using technology. This low expectation led to teacher candidates using the technology to present information or design lessons. Students in the P-12 classrooms were rarely engaged in the use of technology (McDonald, Tassell, & Stobaugh, 2011). The expectations for teacher candidate integration of technology in the current TWS are far more rigorous requiring (a) student use of technology, (b) technology used for higher level thinking tasks, and (c) technology embedded in real-world contexts (School of Teacher Education, 2011). These technology expectations parallel the NETS standards for Students (ISTE, 2007) by requiring students to use the technology for critical thinking tasks within authentic contexts.

While technology expectations for the TWS have increased, teacher candidate success on passing the technology indicator has diminished. The comments on the 2010-2011 institutional teacher candidate survey regarding technology documents the frustrated cries of teacher candidates who realize they are lacking in technology skills. For example, one teacher candidate writes: "I could have been better prepared in how to include student usage of technology in the math classes that I taught. All of the instruction that I received in math teaching methods was with manipulatives and not how to include student use of technology. We could have easily

focused on use of technology without taking away from the overall objective of the course." Another teacher candidate states: "The university did not prepare me well for the technology uses that the education field demands. I had to learn how to use the ActivBoard and the InterWrite on my own. There should be a technology class that covers the different technology pieces that we have to use in our field experience or future jobs." And finally, this teacher candidate seems to sum it up with only a few words: "Technology is so important; I believe more could be done" (College of Education and Behavioral Sciences, 2010, 2011).

Although this university may certainly be commended for examining teacher candidate data for gaps in program preparation, it would certainly be a tragedy to stop there, particularly with the eyes of the nation on teacher preparation programs. For instance, in September 2011 the United States Department of Education released the Obama Adminstration's Plan for Teacher Education Reform and Improvement which states "…that 62% of all new teachers feel unprepared for the classroom" (United States Department of Education, 2011). This plan outlines how federal support will be available for the improvement and reform of teacher preparation programs. Federal reform initiatives recognize the importance of teacher preparation in the education of P-12 students.

One way this university may respond to the technology crisis within their teacher education program is to revisit the program critical performance assessments. A critical performance is evidence required by a program and produced by the student that demonstrates the student has met a standard, in whole or in part. Critical performances are embedded within courses taught by faculty who evaluate the performance using a rating scale of 1 (low) to 4 (high) based on scoring rubrics developed by faculty within the program (College of Education and Behavioral Sciences, 2013). The program areas could develop a curriculum map of technology instruction integration and requirements for teacher candidates ensuring they are exposed to technology in developmental increments. Then, add rigorous and relevant technology performances as critical performances to make certain that teacher candidates demonstrate proficiency on technology standards throughout the program and as part of the required curriculum. Also, a needs assessment could be administered to faculty to determine areas for professional development and training in technology.

With teacher candidates in all program areas finding lower levels of success, there is a glaring and urgent need to examine course work prior to student teaching to embed experiences that prepare teacher candidates for this standard. In addition, teacher education faculty must model innovative and exciting ways to integrate technology in the classroom.

Limitations

1. The study only examined two sets of data (fall 2009-spring 2010 and fall 2010-spring 2011). The study could be replicated next year to determine if the use of technology has been impacted by increased preparation through the teacher candidate coursework leading up to student teaching.
2. The study has a somewhat limited scope as the researchers examined data from one university. Studies could be completed at other universities and compare the results of this study to data at other universities nationwide.

Recommendations for Further Study

1. This study involved only teacher candidates at one university. Additional studies should be conducted to investigate whether the results from other universities in other regions report statistically similar results.
2. Further research could be conducted to determine the reasons for the large discrepancies that exist among the teacher education certification programs.
3. More investigation should be conducted to discover if teacher education programs are preparing teacher candidates in the most effective and recent technologies.
4. The research study by McDonald, Tassell, and Stobaugh (2011) should be replicated with the revised TWS to determine specific strengths and weaknesses in the implementation of technology across program areas and content areas.
5. Finally, further study should be conducted to investigate the knowledge and skills of faculty in teacher education programs to prepare future educators in the most effective use of technology.

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