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The Texas Forum of Teacher Education, a publication of the Texas Association of Teacher Educators (TxATE), is a refereed journal published once annually. Articles in the journal are directed to both campus-based and field-based Texas teacher educators. TxATE members, including graduate students, are encouraged to submit manuscripts. Authors must be active members as a condition for publication.

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EDITOR'S INTRODUCTION

The 2014 issue of *Texas Forum for Teacher Education* includes articles representing a wide perspective of education in our state. Topics include technology, Project-Based Learning, pedagogy, and many more. The topics represented are very diverse, but do demonstrate a challenge to all of us in teacher preparation to stay engaged and informed. I believe the quality of these articles continues to demonstrate a commitment to research and questioning that has been a trademark for our journal. There are always changes happening in education. Several articles in this year's *Forum* may be of interest to teacher educators nation-wide; however these articles are of particular interest to those of us in Texas. The state of Texas has been, and will continue to be, on the fore-front of educational change. I believe our challenge is to push our research and writing to those edges and discuss the important topics of the day. I believe this issue follows suit in that manner. I think these articles will inform and improve your practice, as I know they have mine. I enjoyed working with the authors as they demonstrated their talents and skills.

I was honored to work with Dr. Amanda Rudolph (SFA) and Dr. Debra Shulsky (UHCL) on this project. They were the glue that held this together. I look forward to serving as a past editor for Dr. Shulsky as she takes the lead next year. If you have any comments about the journal, please contact me at rmm023@shsu.edu.

Dr. Robert Maninger

Managing Editor 2014
THE TEXAS FORUM OF TEACHER EDUCATION

STRENGTHENING UNIVERSITY-SCHOOL PARTNERSHIP THROUGH PROJECT BASED LEARNING

Karen McIntush, M.Ed.
Sam Houston State University

Sylvia Taube, Ph.D.
Sam Houston State University

Tiffany Forester, M.Ed.
Sam Houston State University

Abstract

The teacher preparation program at Sam Houston State University aims to strengthen the relationship between the university and rural partner schools. A Professional Development School model (PDS) was implemented, along with the integration of Problem Based Learning (PBL) as a way to strengthen the partnership. Five PBL themes implemented in this PDS that benefited the partner schools are described. Constructive feedback from stakeholders, including teacher candidates and partner teachers, is shared and used as a guide to assess success of the program and future efforts to effectively prepare teacher candidates.

Introduction

The standards for teacher preparation programs are articulated across educational organizations echoing similar goals. Standard 10 of the *Model Core Teaching Standards* articulated by the Interstate Teacher Assessment and Support Consortium emphasizes the importance of having teacher candidates demonstrate leadership roles, assume responsibilities for student learning, and collaborate among learners, families, colleagues, school officials, and community members in order to support learning and student development (Council of Chief

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State School Officers, 2012). Meanwhile, the creation of Professional Development Schools (PDS) was grounded on school partners working together to influence policies, improve teaching standards, and promote high quality teacher preparation. Identifying and meeting students' needs are at the center of PDS, while university and school partners are held accountable for sharing responsibilities for teacher preparation, innovative teaching practice, teacher development, and student learning. Additionally, the National Association for Professional Development Schools (NAPDS), a leader in the teacher preparation reform movement, has articulated nine essentials for a PDS model of teacher preparation program. One of these essentials states: *A school-university culture committed to the preparation of future educators that embraces their active engagement in the school community*.

With this in mind, the philosophy for our teacher preparation program developed. Our PDS model of teacher preparation at Sam Houston State University (SHSU) was piloted in the fall semester of 2011 with twenty teacher candidates in the content methods semester, one semester away from student teaching. Our public school partners are rural districts with a need to develop, hire, and retain good teachers living in the same community and who understand the contextual factors of their school and less privileged students. Our PDS teacher candidates complete at least 200 hours of field experience during the content methods semester and twelve weeks of student teaching in the same classroom.

In addition to sharing responsibilities in teacher preparation with school partners, our goals for implementing a PDS-residency model in the content methods semester are: a) to engage teacher candidates in collaboratively applying and assessing their instructional decision making knowledge, skills, and dispositions to solve real problems associated with teaching the content areas (mathematics, science, and social studies), and b) to help candidates become

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engaged in their learning about teaching diverse students in rural communities. During this semester, the focus is preparing teacher candidates to teach three content areas (mathematics, science, social studies). Prior to the content methods semester, the teacher candidates have had experience teaching and assessing reading and language arts in the real classroom.

Project Based Learning and 21st Century Learning Skills

Introducing and modeling Project Based Learning (PBL) with teacher candidates is a natural fit with the PDS model. There are eight essential elements of PBL: Significant content, 21st Century competencies, In-depth inquiry, Driving questions, Need to know, Voice and choice, Critiques and revision, and Public audience (Larmer & Mergendoller, 2010). Going through these critical features and processes using authentic problems will help students learn content knowledge and skills as they work for extended periods of time, engaging in systematic investigations and solving real world problems.

Research on PBL identified the long-term benefits of this methodology to the learners. They include more in-depth learning, more student autonomy and increased engagement in their learning, (Ravitz, Hixson, English, & Mergendoller, 2012; Strobel, & van Barneveld, 2009). As a teaching strategy, PBL could result in active learning, student-driven activities, and meaningful connections to real problems (Cameron, 2010; Thomas, 2000).

In order to meet the needs of our students in the 21st century, teacher preparation programs should promote the development of teachers who can apply teaching practices that can support communication, critical thinking, and collaboration (Newell, 2003). Addressing this goal implies a dramatic shift in our practice toward strategies that provide opportunities for future teachers to use data, examine contextual factors, identify problems related to teaching,

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learning diverse populations, and initiating possible solutions. Project based learning seems a perfect fit as a methodology to infuse in the content methods courses.

This paper describes our design and implementation of PBL as a learner-centered methodology grounded on a constructivist learning theory and with the intent of building better relationships with our partner schools. Every semester, the content methods instructors work collaboratively to design and implement one PBL as a common major assessment for all our courses. Since we teach our PDS content methods classes (mathematics, science, social studies) in one of our partner schools, we want to reciprocate their hospitability by providing additional opportunities for low SES students to enhance their learning experiences and prepare them for college and careers. Driving questions for our PBL varied each semester to ensure that teacher candidates are cognitively engaged in their learning about teaching diverse students in rural communities.

Five Successful PBL Events Involving Rural School Partners

After the first year of implementing a PDS model, we decided to emphasize and embed PBL in our content methods courses. This effort was well supported by a newly created *Center for PBL, Teaching, and Assessment* housed in our department (Curriculum and Instruction). We went through an intensive training on PBL sponsored by the Buck Institute for Education, one of the leaders in PBL for twenty-five years now. Since then, we have been utilizing PBL as a methodology in our courses in order to engage our teacher candidates in applying and assessing their instructional decision making knowledge, skills, and dispositions to solve real problems associated with teaching of mathematics, science, and social studies (K-6). The following section presents synopses of five PBL themes we have implemented in the last three years which benefited our school partners.

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Wax Museum

The room is filled with famous inventors and scientists at a partner rural school library. Amelia Earhart, Thomas Edison, and Ruth Wakefield, the inventor of chocolate chip cookies, are telling their stories around the room to elementary students, presenting pictures and videos of their life accomplishments. This was the result of addressing the driving question *"How can we create a mobile, instructional field trip for rural students?"* when there is limited financial resources. The answer: take the field trip to the students through a Living Wax Museum. Each teacher candidate was charged with researching an inventor and making it come alive for students in an interactive and fun learning environment. Teacher candidates incorporated technology to show videos, Prezi's, and websites detailing each inventor's life and achievement.

The Entry Event for this problem-based assessment was as follows: *Progressive I.S.D. has no funds for field trips for their students. The district has approached the SHSU teacher candidates about bringing a field trip to the school based on history, mathematics, and science."* From here, the Wax Museum began to take form. Each teacher candidate researched important historical and scientific figures and chose one to showcase. The teacher candidates incorporated technology into their Wax Museum presentation through Prezi's, videos, and websites that would allow the elementary students to explore the figure being presented. Additionally, the teacher candidates dressed up as the important person and/or created a 3-dimenstional figure (e.g., using a large empty bottle) that includes physical features of the famous person/inventor. This model provided good visuals for students as they interacted with the teacher candidates at each station.

Opening day of the Wax Museum occurred on two rural partner school campuses. A schedule was created for the various grades to visit the "museum" and teacher candidates set out their exhibits in either the school library or gymnasium. Because various grade levels attended

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the Wax Museum, teacher candidates learned quickly about how to adapt their presentation on the spot to fit the learners' developmental stage.

The experience for teacher candidates, students, and teachers alike proved to be a success in many ways. It exposed these elementary students to many different inventors (e.g., Bill Gates) and famous people (scientists) who made a significant contribution to society and provided them with a non-traditional and enriching learning experience. The teacher candidates learned not only about planning and implementing a learning experience, but also skills in problem-solving, critical thinking and collaboration. The teachers of this school benefited from the partnership established and became more open to working with our teacher candidates based upon the quality of the curriculum implemented and its impact on students.

Trash Day

Mounds of "clean" trash are piled throughout the hallway as a simulation of a landfill overflow to this rural partner school campus. Teacher candidates at Sam Houston State work to address the driving question *"How can meaningful learning experiences be developed using clean trash that meet state standards?"*

This problem based experience was introduced through the following Entry Event: *The landfill in New Waverly, TX has overflowed to the New Waverly Elementary Campus. Now, the teachers must find use for the clean, dry trash that now exists on their campus.* From here, our future teachers formed teams to address the problem and created learning experiences for students that met state standards (TEKS) and incorporated the use of the "trash" and recycling. Each team was to research, create, and implement enrichment activities for elementary students in grades 3 and 4 that included math, science and social studies topics. The teacher candidates

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were given choices as to how to address this problem, which required small and large group collaboration throughout the process.

To begin this problem based experience, each teacher candidate collected clean trash and used it to create a fun learning day for the elementary students at our partner school. The collection was then brought to one of the partner schools for evaluation and to determine how it would be used. State standards (TEKS) were reviewed, ideas brainstormed, and activities created. A date was set with their partner school for sharing this learning experience with the elementary students there.

On Trash Day teacher candidates set up their enrichment activities in the school cafeteria, created a rotation schedule for the students, and implemented their activities with the students. Stations were set up in the cafeteria where elementary students learned various concepts regarding the environment, scientific processes, and civic responsibility. Students rotated through the stations to learn how to make jewelry, toys, musical instruments, greeting cards, etc. from clean trash. The high level of engagement of students in the activities provided by the teacher candidates was evidence of the hard work put into this project as well as the high quality of work stations prepared by our teacher candidates.

Sam Invasion

Four long buses from two partnership schools arrive at the campus of Sam Houston State University loaded with a group of excited 5th graders. There are 20 anxious, but ready teacher candidates waiting for students from rural areas to show them what college is about, while integrating learning experiences that will enrich their visit. The driving question posed to these 20 teacher candidates was *"How can we coordinate an educationally-rich field trip that also provides low SES students with the opportunity to explore higher education?"*

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The Entry Event presented to the teacher candidates was *"Students from two local elementary schools are scheduled to invade Sam Houston State University on April 29th. This will bring in a large number of 5th grade students wandering about the SHSU campus. You are in charge of all of these students for the day to expose them to the college atmosphere while also engaging students in meaningful learning activities aligned with TEKS."*

Due to the enormity of the task, this entry event was initially met with apprehension. Later, the motivation to create a memorable experience for low SES students increased. After reviewing the known and unknown, brainstorming ensued on how to tackle this very large task. The teacher candidates formed several committees responsible for various tasks such as food allocation, communication, and TEKS related activities (educational and/or games) for students to do while they were on the college campus. Additionally, the teacher candidates had a back–up plan in case of inclement weather and students could not be outdoors. Individual committees met several times to discuss progress, resolve problems, and identify tasks still to be completed.

The planning process for Sam Invasion included connecting with a) campus police regarding bus parking, b) leaders of campus organizations who could meet with the students, c) residential halls that could be toured, and d) individuals from various athletic and social organizations who could visit with students during lunch. Moreover, each team of teacher candidates prepared warm-up activities that allowed them to get to know their students and keep the students focused until the scheduled orientation took place.

Our partner schools serve students from economically disadvantaged families. The proportion of students in this category ranges from 55 to 69 percent. For many of the elementary students, this may be their first visit to an institution of higher learning. Likewise, some of our teacher candidates expressed the same experience growing up and now wanted to make a

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difference. Many shared their own stories regarding how they paid for college and wanted these elementary students to understand that college was an option for them, but they have to be prepared. This was incorporated into their plan as they walked with students around the campus and built relationships with these students for the day.

Implementing *Sam Invasion* started early in the morning with teacher candidates sorting out group packets, setting up the lunch area, and preparing to meet their groups of students outside the SHSU coliseum. Additionally, *Sammy Bearkat*, the campus mascot greeted the students as they got off the buses. *Miss Sam Houston State University* and student athletes from varied sports attended lunch with the students and visited with them about college and their experiences at SHSU. Students and their teachers had a great day learning and being a *Bearkat* for the day.

Classroom Community

"May I go sharpen my pencil, Miss Junco?" "*Yes, you may, but you owe me a one gold fish fine since pencils are to be sharpened first thing in the morning*." This is just one of several conversations that occurred in one third-grade classroom at this rural district. In Miss Junco's classroom is set up with a complete community, including a government, an economic system, and a work force. Her students are not just learning, but experiencing democratic and economic principles as well as being a responsible citizen within their own classroom. Miss Junco was one of our PDS teacher candidates who had the same mentor and classroom for two consecutive semesters.

The third grade curriculum includes community as well as other social studies topics. Miss Junco posed a driving question to her classroom in her efforts to experiment with PBL. *"How can we create a community in our classroom and work to meet its needs?"* She chose to

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bring the curriculum alive by having elections for their newly named country, their classroom, where the teacher was voted as president. Rules for their community were established and voted upon. Additionally, an economic system of gold fish for money was used, which brought about discussions on earning, spending, and saving. This led to the need to "hire" students for open positions in the classroom like "electrician", "messenger" and "paper passer". Students completed applications and stated their qualifications for the position. The discussion then turned to work, service, and volunteerism. Learning was authentic and meaningful to students.

What started out as a unit to address state standards (TEKS) resulted in a rich and meaningful learning experience for this teacher candidate's students. Students inquired about practices that were going on in the classroom that led to deeper learning about democratic and economic principles. Students experienced the workings of a government, an economic system and roles of community members as it related to their classroom, leading to a greater understanding of the outside world.

Ecosystem Inquiry

If the world today were coming to an end, how would you survive? What type of ecosystem would you live in and why? This was the Entry Event given to the fifth-grade science class at one partner school by one student teacher who was eager to implement PBL. Teams of fifth graders worked collaboratively to solve this problem through research, discussion, reading of varied resources, and critical thinking. Throughout the process students experienced the life of various biomes. This resulted in researching and understanding food webs as well as plant and animal life within each biome as students worked collaboratively to understand these concepts and how it would influence their final biome decision.

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In one instance, students were given a food web activity to complete and told to make as many food chains as they could. Students within the groups took specific roles such as writer, scissor operator, and gluer. As they went through the process students began to analyze why certain food chains worked and others did not, incorporating the science vocabulary to explain their position. They worked together sharing information and correcting each other for misconceptions and errors. Students were explaining ideas to each other and generating rich interaction and communication. Finally, the teams presented their findings to the class.

The final project involved the students creating a biome box which captured the essence of the researched biome in a shoe box. Students decorated the box to represent the biome accurately and to support their reasons for choosing this biome if the world were in fact to end. The high quality student work and interaction during the learning process were clear signs of a successful PBL from this teacher candidate.

Impact of PBL on the Stakeholders and Partnership

After the *Sam Invasion* event was over, we collected feedback from ten teacher chaperones, 20 teacher candidates, and close to 80 percent of the fifth-grade students who attended the field trip. The teacher candidates asked students, using a quick interview, about their overall experience at SHSU at the culmination of the event. Teacher chaperones completed a 5-item survey asking them of the benefits of such an event and how to improve the implementation. Meanwhile, all 20 teacher candidates completed an online survey asking about their overall experience in planning and implementing the event. They were asked to rate themselves in terms of their gained competencies in the areas of communication, collaboration, problem solving, and critical thinking. Additionally, they were also asked to evaluate their comfort level with PBL as a methodology. Teacher candidates gave additional testimonies as

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well as suggestions during the de-briefing session that followed immediately after the event. All instructors were present during this session.

Teacher Candidates

When asked about their comfort level in implementing PBL in student teaching or first year of teaching, 19 out of 20 teacher candidates said, "Very comfortable" and only one said, "Somewhat comfortable". The following were some of their explanations:

- *Incorporating PBL in my classroom would be an engaging and wonderful learning experience for my students;*
- *PBL does not have to be a big trip. It can be simplified in smaller scale;*
- *I feel comfortable giving an inquiry or research project for students to use technology and create some sort of presentations;*
- *It allows students to learn on their own, gives students a unique and authentic hands-on learning experience;*
- *As a teacher, I want to be a facilitator, and not a dictator. Students learn better by doing.*

Teacher candidates were also able to describe positive experiences they had while completing the PBL assessment. The following were selected direct quotes from them:

- *PBL taught me a new strategy such as, getting the students outside and how you can incorporate all content areas in different activities;*
- *Being able to let students (us) inquire and figure out the details for a successful field trip;*
- *PBL helps students (us) drive their own learning; I love how PBL is student focus (sic) rather than teacher focus (sic);*
- *PBL taught me how to work with other people and to compromise;*

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- *PBL is great in helping students gain social skills, collaborate, and interact with peers.*

One teacher candidate wrote a powerful reflection about her involvement with PBL which depicts its unique nature and outcomes:

"PBL gives students a reason for learning. Instead of just learning a lesson from the textbook, they learn to accomplish a task. Because they have reasons for learning, they're more engaged. Also, they learn at a deeper level because they are applying what they have learned to their project. This experience has taught me that I can think on my feet and not everything has to be planned out."

Fifth Grade Low SES Students

Feedback from the classroom teachers and our teacher candidates gave us a glimpse of what the fifth-grade students thought and learned from "Sam Invasion". Overall, the students said they had a good time and did not want to be picked up by the buses at the end of the day. Students enjoyed all the activities planned by the teacher candidates including touring the residential halls, participating in the planet activity, and participating in the relay race.

Teacher Chaperones

Written feedback from five teachers who chaperoned the fifth-grade students gave additional evidence of our PBL and its impact on the partnership. Teachers said their students liked walking around and learning historical facts about the university. The peaceful ambience of the campus made their students less fearful about going to college. Another teacher said her students did not have clear ideas about college life and "Sam Invasion" gave them that opportunity. All five teachers agreed that "Sam Invasion" was "well organized" and "went very smoothly". They also gave suggestions for improving the educational field trip.

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Reflection and Recommendations

With each PBL implementation, the impact on our partner school was evident not only from the final assessment but from feedback received from stakeholders involved. Embedding PBL both as a teaching strategy and a form of performance-based assessment in an educator preparation program is not only appropriate but needed. Pre-service teachers have to experience, as learners themselves, the key processes and elements of PBL before they can implement the same methodology in their own classroom. Twenty-first century teachers need critical thinking in order to effectively use school data, research, and communication for solving problems about instruction, curriculum, and assessment. They need skills to address factors affecting learning outcomes of diverse students in our schools.

The journey of implementing Project Based Learning to enhance our partnership with local schools proved to be a positive step. Our partner districts recognize the impact of PBL on student learning and look to our partnership for guidance as they take the venture with us. It was evident that mentors need PBL training. By training teacher candidates to be competent in PBL, they have been able to influence their mentor teachers by showing them how the process works and what possibilities PBL can bring to motivate and engage students.

Along with the many successes, our journey has definitely had its challenges. It becomes difficult to watch the teacher candidates flounder as they work collaboratively to solve the many problems that arise from the problem assigned them. It would be much easier on everyone if the teacher candidates were given a neat check list of what is to be accomplished; yet lost would be the analytical thinking, collaboration, creativity, and problem solving that we so want developed in our teacher candidates. The advantage to this is that the teacher candidates have experienced

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this from the learner's perspective. In future efforts to implement PBL in the classroom, they will have keen insight to what their students are experiencing and will be better prepared.

Another area for improvement includes the need to revise the assessment process of our teacher candidates by developing clear rubrics for the task at hand. Evaluating such skills as critical thinking and collaboration had their challenges from the instructors' perspective. A clear set of guidelines will assist the evaluation process as well as provide the teacher candidates with the standards to follow. However, with each PBL implementation we have shown improvement and felt more comfortable with the process.

Teacher educators interested in implementing PBL need to work collaboratively with a team of committed instructors. The teacher candidates in our program were given a PBL that is quite intense throughout the methods semester. In a real elementary classroom, a teacher is not afforded the luxury to take a month or more to complete a project due to pressures from the state testing mandates. To make PBL more appealing to teachers, we have realized the need to demonstrate PBL on a smaller scale. Projects such as the Classroom Community and the Ecosystems described above would be doable. We have then designed many of our classroom projects/activities as "mini-PBL's" to show that within the constraints of the elementary classroom, teachers can implement PBL to promote and strengthen 21st century skills.

More importantly, teacher educators in Texas must address and align the Pedagogy and Professional Responsibilities (PPR) competencies with each PBL event. For instance, the PBL themes we have described above revolved around designing and implementing integrated lessons and/or units with high use of technology, contextual factors, and appropriate assessments. Each PBL theme addressed all four domains on the PPR. Test results from our teacher candidates (EC-6 program) showed at least 98% passing rate on the PPR (K-12) on the first attempt.

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Finally, these PBL events supported our partner schools in many ways and raised the bar for our teacher candidates as they took a strong leadership role in the implementation. Teacher candidates saw themselves as a positive force in designing and implementing meaningful learning opportunities which, in turn, improved their understanding of their professional roles and their power to impact student learning.

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CASE STUDIES OF ONE-TO-ONE iPAD INITIATIVES IN TEACHER PREPARATION PROGRAMS

Jodi Pilgrim, Ph.D.
University of Mary Hardin-Baylor

Sheri Vasinda, Ed.D.
Oklahoma State University

Judy A. Leavell, Ph.D.
St. Edward's University

David R. Hollier, Ed.D.
St. Edward's University

Abstract

One-to-one mobile technology initiatives are spreading rapidly across all educational sectors. The iPad has become the technology of choice for many schools, and teachers must be prepared to integrate the use of iPads into meaningful classroom activities. The case studies in this article represent three university teacher preparation programs involved in one-to-one technology initiatives. In order to provide insight into the various uses of iPads as instructional tools, four instructors reflected on the implementation of iPad initiatives and the application of the iPad in the classroom. The SAMR model provided the framework for the reflections.

Introduction

Technology spending in United States averages four hundred dollars yearly per student enrolled in K-12 schools (Johnson, 2012). Given the fast pace with which schools have invested in technology, there has been little research published to date on whether, and how, technology improves student learning. The National Education Technology Plan, *Transforming American Education: Learning Powered by Technology*, called for increased practical technology use in

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the classroom in order to enhance student learning, adopt effective practices, and use data for continuous improvement (U.S. Dept. of Education, 2010). Educators in many school districts address this goal through the adoption of one-to-one technology initiatives, and mobile tablet computers are major contenders to transform the face of classroom learning (New Media Consortium, 2012). Tablet features such as cost, portability, touch-screen capabilities, video and phone options, web browsers, and applications appeal to educators at institutions of all levels, and K-12 institutions consider tablets a cost-effective alternative to the Netbook when planning one-to-one deployment (New Media Consortium, 2012).

How should teachers use these devices? How are the affordances of the technologies leveraged to transform learning tasks? The Substitution Augmentation Modification Redefinition (SAMR) model may help educators examine such questions. The model, developed by Rueben Puentedura (2006), enables teachers and researchers to evaluate activities involving technology tools. The purpose of this article is to evaluate and reflect on technology use within the framework of the SAMR model, which provides insight into possibilities technology affords for enhancing and transforming literacy work in one-to-one iPad initiatives with preservice teachers.

Technology Initiatives

The definition of one-to-one (1:1) typically refers to a school that provides a take-home laptop computer or tablet for each student in the school system or for each student in a grade level for use in the classroom and at home (Sauers & McLeod, 2012). Proponents of 1:1 initiatives assert that the programs reduce costs for textbooks, paper, assessments, and paperwork (Goodwin, 2011). In regards to student learning, though, findings in literature present mixed results for the success of these initiatives (Sauers & McLeod, 2012; Goodwin, 2011). Some

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reports indicate that 1:1 technology initiatives do not have a positive impact on student achievement at school, but other cases support the academic benefits (Sauers & McLeod, 2012). Researchers report increased student achievement in writing, literacy, and science in addition to higher exam scores and grade point averages (Sauers & McLeod, 2012; Goodwin, 2011). "To date, the most significant gains from 1:1 programs seem to be related to students' writing skills" (Richardson, McLeod, Flora, Sauers, Kannan, & Sincar, 2013, p. 6). In addition, student use of 21st century knowledge and skills increased in 1:1 initiatives (Lowther, Inan, Ross, & Strahl, 2012; Richardson et al., 2013; Goodwin, 2011). A Texas study reported that after three years of implementation, the technology skills of students in laptop initiatives improved significantly, equaling levels of technology proficiency similar to wealthier students in the control schools (Shapley, Sheehan, Sturges, Caranikas-Walker, Huntsberger & Maloney, 2009).

In addition to the research examining student achievement and skills, the use of technology affects other aspects of schooling, including student engagement, attendance, behavior, motivation, and teacher practices (Sauers & McLeod, 2012; Shapley et al., 2006). Additional research is needed in order to examine meaningful application of iPads in the classroom. More than 1,000 1:1 projects exist in the United States involving Apple devices in which each student has access to a laptop or iPad (Apple Events, 2012). However, as Bill Gates stated, "Just giving people devices has a really horrible track record" (Gates, 2012, para. 8). Issued devices must be purposefully and appropriately integrated into instructional practices, and these practices should be modeled in teacher preparation programs. Murray and Olcese (2011) found that most iPad applications, or apps, used in education utilized drill and practice approaches, indicating that "the bulk of the applications written to run [on] iOS devices are

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woefully out of sync with modern theories of learning and skills student[s] will need to compete in the 21st century" (p. 48).

This article presents three case studies of universities implementing 1:1 iPad initiatives with preservice teachers in undergraduate courses. In order to provide insight into the various uses of iPads as instructional tools, four college instructors reflected on the implementation of iPad initiatives in literacy education courses using the SAMR model as an evaluation tool.

SAMR Model

Through his observations of technology usage in both business and educational environments, Rueben Puentedura (2006) identified and categorized the ways that technology integration enhanced or transformed the process or product of work. His SAMR model (2006) provides a framework which may be used for the design and evaluation of activities or tasks involving technology tools to support learning objectives (Figure 1). The model enables teachers and researchers to examine the levels of technology use based on the way technology is integrated into assigned tasks. In the SAMR model, *substitution* reflects ways technology acts as a direct substitute for another tool, without significant changes in application. *Augmentation* reflects ways technology replaces another tool, with an increase in functionality. *Modification* reflects ways technology enables the redesign of portions of a task, providing transformation of the activity at hand. Finally, *redefinition* reflects ways technology allows for the creation of new tasks, which would be impossible without the chosen technology. The model works like a taxonomy, in that substitution may be considered a lower level technology integration and redefinition may require a higher level of critical thinking and technology application. For the purpose of this article, instructors used the SAMR model to evaluate the levels of technology

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integration using iPads in undergraduate classrooms to determine whether the technology tool or applications (apps) enhanced or transformed literacy tasks.

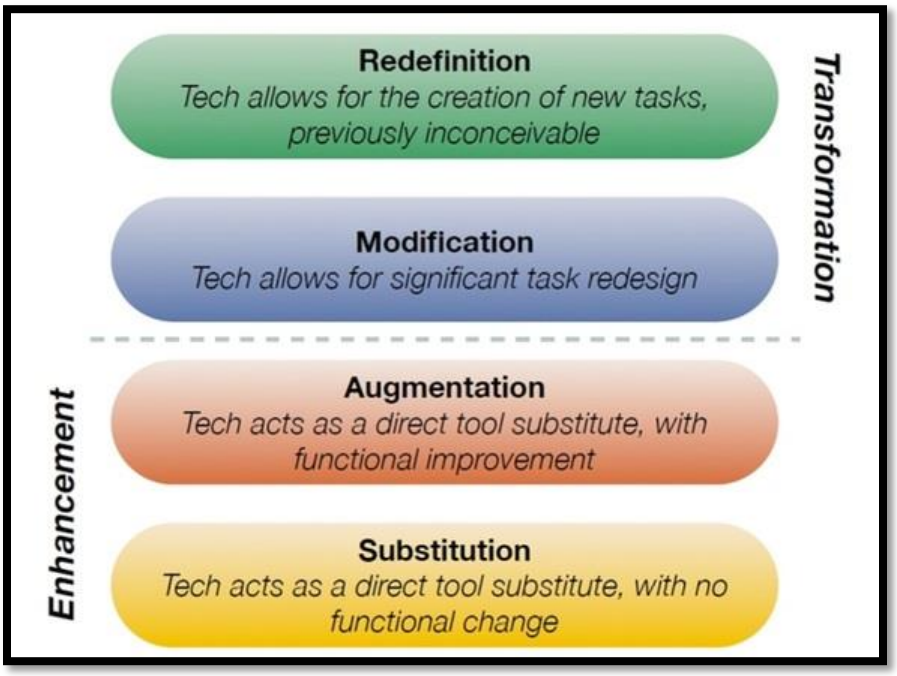

Figure 1. SAMR Model, Source: Puentedura, R. (2006)

The iPad apps utilized in classroom activities may fit the model in any of the four levels. However, goals for educators include the integration of student-centered activities, which require creativity and critical thinking. This idea is supported by education standards. According to the International Society for Technology in Education (ISTE),

> simply being able to use technology is no longer enough. Today's students need to be able to use technology to analyze, learn, and explore. Digital age skills are vital for preparing students to work, live, and contribute to the social and civic fabric of their communities (ISTE, 2012, para. 2).

ISTE developed the National Educational Technology Standards (NETS) for student success in a digital age. The standards include skills related to creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving and decision

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making; digital citizenship; and technology operations and concepts (ISTE, 2012). Through each of the following case studies, the SAMR model provided a framework for the evaluation of and reflection upon iPad initiatives.

Case Studies

Three southwestern universities integrated iPads into aspects of their teacher education programs during the 2013-2014 academic year in order to model technology integration and to improve student understanding of technology skills required for the K-12 classroom. The instructors involved with 1:1 iPad initiatives reflected on the process of technology integration in order to provide other university faculty insight regarding tablet use for teacher preparation. Each case described below documents the launch of the initiative, the implementation of technology, including apps used in the literacy classroom, and a reflection of technology integration with iPads using the SAMR model.

Case Study One

Launch of iPad initiative. Preservice teachers at the University of Mary Hardin-Baylor participated in an iPad initiative in the spring, summer, and fall of 2013. Due to limited numbers of iPads, not all education courses could participate in the 1:1 initiative, so one instructor piloted the program in order to investigate technology integration with iPads. A combination of College of Education surplus funding and internal grant funding provided 28 iPad Minis (16G), Otterbox cases, and apps. In the spring and fall of 2013, preservice teachers taking a 6 hour, field-based literacy course, Reading and Language Arts, were issued iPads for use in class (any class) and at home. All but one preservice teacher in these courses checked out an iPad, which required a signed contract regarding financial responsibility.

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During the first semester of the iPad implementation, preservice teachers used individual iTunes accounts with the devices. They also received instruction on the care and use of the iPads. When iPads were turned in, the devices would not allow another iTunes account/user for sixty days. Therefore, in subsequent semesters, the iPads were linked to a university iTunes account, and literacy apps necessary for class were preloaded. During the summer, preservice teachers enrolled in Disciplinary Literacy were issued iPads.

Implementation. Preservice teachers in the six hour literacy course spent four hours per week in class and four hours per week observing and teaching in an assigned elementary or middle school classroom. The university instructor modeled the use of technology tools during class. In addition, preservice teachers were encouraged to use the university iPads in their teaching assignments. In the local district's middle schools, where sixth, seventh, and eighth graders participated in a 1:1 iPad initiative, preservice teachers downloaded many additional apps they observed and used in their field experiences.

The integration of the iPads aligned to course objectives. For example, if phonics instruction was the lesson focus, apps designed to reinforce phonics-related activities in the EC-6 classroom were introduced in class. In addition to the apps shared by the instructor, preservice teachers were encouraged to locate and download other apps related to phonics instruction.

During the summer of 2013, preservice teachers in a disciplinary literacy (content area reading) course used iPads to design student-centered activities in a 1:1 summer camp setting with middle school campers (Pilgrim & Berry, 2014). The camp, titled Learning with Technology, focused on web literacy skills, including the ability to locate, synthesize, and evaluate online information. Each teacher candidate was paired with a middle school student for one week in which a topic was researched and presented in class using technology tools available

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on computers and the iPad. Preservice teachers were required to integrate Voki (www.voki.com), iMovie, and at least five other apps into lessons.

Participation in the 1:1 iPad initiative worked best when apps were preloaded using a university iTunes account. This enabled preservice teachers to access apps such as iMovie, which cost money to download. However, due to preloaded apps and the addition of apps throughout the semester, storage space on the device eventually became an issue. Preservice teachers received exposure to more than 20 apps during a semester, not including apps they may have downloaded on their own. Table 1 contains reading, writing, and creation apps used in literacy courses. Creation apps are open-ended and allow users to generate a variety of products that include multimedia (images, video, drawings, text, sound) with the ability to share content for project/presentation purposes. These apps, also referred to as generative apps, receive attention throughout the article.

Table 1

Apps Used in Literacy Courses

Reading	Writing	Creation	Other
Starfall	Handwriting apps-	ShowMe	QRReader
BobBooks	Alphabet	iMovie	Dictionary.com
Spelling City	ABC Cursive	Inspiration Maps	Dragon Dictation
Timed Reading	Letter School	Puppet Pals	GoodReads
Record of Reading	Grammar Apps		
Word Bingo	MadLibs		
Quizlet	Story writing apps-		
Spelling/Vocabulary City	StoryKit		
Dr. Seuss (and other apps with books)			

Reflection. Participation with iPads worked best when apps were preloaded and when iPads were used by mentor teachers in field-based courses. Increased exposure in a 1:1 environment at the middle school seemed to lead to a greater understanding of the potential of

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iPad technology and motivated students to try apps modeled by their mentor teachers. A few preservice teachers in the courses used their iPads when implementing activities in the field (MadsLibs and Inspiration Maps). When using the descriptors of the SAMR model to evaluate the use of apps, varied levels of technology integration were revealed.

Substitution. Preservice teachers liked the MadLibs app, which replicates the pen and paper tasks traditionally used to reinforce parts of speech with a fill-in-the-blank story. Several preservice teachers selected this tool for grammar practice with small groups of students in the elementary school. Because the MadLibs app provided a direct substitute for the traditional activity and the use of the tool did not impact learning outcomes, the app fits with the substitution level of the SAMR model.

Augmentation. Many apps used in the spring and fall enhanced learning at the augmentation level because they substituted for traditional activities, with functional improvement. For example, word bingo provides engaging interaction with sight words, but children can play word bingo without an iPad. The difference typically involved digital features, which provided immediate reinforcement to the player who matched the sight word during the game. The app enhanced ways players carried out tasks, but outcomes were not changed.

Similarly, some handwriting apps provided functional improvement which scaffolded letter-making skills. With Letter School, children must place their finger/stylus at the correct place on the virtual lines in order for the interactive features to work. Apps that serve as resources or tools also fit under augmentation. For example, although a dictionary is a common school resource, dictionary.com enhances use through instant access. Features such as the microphone and audio capabilities provide scaffolding unavailable with traditional print resources.

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Modification. Preservice teachers used ShowMe as a way to introduce themselves to the teacher and students in an assigned field-based course. Other uses for the app, such as homework demonstrations, were presented. ShowMe, an interactive white board with voice capabilities, enables the user to record the activity, producing a link to the recording available online. This tool reflected modification of learning because the user is able to reach goals unavailable before the introduction of the tool.

StoryKit also reflected modification of learning. The app, used in class to create a Phonics Study Guide, could also be used with young children to write and record stories. Traditional story writing is enhanced with the app through audio and recording capabilities.

Redefinition. Creation-based apps, or generative apps, offer opportunities for transformed learning, as the apps have an open-ended nature so that students can create content and demonstrate understanding in a variety of multimodal ways. With these apps, students have more agency as they create digital stories, movies, or other projects. During the summer of 2013, preservice teachers created iMovies with the middle school student they tutored. This level of learning reflected redefinition as technology enabled significant task redesign. iMovies created for class required a variety of media skills, and in many cases students layered apps, such as PuppetPals and Inspiration (graphic organizer), and used critical thinking skills to create complex movie products. With these tasks, the highest level of the SAMR model was evident.

Case Study Two

Launch of iPad initiative. Students at St. Edward's University participated in an iPad initiative in the fall of 2013 and the spring of 2014. Internal funding at the University allowed the purchase of 10 iPads for research in technology use. Prior to use, instructions were given on care and appropriate use of iPads. In the fall semester, of the fourteen students, several had their

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own mobile devices so ultimately and conveniently only 10 iPads were checked out. Each student participant reviewed and signed a contract regarding financial responsibility. The university iPads were returned at the end of the semester.

The focus of the iPad use for this class was to measure increase in quantity and quality of interaction time and e-literature selections, as well as quantity and quality of skills developed in the use of technology. All iPads were linked to a university iTunes account, and literacy apps necessary for class were preloaded. In particular, the apps Free Books and Gutenberg Pro enabled downloads of free e-literature. In addition, iMovie was preloaded on each iPad for creating book trailers, using movie trailer formats as the framework. All purchases for the iPads were through the School of Education's iTunes account. This may have limited student free choice to some degree, but there remained many possible e-literature selections to review and read.

Implementation. At the beginning of the fall implementation, students were encouraged to bring their own mobile devices to class, and iPads were provided to those without. Students were asked to select a sign that read "Expert" or "Novice" which reflected their current skill with iPad use. Pairs were formed (one expert with one novice) for initial exploration and engagement with the devices. The course focus emphasized the access to online reading, which involved locating and downloading free e-literature for class exposure. The actual reading of e-literature was to take place outside of class.

Later in the semester, students were introduced to iMovie and Apple's templates for the production of movie trailers. Students were to use those templates to create book trailers. The book trailers provided an alternative to some other form of book report.

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Reflection. The use of iPads in the Children's Literature class led to an increase in the reported number of e-literature selections read during the semester and to reports of increased skill in iPad use. When evaluating the iPad initiative through the SAMR framework, overlapping levels of the technology use emerged.

Substitution. On the surface level, the downloads of e-literature to a mobile device required simple *substitution* because reading the selection on the iPad device was a substitute for the actual book.

Augmentation. This same activity offered an *augmented* advantage since the process includes an abundant supply of e-literature available for free download to read with instantaneous access. This use offers great financial and access advantages. One task for students in Children's Literature is to read widely from multiple genres, which often requires the purchase of books or the search for books in local or other libraries. With the iPads and e-literature, an entire library of multiple titles can be carried around and accessed on one device. It should be noted that not all notable selections of children's literature are available in e-literature format. Although the number of e-literature selections is quite large, many recent award winning books of quality have not been provided to the e-literature market.

The digital features of e-literature also improve or augment the function of the book. For example, font sizes can be increased and audio/video can be utilized. Note taking and highlighting capabilities also support the user's needs. While these possibilities are helpful to many, the use of electronic text is not without some drawbacks. More than one student reported visual difficulties while using electronic screens as compared to viewing print on paper.

Modification. Often, forms of e-literature offer interactive features the reader can control, which changes the nature of the reading experience. For example, an unknown word

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may be defined with the dictionary feature. Also, additional embedded links move the reader away from the linear text and provide additional background knowledge or support. While many of these interactive features are seen as advantageous, contributing to reader engagement, the effects still need to be studied.

Redefinition. Technology often allows students opportunities to create products previously impossible. The use of iPads enabled *redefinition* with activities such as creation of book trailers using iMovie. The book trailers served as an alternative for creating a book report. The digital trailers transformed the assignment and product by using visual material to convey a conceptual point. The assignment introduced opportunities for a different type of creativity and cognitive synthesis during production of the book trailer rather than other types of written or illustrated book reports. The use of animated visual images, sound, and music transforms this into a multimodal product and considerations of how visual and auditory additions change the tone, mood, or theme. *Redefinition* occurred through the creation of audio-visual stimulating products without extreme expenditure on materials adding additional cognitive loads and engagement. The digital format, rather than a paper format, increased storage and sharing capabilities.

The iPad initiative continued into the spring semester but with modifications. Instead of issuing devices to all, the iPads were issued to students as needed during classroom use. In addition, to improve efficiency of the book trailer assignment, an IT (instructional technology) specialist prepared an instructional video on the creation of book trailers and modeled the process in class. The modeling and subsequent supervision of iMovie book trailer projects proved beneficial to the students, which indicated the advisability to provide explicit instruction to preservice teachers in the use of technology tools.

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During the two semesters iPads were used in the children's literature classroom, instructors conducted periodic survey research to gather notes about students' self-reported reactions and change. Some of the key points are as follows: increase in reported hours of iPad use; increase in the number of free apps downloaded; and the number of e-literature selections viewed /read. For the fall, the number of selections was 75, and in the spring 121 (based on class sizes of 14 and 13). The types of skills students reported learning were: accessing sites with e-literature and/or other resources; establishing and/or locating groupings, files, etc. of downloaded e-literature; interacting, manipulating, or engaging with e-text; sharing with others across devices; evaluation of free apps, and other incidental skills. These 21st century skills related to use of the iPad device and exceeded typical skills used in past children's literature courses.

Case Study Three

Launch of iPad initiative. The iPads used at Oklahoma State University were obtained through two grant sources, one internal and one through the Oklahoma Commission for Teacher Preparation. With these grants the Elementary Education faculty members were able to purchase 95 iPad2s, 20 iPad Minis, iPad cases, and a variety of apps as well as a laptop to configure the apps and a cart to deploy the apps to the devices. The iPads are used in two courses: Literacy Assessment and Instruction and Teaching Mathematics at the Intermediate Level. Each of these courses has a practicum in which preservice teachers tutor community elementary and middle school students in the Randall and Carol White Reading and Math Center (RMC) on campus. The devices are issued to the preservice teachers to use as their own at the beginning of the second semester of their junior year in the literacy methods course and the first semester of their senior year in the mathematics course. Once the initial grant was awarded, the faculty worked with the technology department to develop an Acceptable Use Policy that the students were

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required to sign upon issuance. This case focuses on the implementation of the iPads in the literacy course.

The TPACK model (Mishra & Koehler, 2009), which focuses on the integration of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), was used as a framework to support both faculty and preservice teachers in lesson planning and task design. Preservice teachers plan individualized instruction based on the student's needs, the content associated with that need, and their pedagogical intent as well as the benefits or drawbacks of new technologies. In an effort to highlight and support student-centered pedagogies, the apps loaded on the iPads were carefully considered for high-utility and open-ended use (Table 2). Faculty used TPACK (Mishra & Koehler, 2006) to plan, select, demonstrate and model various apps during class to support literacy processes as Content Knowledge (CK), highlighting the technology affordances to support that content. Additionally, students were encouraged to explore apps on their own and use their personal iTunes account to access free or paid apps. During the third semester, the SAMR model was introduced to faculty and students to use as another resource, or guide, to consider when planning technology integrations into their lessons.

Table 2

iPad Applications Used to Support Literacy Learning in the Reading and Math Center

Free Apps	Purchased Apps
• Pocket Wavepad (audio recording) • Show Me (slate / IWB) • Educreation (slate / IWB) • iPrompt Pro (scrolling text)	• Popplet $4.99 • Book Creator $4.99 • iCard Sort $5.99 • iMovie $4.99 • Letter School $2.99

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Implementation. During the iPad initiative, instructors intentionally analyzed apps for levels of engagement. Drill and practice apps were avoided compared with more creation-based or generative apps such as Book Creator or iMovie. Faculty assigned teacher candidates to use apps such as Popplet, a fluid graphic organizer app, to create concept maps for course reading assignments. During class this same app was used to collaborate on a summarization strategy to demonstrate how students can work together in the same digital space to deepen their understanding of how narrative summaries are created.

Apps that afforded opportunities for creating content, such as educreation, Book Creator, and iMovie, were demonstrated in class and their use was encouraged for tutoring. The auditory feature of Book Creator enabled students to orally rehearse stories to playback and type. Struggling writers could tell their stories first and capture it through auditory recording. The preservice teachers incorporated interactive writing activities to support emergent writers, but they would share the typing on the keypad instead of "sharing the pen" (Fountas & Pinnell, 2000). Pairing audio recording with reader's theater for fluency work were modeled and practiced to increase fluency and comprehension (Vasinda & McLeod 2011, 2013).

As the preservice teachers planned and implemented weekly lessons for their students in the RMC, their plans reflected applications demonstrated in class or missed opportunities for the inclusion of technology. Often, the instructor would notice opportunities for technology integration that were overlooked by the preservice teacher and would offer a reminder to consider particular iPad apps to enhance instruction.

Reflection. Because this project was started prior to awareness of the SAMR model, faculty believed their choices of apps would result in high levels of leveraging the affordance of the apps paired with strong literacy strategies. As faculty used the descriptors of the SAMR

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model to evaluate technology use, varied levels of technology integration were discovered. An example of each level is shared below.

Substitution. The sorting app, iCardsort, was a direct substitution for a traditional paper task, in terms of learning objectives and experience for the K-8 student. For the faculty and preservice teachers, it affords ease of preparation. Faculty could create a word sort and share it over through "beam" (single sharing from one device to the other) or "blast" (multiple wireless sharing) features of the app. Preservice teachers reported the ease of creating a word sort without having to cut apart and store multiple cards. Although instructors might view this as augmentation, reflecting on the learning task itself, as Puentedura (2006) suggests, the task remains at substitution for the learner.

Augmentation. Letter School, a letter recognition, phonics and handwriting app, originally considered the closest to a drill and practice app, offers some substantial affordances that augment the learning task for the students. One challenge of teaching letter formation in a classroom setting is monitoring inefficient strokes and letter reversals. The affordances of this app make it impossible to form letters incorrectly, and the animations are engaging so that students want to repeatedly practice. The challenge to the preservice teacher is to take that new learning to the school context of pencil to paper. Careful sequencing of letter formations paired with kinesthetic feedback from mouth formations have been very effective in helping children overcome letter reversals such as "b" and "d".

Modification. Popplet can be used at the augmentation level if it is substituted for paper graphic organizers. Because more "popples" can be added, size adjusts to the amount of text within it, and images can be inserted or drawn, the app has some direct affordances that push it past simple substitution. The app reflects modification when it is used in collaboration with

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others. Small groups can work in the same digital space to co-create content such as concept maps, timelines, and summaries.

Redefinition. The affordances of audio and video transform student publications into authentic, multimedia, professional-like iBooks with the Book Creator app. Their digital books can be shared with family and friends as an iBook or portable document format (pdf) (although audio and video benefits are lost in pdf format). Struggling writers can enter the writing process with drawings or audio recordings as a first draft, listening and adding details to stories before matching printed words to a page. Text may be added through either handwritten with a finger or keypad text. When preservice teachers reflected on various lessons they planned and implemented with the iPad, the most transformative work was with reluctant writers using the affordances of Book Creator.

Implications

With the ubiquitous nature of mobile technology outside the school setting and the move toward increased educational adoption of mobile technology, such as iPads, preservice teachers enter a classroom environment that neither they, nor university faculty have experienced. Continuous learning, unlearning, and relearning as new technologies are developed, implemented and replaced will be part of the skills set needed to be successful in the 21st century (McLeod & Vasinda, 2009). Mobile technology tools, such as iPads, are often used in the classroom to support learning by creating a 1:1 environment. These innovative 1:1 environments offer more time with devices and applications and more possibilities for collaborations and transformations when everyone is on the same device (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2012).

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The SAMR model offers a way to evaluate the way technology integration leverages learning opportunities for students and teachers. If the opportunity only provides substitution, perhaps traditional tools are sufficient, but even with substitution, students are usually more engaged in the learning. However, technology tools which promote the highest degree of critical thinking are those that transform learning (Puentedura, 2006). The case study reflections indicated iPads, if used to their fullest potential, could be used to transform learning. Creation apps in particular provided opportunities for students to redesign or construct projects, which required high levels of skill and engagement with tools not available before the implementation of the technology tools. According to Interactive Educational Systems Design, Inc. (2013), creation apps include one of several categories of apps considered most beneficial to student instruction. Therefore, teachers must understand how to utilize iPads and creation apps for effective classroom instruction. Teacher preparation programs should model technology integration through coursework and technology-rich assignments, and preservice teachers should be exposed to a variety of ways to use technology to enhance student learning. Perhaps, with the increase of technology initiatives in K-12 settings, teacher preparation programs should consider the use of iPads (1:1) for teacher training purposes.

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Appendix

iPad Apps for the Classroom

App	URL
ShowMe	https://itunes.apple.com/us/app/showme-interactive-whiteboard/id445066279?mt=8
Educreations Interactive Whiteboard	https://itunes.apple.com/us/app/educreations-interactive-whiteboard/id478617061?mt=8
Dictionary.com	http://itunes.apple.com/us/app/dictionary.com-dictionary/id364740856?mt=8
Starfall ABCs	https://itunes.apple.com/us/app/starfall-abcs/id395623983?mt=8
BobBooks Reading Magic	https://itunes.apple.com/us/app/bob-books-reading-magic-lite/id408873050?mt=8
Vocabulary/Spelling City	https://itunes.apple.com/us/app/spellingcity/id538407602?mt=8
K12 Timed Reading Pracice	https://itunes.apple.com/us/app/k12-timed-reading-practice/id374985358?mt=8
Record of Reading	https://itunes.apple.com/us/app/record-of-reading/id543574721?mt=8
Word Bingo	https://itunes.apple.com/us/app/word-bingo/id406264088?mt=8
Quizlet	https://itunes.apple.com/us/app/quizlet/id546473125?mt=8
Dr. Seuss's ABC	https://itunes.apple.com/us/app/dr.-seusss-abc/id354855128?mt=8
ABC Print Big Trace	https://itunes.apple.com/us/app/abc-print-big-trace-hd-free/id420112902?mt=8
ABC Cursive Writing	https://itunes.apple.com/us/app/abc-cursive-writing-free-lite/id410300427?mt=8
LetterSchool	https://itunes.apple.com/us/app/letterschool/id435476174?mt=8
MadLibs	https://itunes.apple.com/us/app/mad-libs/id326885152?mt=8
StoryKit	https://itunes.apple.com/us/app/storykit/id329374595?mt=8
iMovie	https://itunes.apple.com/us/app/imovie/id377298193?mt=8
Inspiration Maps VPP	https://itunes.apple.com/us/app/inspiration-maps-vpp/id510173686?mt=8
Puppet Pals	https://itunes.apple.com/us/app/puppet-pals-hd/id342076546?mt=8
QRReaader	https://itunes.apple.com/us/app/qr-reader-for-iphone/id368494609?mt=8
Dragon Dictation	https://itunes.apple.com/us/app/dragon-dictation/id341446764?mt=8
GoodReads	https://itunes.apple.com/us/app/goodreads/id355833469?mt=8
Free Books	https://itunes.apple.com/us/app/free-books-23-469-classics/id364612911?mt=8
Gutenberg Literature	https://itunes.apple.com/us/app/gutenberg-literature/id585534682?mt=8
Pocket Wavepad	https://itunes.apple.com/us/app/wavepad-free-audio-editor/id395339564?mt=8
iPrompt Pro	https://itunes.apple.com/us/app/i-prompt-pro/id539175031?mt=8
Popplet	https://itunes.apple.com/us/app/popplet/id374151636?mt=8
Book Creator	https://itunes.apple.com/us/app/book-creator-for-ipad-create/id442378070?mt=8
iCard Sort	https://itunes.apple.com/us/app/icardsort/id384552728?mt=8

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CROSS-GENERATIONAL DIFFERENCES: BENEFITS AND CHALLENGES AMONG TEACHING PROFESSIONALS

Anna L. Fox, Ed.D.
Tarleton State University

Christie Bledsoe, Ed.D.
University of Mary Hardin-Baylor

Marlene Zipperlen, Ed.D.
University of Mary Hardin-Baylor

Terry L. Fox, Ph.D.
University of Mary Hardin-Baylor

Abstract

Today's new Generation Y teachers (born between 1982 and 1994) have a different mindset, perspective, set of expectations, and outlook than teachers from previous generations. This qualitative study explored generational differences within a school environment, particularly regarding the challenges and benefits of working with educators of other generations. Survey respondents answered open-ended questions, which showed teachers perceive challenges and benefits when working with other generations. The results have implications for new teachers, experienced teachers, and school administrators in developing a cohesive and supportive working environment, which recognizes and accepts generational differences.

Introduction

Various generations have one thing in common, and that is differences – different perspectives, different experiences, and different expectations regarding how the future should come to be (Strauss, 2005). These differences offer healthy contrasts, but can also create considerable difficulties when not understood and welcomed. Today's multi-generational work

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environment is one place in particular where generational differences create both opportunities for increased understanding, as well as potential conflicts (Strauss, 2005). The school workplace is certainly no exception. This study examined generational differences among K-12 educators in an attempt to increase understanding of differences between the generations of teachers and administrators currently working together. Within the school environment, professionals representing multiple generations work together on a daily basis. In today's schools, as many as four different generations work together. Previous research revealed various generational cohorts approach work and life from differing perspectives. The intent of this study was to examine the generational differences that exist within a school environment in order to promote understanding and guide administrators in their efforts to create a cohesive community within the school environment.

Nature of the Problem

Each generation is rooted in a particular ideology with respect to education, and each believes their approach is the right one (Behrstock-Sherratt & Coggshall, 2010; Young, 2009). As times and students have changed, however, teaching philosophies have also changed. Older generation teachers can offer much to younger generation teachers through their experience and knowledge. Younger generation teachers can also contribute to older generation teachers with respect to new ideas and approaches. However, often these generational differences can appear to be conflicts rather than opportunities. It is imperative that educators recognize these differences for what they are – both potential conflicts as well as opportunities, and act on them appropriately (Cochran-Smith, 2004; Gordon & Steele, 2005).

Today's new *Generation Y* teachers (born between 1982 and 1994) have a different mindset, perspective, set of expectations, and outlook than teachers from previous generations.

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Today's school culture is still much aligned with perspectives based on teachers and administrators who were educated in the 1970s and 1980s, before today's new generation of teachers were born. Experienced teachers from previous generations have much to offer as mentors to novice teachers, but often have difficulty identifying with this new generation (Behrstock-Sherratt & Coggshall, 2010). Simultaneously, the new generation does not necessarily accept and respect established school culture (Lovely & Buffum, 2007). Specifically, the problem is how generational differences, particularly concerning attitudes and perspectives, can affect the working environment and relationships within the school (Lovely & Buffum, 2007).

Purpose of the Study

The purpose of this study was to examine generational differences among K-12 educators. The intention of the research is to benefit new teachers, experienced teachers, and school administrators as these groups strive to develop a cohesive and supportive working environment, which recognizes and accepts generational differences. Moreover, as reported in the literature, ease of acclimation in the school environment is a contributing factor in the retention rate of beginning Generation Y educators. Perhaps a better understanding of generational differences by school leaders can help focus actions to aid in retaining the educators of this generation.

In an extensive study of 50,000 educators, Ingersoll and Merrill (2010) attempted to identify changes taking place in the teaching profession. Using the Schools and Staffing Survey (SASS) and the Teacher Follow-up Survey (TFS) over a 20-year period, the authors concluded the American teaching force has changed, and in some respects, dramatically. One dramatic change is the relative increase in the number of beginning teachers in American classrooms.

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New, young teachers bring vitality to the classroom, but they also need direction and mentoring from veteran teachers. Moreover, the teacher workforce is growing older – teachers in 2007 and 2008 had a modal age of 55 years – a remarkable increase from 41 years only a decade earlier Ingersoll and Merrill (2010). Ingersoll and Merrill (2010) also addressed the increasing trends of attrition in American schools, in particular attrition rates among young and minority teachers. The researchers encouraged further study of the changing American teaching professional and encouraged discussion with those who make policy (Ingersoll & Merrill, 2010). Differing perspectives and expectations, often a result of generational differences, are a leading cause of the workplace challenges among teaching professionals. Currently, four generations (Traditional, Baby Boomers, X-Generation, and Y-Generation) coexist in the workplace (Gordon & Steele, 2005). Lyons, Duxbury, and Higgins (2007) stated generational-based differences in values and perspectives directly affect the work environment.

The uniqueness of the generational cohorts include attitudes about work, expectations in management, communication, work hours, and even dress, all of which affect the work environment (Gordon & Steele, 2005). To start understanding workplace differences, one must first begin with an understanding of the generations themselves. Figure 1 provides a summary of labels various researchers attributed to the different generations. The labels provided by Behrstock and Clifford (2009) were used in this study, as their study specifically focused on generational issues within the school setting.

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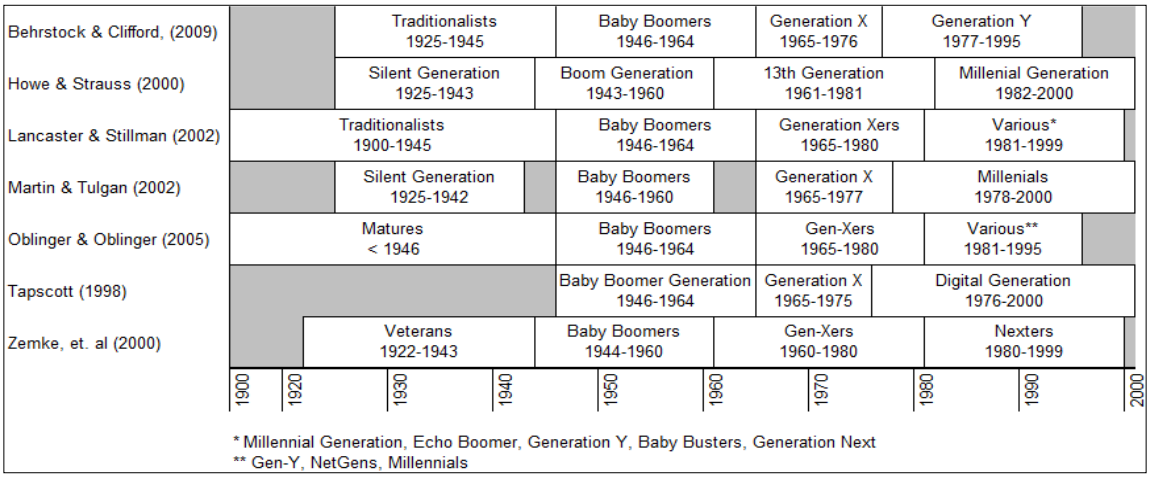

Figure 1. Labels and date ranges of generations according to various authors.

Generations must find ways to work together despite their differences. Likewise, organizational leaders must also acknowledge mixed-generational school environments are both challenging and rewarding (Gordon & Steele, 2005). According to Ansoorian, Good, and Samuelson (2003), educational leaders must acknowledge these demographic challenges and strive to keep communication in the forefront. School leaders have the inherent responsibility to balance the needs of all generations represented in a work environment (Ansoorian et al., 2003).

Retention of the next generation of teachers is also a significant problem. Carroll (2009) noted young teachers bring a great amount of energy and a wealth of technical knowledge to the workplace. However, the rate of attrition among young teachers is high and continues to increase. Carroll (2007) reported one-third of new teachers left the classroom within three to five years. This "teacher dropout" rate is higher than student dropout rate in some high-need urban schools (Carroll, 2007, p. 1). The high attrition rate costs American schools an estimated $7 billion annually (Carroll, 2007). "It is draining resources, diminishing teacher quality, and

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undermining our ability to close the student achievement gap" (Carroll, 2007, p. 2). Ingersoll (2002) stated:

> The data suggest that improvements in the conditions of the teaching job, such as increased support for teachers, increased teacher salaries, reduction of student misbehavior and enhanced faculty input into school decision making, would all contribute to lower rates of turnover. This, in turn, would diminish school staffing problems and ultimately contribute to better school performance. (p. 42)

Carroll (2009), in summarizing Ingersoll's (2002) study, offered this possible explanation:

> Beginning teachers give many reasons for leaving as they walk out the door, but chief among them is the frustration with a debilitating sense of isolation that grows out of a lack of support from more accomplished colleagues and school leaders. (p. 11)

A potential benefit of this present study was in examining the impact of generational differences in retaining the newest generation of teaching professionals. As this group is experiencing a growing attrition rate at the same time older experienced teachers are retiring, it is relevant to identify and address the potential reasons. By acknowledging these differences, and creating a better understanding of these differences, school administrators and experienced teachers will be better prepared to work with, encourage, and learn from the new generation of educators.

Methodology

To explore potential generational differences among teaching professionals, an online survey containing two open-ended questions was sent to teaching professionals in seven school districts in Texas. Demographic information was gathered to identify the teaching professional's

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generation, number of years of professional experience, school district classification, current teaching assignment, generational cohort, gender, and ethnicity.

The first open-ended question was, "Please describe any challenges you have faced when working with people of other generations." One hundred twelve participants responded to this question, consisting of 54 Baby Boomers, 36 Generation Xers, and 22 Generation Yers. The second question was, "Please describe some benefits of working with people of other generations." One-hundred-three participants responded to this question, consisting of 56 Baby Boomers, 24 Generation Xers, and 23 Generation Yers. Content analysis was the approach to analyze each of these questions. The researcher and a co-rater independently examined each of the responses, initially identifying and highlighting common words and phrases. The second step in analysis was to determine if the common words and phrases tended to group into similar categories. For example, many of the participants mentioned words such as *new technology* or *unwilling to change* as challenges, and words such as *experience* and *perspective* with respect to benefits. After identifying the common words and/or phrases, a count was made of each theme, in total and by generational group.

Open-Ended Question: Challenges

Table 1 presents the results of the content analysis for the first open-ended question addressing generational challenges among teaching professionals. A discussion of the most frequently mentioned factors follows.

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Table 1

Results from Open-Ended Question: Challenges

Q1: Please describe any challenges you have faced when working with people of other generations.

Factor	Frequency			
	Baby Boomer	Gen X	Gen Y	Total
Unwillingness to change	14	14	13	40
Understanding new technology	11	4	6	21
Differing values and work ethic	11	3	1	15
Lack of knowledge and experience	10	2	1	13
Communication issues	1	2	1	4

Unwillingness to change. In examining the participants' responses concerning challenges working with different generations, a predominant theme was the issue of unwillingness to change. When assessing the frequency of responses among the three generational groups, unwillingness to change consistently appeared as the most significant challenge when working in a multiple-generation work environment. The older generation teachers reported they did not welcome change, and the older generation recognizes this struggle as often as the younger generation. One member of the Baby Boomer Generation commented:

> I am the generation at the top end. I can see and understand the challenges of working with me, because I believe that what I do "works" and do not usually see the need to change. I do recognize the changes that I view as being beneficial and usually can embrace those, but I do not change just because the wind is blowing that direction.

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Generation X, the generation between the older Baby Boomers and the younger Generation Y, holds the perspective of being "caught" in the middle. One Generation X participant wrote:

> When referring to my colleagues, I tend to feel in the middle, caught between the "Old School" (resistance to change, outmoded styles of teaching, etc.) and the "Very New School" (young, extremely idealistic, "let's try this because it's new" attitude).

The younger Generation Y teachers articulated some frustration with older teachers regarding their lack of willingness to change, and in particular, how to teach a new generation of students. One Generation Y participant summarized it thusly:

> Older teachers tend to be set in their ways and teach things the same way they have for years. Kids have changed just in the last several years since I began my career, so I can only imagine how different things were for teachers when I was young. Why do they believe the same practices then always work now?

Understanding new technology. Constantly changing technology, the demands of a changing classroom, and the expectations placed on teachers to use technology were significant issues among all three generations. One Baby Boomer wrote, "Technology creates the biggest gulf between me and younger generations." Many of the responses of the Baby Boomer generation indicated they do not always feeling adequate using technology in the classroom. Another Baby Boomer participant commented, "Technology skills have well surpassed my skills. I cannot multitask with technology. Other generations get frustrated with my speed of technology use."

Generation X participants also identified a significant concern regarding the use of technology and the "technological divide" that seems to exist between the oldest generation and the youngest generation. One Generation X participant wrote, "They [Baby Boomers] don't

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know much about the technology. Younger teachers assume that you know everything that they do about technology. . . . They are energetic and eager to find the quickest, easiest solutions."

Generation Y participants similarly identified understanding technology and awareness as a significant challenge that existed between themselves and older generations. Their responses tended to convey older generation teachers as reluctant to use technology and embrace technological methodologies. One Gen Y participant commented, "Technology and the constant change of how to teach today's learners becomes a problem for older teachers who are stuck in their teaching method." However, they also expressed concern when held primarily responsible for understanding the latest technology, since they are of the "tech generation." One young teacher wrote, "Teachers outside the 'tech generation' expect the younger teachers to take care of anything computer-wise: formatting tests, finding video clips, etc." However, simply being a member of the "tech generation" and being able to understand and apply the latest technology are not necessarily the same thing.

Differing values and work ethic. The Baby Boomer participants commented more on the issues of differing values and work ethic than either Generation X or Y participants. Some issues mentioned related to stage of life and family concerns. As one Baby Boomer acknowledged, "Values and priorities are different, mainly because they are just starting a family and I am an empty nester." Other comments had a more critical tone of social behavior and personal values of younger teachers, e.g., "Younger teachers seem to be more and more uncaring of the moral expectations that teachers have always lived up to. They seem to drink and party more than teachers used to. At least in public." Yet another Baby Boomer stated, "Younger teachers are lazier than older ones. They want everything handed to them and aren't willing to work to learn their craft. Therefore many of them stagnate for years without growing into better

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teachers." Working together can be difficult when each generation views work and its demands differently. Again, a Baby Boomer acknowledged this difference, "It has been hard to agree on some time issues - deadlines and shared responsibility mean different things to people of different generations."

Lack of knowledge and experience. Almost as many Baby Boomer (n = 10) participants mentioned the lack of knowledge and experience as a significant challenge among the various generations as mentioned technology and differing values (n = 11), but almost no Generation X (n = 2) or Generation Y (n = 1) participants acknowledged this as an issue. One Baby Boomer participant commented, "The younger generation of teachers are not equipped to meet the challenges of having a special needs student in their classroom." Another Baby Boomer succinctly stated, "What younger teachers don't always realize is that education is so dynamic that each new school year provides many of the same challenges I faced when I was a beginning teacher." Yet another Baby Boomer summarized strong feelings:

> I sometimes feel that the administration and teachers from a younger generation than I do not appreciate my experience. Sometimes they are overly bubbly and enthusiastic about new programs that haven't been proven locally and will probably go by the way side by the next school year. In other words, sometimes they don't seem realistic about expectations of the students or the school administration. Younger teachers don't put in the effort or hours that I do because they have young families and have other concerns after school.

The only Generation Xer who noted a lack of knowledge and experience as a challenge admitted, "Sometimes it can be intimidating to present new or different ideas. At times it can

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feel like your thoughts or experiences are disqualified simply because you don't have the experience."

This open-ended question provided the participants an opportunity to respond to generational challenges they observe in their school. An "unwillingness to change" was the most frequently mentioned concern across all generations, while "understanding new technology," "differing values and work ethic," and "lack of knowledge and experience" were much more frequently mentioned by the Baby Boomers than the other generational cohorts. As the comments indicated, individuals do actually perceive observable challenges and differences among teachers of other generations.

Open-ended Question: Benefits

Table 2 presents the results of this content analysis for the second open-ended question. A discussion of these factors follows the table.

Table 2

Results from Open-Ended Question: Benefits

Q2: Please describe some benefits of working with people of other generations.

	Frequency			
Factor	Baby Boomer	Gen X	Gen Y	Total
Sharing/gaining from experience	6	10	9	25
Seeing things from a different perspective	8	4	6	18
Learning new technology	11	4	2	17
Learning from each other	11	3	1	15
Enthusiasm and energy	10	1	0	11

Sharing/gaining from experience. The second question was about the benefits of working with people of other generations. Although participants from all generations recognized

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the benefits of experience, Generation X and Generation Y participants mentioned this more frequently than Baby Boomers. Several respondents referred to the older Baby Boomer generation as willing to share their wealth of experience to a younger generation of teachers. A young Generation Y teacher recognized the importance of the older teacher's experience, "I am teaching with teachers who taught me and I am still learning from them. They have a lot of knowledge and ideas that administrators don't always give them credit for." Moreover, several of the younger generation of teachers acknowledged the give and take benefits of generations working together. A Generation Y teacher wrote of the multigenerational team helping each other for the benefit of all:

> I work with seven other teachers. Five of the teachers are 40 years old and up. Most have been teaching for 25 plus years. Myself and one other are in our twenties. I love working with these experienced teachers. They have taught me so much, and I have taught them so much. Modern technology is easier for me to adjust to compared to the older teachers. It makes for a good balance.

Generation Xers are in a position to benefit from both older teachers' experience and the "fresh approach" younger teachers bring to the workplace. One Generation X participant commented:

> There is a benefit of working with teachers older as well as younger. Younger teachers are able to offer new, fresh approaches to teaching concepts. They are usually more positive and open to change. Older teachers come with experience and often have advice on how to handle situations that they may have dealt with at one time or another.

Even the older generation participants recognized that everyone has something to contribute. A Baby Boomer, in true teacher fashion, recognized, "It is exciting to share what I have learned

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after teaching for 27 years with younger teachers. I also like to hear their new ideas and strategies. There is always something new to learn."

Different perspectives. Acknowledging differences in perspective can provide benefits to the working environment. One Baby Boomer teacher stated, "I have loved seeing the different perspectives of the younger teachers. I love their energy, fresh outlook, and idealism. It really gives new life to my teaching, and I appreciate their dedication and affection to the children." A Generation Y teacher also commented on the importance and benefit of sharing different perspectives on life and teaching, which can contribute to a positive school environment and teamwork:

> I enjoy gathering and discussing, trading, sharing ideas that worked in the classroom, activities that students enjoyed while meeting the standard being taught at its specificity. I believe working together as a group generates more ideas as to better prepare students for the future. It also builds a grade level, to seek out to each other for direction and planning.

Learning new technology. As with challenges, respondents also discussed learning new technology as a benefit when working with multigenerational cohorts. However, a much larger number of older teachers recognized this benefit as compared to the younger generations. A recurring comment was the younger teachers could help their older colleagues with the technical skills required in the classroom. A Baby Boomer teacher expressed her appreciation for the help and level of technical skill younger teachers bring with them when she commented, "I've loved working with the new generation of teachers. They are extremely knowledgeable about technology and helpful to me in my quest to at least begin to catch up." Another Baby Boomer

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teacher stated, "I especially look for new ways to bring technology into my classroom in innovative ways, and look to younger teachers as a resource."

Learning from each other. The sharing of ideas and learning from each other was another benefit more often mentioned by the Baby Boomer generation than the other two generational cohorts were. A Generation X teacher believed both the older and younger teacher contributed to the work environment:

> Older generations have great ways and strategies to deal with kids that are sometimes hard to deal with. Younger generations bring all sorts of new and inventive ideas to the 'teaching table.' All in all, we all have things to learn from each other – we just have to be willing to talk about our ideas.

A Generation Y teacher wrote of the mutual relationship between the older "teacher" and the younger "learner" by stating, "You can learn so much from the ones who are willing to teach you."

Enthusiasm and energy. Similar to the two previous most often mentioned benefits of working in a multigenerational environment, the Baby Boomer teachers identified enthusiasm and energy much more often than were younger generation teachers. One Baby Boomer stated, "Younger teachers have enthusiasm that can be contagious. Some younger teachers also bring new ideas and teaching methods that are inspiring." The vitality and youth the younger generation brings with them can be encouraging to an older generation teacher, as this teacher commented, "Working with younger people, keeps me young too! I love the new ideas and enthusiasm of the younger teachers on our campus."

This second open-ended question asked participants to reflect on the benefits of working with teachers of other generations. "Sharing/gaining from experience" and "Seeing things from

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a different perspective" were the two most frequently mentioned benefits by all three generational cohorts. "Learning new technology," "learning from each other," and "enthusiasm and energy" were also identified as benefits, but much more often by the Baby Boomers. The comments indicate teachers recognize there are benefits of working with colleagues of other generations. However, the findings also indicate differences do exist between generational cohorts even when identifying these benefits.

Recommendations

The first open-ended question was about challenges when working in a multigenerational work environment, and the second was about the benefits. It was evident that different perspectives existed among the generations, but similarities did as well. For example, while teachers from all generations mentioned the greatest challenge was an unwillingness to change, considerably more Baby Boomers mentioned other challenges related to understanding new technology, differing values and work ethic, lack of knowledge and experience, and communication. With respect to the benefits of working in a multigenerational environment, respondents from all generations mentioned sharing/gaining from the experience of older generations and seeing things from different perspectives. However, a much larger number of Baby Boomer teaching professionals also identified learning new technology, learning from each other, and enthusiasm and energy as additional benefits. The younger teaching professionals rarely mentioned these ideas, if at all. The participants not only recognized the challenges of working with teachers of other generations, but also acknowledged the benefits of the contributions all generations make to the school environment and the ultimate mission of educating children. However, it is interesting to note Generation X and Generation Y teaching professionals tended to focus only on one or two challenges or benefits, while Baby Boomers

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tended to mention several in each area. The participants identified challenges and benefits of working in a multigenerational setting. One hundred-twelve participants responded to the question regarding challenges, and 103 participants responded to the question regarding benefits. This high response rate for the open-ended questions could indicate the topic of generational differences is of considerable interest, and concerns are actually present in the workplace. Lovely and Buffum (2007) stated the current public school workforce is a setting with distinct generational cohorts. Each of the generations is characteristically different, and they represent perceived differences to the workplace.

Building a positive school culture includes acknowledging teaching professionals from various generations do differ in how they view their work. Educating teachers about generational differences could help them understand one another better. Teachers can learn not only to accept, but also value, each other's differences and strengths. Multigenerational awareness can make the faculty more understanding and more productive when facing the challenges of the workplace. The school leaders should acknowledge and understand the differences between generational cohorts when leading a diverse workforce (Lancaster & Stillman, 2002; Zemke et al., 2000). The qualitative findings indicated a number of challenges, as well as benefits, exist when working in a multigenerational workplace. Members of all three generations recognized the unwillingness to change as a challenge in the school environment, predominately on the part of the older generation. When school leaders introduce change (e.g., approaches, techniques, and curriculum); they must be intentional in explaining the need for changes, how changes can benefit student achievement, and provide guidance to teachers during the changes. Veteran teachers, in particular, need to understand that regardless of the way they may have been *doing things*; there can be opportunities to improve.

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The participants also identified the challenge of understanding new technology. Older generations are perceived by the younger generations as unwilling, or even unable, to use new technology. Conversely, older generations expect the younger generation to not only master but also be ready to explain the use of any new technology. One recommendation related to this finding is to provide technology training utilizing a multigenerational approach of younger and older teachers teaming together to learn and integrate technology into the classroom. Moreover, design technology training to coincide with the comfort level of the individual teachers. Instead of training with a one-size-fits-all mindset, design training to gradually introduce new technology, provide support to the teacher, and model how to integrate technology into the classroom successfully. Veteran teachers, although certainly not novices in the classroom, are often novices when learning new technology. Properly designed training can provide support and ease veteran teachers into the new technology. Conversely, younger teachers tend to be more comfortable with new technology and could often relate to faster-paced instruction on new techniques.

Conclusion

School leaders need to be aware of the generational landscape of their school. The mix of generations can be both a challenge and benefit to the school environment. Leadership should examine opportunities to build positive relationships between teachers of different generations. Moreover, school leaders cannot assume all teachers are of one mindset. Teachers of different generations do hold different perceptions, as indicated in the study. As identified in this study, generational differences were a contributing factor in how young professionals perceive the school culture and their work environment. Exploring the perceptions and attitudes of how to retain young Generation Y teachers in American schools needs additional research. Baby

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Boomer teachers are already retiring and will continue to do so in large numbers, taking with them their invaluable experience. Compounding their departure is a younger generation of teachers who are not staying in the profession more than three to five years. American schools could experience a shortage of qualified teaching professionals in the next few years. School leaders need to build and maintain an effective workforce to carry out the mission of educating the children of this country. A school culture that is collaborative and inclusive to all generations of teachers is crucial. Understanding the challenges inherent in a multigenerational workplace is one of the first steps toward creating an effective and supportive environment, which will welcome and encourage teaching professionals of all generations.

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SYSTEMATIC CLASSROOM OBSERVATIONS OF FIRST-YEAR TEACHER INTERNS' PEDAGOGICAL TECHNOLOGY INTEGRATION IN SECONDARY SCHOOLS

Nancy Dubinski Weber, M.Ed.
Texas A&M University

Hersh C. Waxman, Ph.D.
Texas A&M University

Abstract

One of the critical challenges of teacher education programs is to prepare future teachers to use technology to facilitate 21st Century learning for their students. Although there have been many studies investigating preservice teachers perceptions of usefulness of technology, attitudes toward computer use, and self-efficacy for using technology, there have been very few studies that have actually observed the extent to which novice teachers use technology in their classrooms. This study examined 30 teacher interns' use of technology during their first year of teaching to answer the following questions: (1) what technology is available in the classrooms of first-year secondary teachers?; (2) to what extent is the available technology used by first-year secondary teachers?; (3) how do first-year secondary teachers integrate technology into their instruction?; and (4) how do students in the first-year secondary classrooms use technology? A series of MANOVAs and follow-up ANOVAs were conducted to answer these questions. The current study demonstrated fairly consistent use of technology by both teachers and students across the Fall and Spring semesters. Technology use was rarely student-centered, but the quality of the overall use of technology improved from the fall to the spring.

Introduction

Much research has been done to examine how technology is being infused into teaching and learning and to determine what effects, if any, this growing trend has on student achievement. In their 2013 meta-analysis, Lee, Author, Wu, Michko, and Lin synthesized 58

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studies over the past 15 years to examine the effects of teaching and learning with technology on student outcomes. Overall, they found that technology integration in classroom instruction has positive effects on both students' cognitive and affective outcomes. They also suggested that the impact of technology on student outcomes increases as new developments in technology emerge and it becomes more prevalent in classroom pedagogy (Lee et al., 2013).

The integration of technology into the classroom provides teachers with more numerous and flexible ways to share information (Campbell & Martin, 2010) and allows students to become more proactive in their learning experience by individualizing the acquisition and evaluation of knowledge (Ma, Andersson, & Streith, 2005). Teacher technology use generally includes: instructional planning and preparation, delivery of instruction, instructional accommodation and modification, professional communication, and directing and assisting students with technology for specific instructional purposes (Russell, Bebell, O'Dwyer, & O'Connor, 2003). Through technology use, students can conceptualize and actualize ideas in ways that are not otherwise possible (Cuban, Kirkpatrick, & Peck, 2001). Technology-driven lessons tend to require students to produce representations of their knowledge and understanding, often making them more student-centered than traditional lessons that do not include technology components (Inan, Lowther, Ross, & Strahl, 2010; Lowther, Ross, & Morrison, 2003).

The infusion of technology into the learning environment can ease interaction, communication, and collaboration between students. Technology allows for digital convergence (Campbell & Martin, 2010) where a single device, like an interactive whiteboard or a tablet, can combine the features and abilities of several devices into a simplified device or system, digitizing teaching and learning. Increased access to technology creates a more active learning environment, increases student engagement, and improves student proficiency at using

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technology as a learning tool (Lowther, Ross, & Morrison, 2003). The goal of technology integration into the classroom is to improve student learning, but simply using the technology will not guarantee improved student learning (Lei & Zhao, 2007).

Pre-Service Teacher Preparation for Technology Integration

Pre-service teachers should receive training on how to effectively use technology and integrate it into their teaching. Since the quality of technology use is more critical to student learning than quantity is (Lei & Zhao, 2007), there has been an ongoing effort to improve teachers' use of technology in the classroom (Campbell & Martin, 2010; Clausen, 2007). This emphasis has generated numerous studies and recommendations regarding the importance of teacher preparedness and belief in technology incorporation as well as best practices for preparing new teachers to meaningfully integrate technology into their teaching.

Pre-service teacher education should focus on teachers' pedagogical readiness and beliefs regarding technology integration as well as basic technology competencies and skills (Inan, Lowther, Ross, & Strahl, 2010). The teachers' overall developmental process includes their own K-12 experiences as students, their teacher education coursework, their preparatory field experiences, and their induction and early career teaching experiences (Feiman-Nemser, 2011). Although new teachers often have excellent technology for their own personal or professional practice, they typically struggle with how to integrate technology into their instruction. Early career teachers tend to question the effectiveness of using technology for instructional purposes because they believe that use of technology in the classroom increases classroom management issues (Russell et al., 2003). To combat this resistance, they must acquire the knowledge and skills that will help them figure out how technology can function within their own pedagogy and in what capacity to most effectively influence positive student learning outcomes (Inan et al.,

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2010). Their attitudes and beliefs toward technology greatly influence how they adopt and use it in their classrooms (Russell et al., 2003).

The potential of technology integration into classroom teaching and learning cannot be fully realized unless teachers are adequately trained and prepared to effectively use it for instructional purposes (Russell et al., 2003). Teacher preparation programs should allow pre-service teachers to experience how technology can enhance teaching and learning through examples and models (Russell et al., 2003). This can be accomplished by including training for integrating technology into pedagogy (Lee, Author, Wu, Michko, & Lin, 2013) by introducing teachers to technology devices and applications that are available for classroom use so that they can become conversant and aware of how it can affect their professional practice (Campbell & Martin, 2010; Russell et al., 2003). This introduction should occur gradually and with continued support (Inan et al., 2010) as teacher educators model effective technology use and integration into their own instruction (Campbell & Martin, 2010). Once teachers are comfortable with basic integration, training should focus on how technology can enhance student-centered learning through collaboration, higher-order thinking, and scaffolded student independence (Inan et al., 2010). Teachers' perception of technology's usefulness and ease of use are key determinants of their intention to integrate technology into their instruction and its use in the classroom (Ma, Andersson, & Streith, 2005)

School Contexts for Technology Integration

For the past two decades, federal policy has reflected a commitment to technology integration in classrooms through the development and implementation of student technology use standards (U. S. DOE, 1996, 2001, 2003). This national push for increased technology availability and use has not led to improvement in technology-rich pedagogy; computers and

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other devices continue to be mainly used to present content, for drill and practice, or for educational games (Inan et al., 2010). This assertion has been supported by studies indicating that the internet browser is the most commonly observed computer application, along with word processing and presentation tools (Inan et al., 2010; Lei & Zhao, 2007).

Clausen (2007) reports the International Society for Technology in Education (ISTE)'s list of essential teacher education and school contexts for effective technology use by beginning teachers, which includes: a shared vision for technology's role in education, access to the necessary technology, educators skilled in content and instructional knowledge, professional development for effective integration, technical assistance for technology use, content standards and curriculum resources to guide instructional planning and delivery, student-centered teaching methodology, assessment, community support for technology-driven pedagogy, and campus and district policies that support technology use. School contexts that support and value instructional technology use increase the chances that new teachers who were equipped by their preparation programs to use technology, will do so (Clausen, 2007). This increased access to technology lets students pursue learning beyond the walls of the classroom, allowing them to keep up with the growing social and professional demands for success (Collins & Halverson, 2009).

Challenges to Technology Integration for First-Year Teachers

For effective implementation of technology, teachers need: proper training and support, confidence in their own ability to use technology to enhance their pedagogical practice and students' learning, and time to develop effective technology-driven lessons (Campbell & Martin, 2010). Vannatta and Fordham (2004) found that higher levels of classroom technology use is best predicted by the amount of technology training a teacher receives as well as the amount of time the teacher spends outside the classroom preparing for instruction, and the teacher's

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openness to change, regardless of teaching philosophy or self-efficacy for teaching. Though access, training, and policy have become more supportive of technology integration in the classroom, high-quality use has remained low, suggesting the presence of other barriers, like teachers' pedagogical beliefs (Ertmer, 2005).

The first year of teaching is a period of survival and adaptation as novice teachers engage in trial-and-error regarding instructional practices, classroom management, and curriculum development while reconciling their own personal views and ideals with reality (Clausen, 2007). First-year teachers tend to view technology as separate from their regular instructional practices and therefore feel it is an additional step to integrate it into instruction, limiting its use (Clausen, 2009).

Purpose of the Study

Although there have been many studies that have investigated preservice teachers perceptions of usefulness of technology, attitudes toward computer use, and self-efficacy in using technology (Teo, 2010; Whitacre & Pena, 2011), there have been very few studies that have actually observed the extent to which novice teachers use technology in their classrooms. Most studies assessing technology use have relied on self-report data from administrators or teachers (e.g., McKinney, Chappell, Berry, & Hickman, 2009; Vannatta & Fordham, 2004). These types of data are often unreliable and tend to be upwardly biased in the direction of over reporting the actual amount of technology use (Cuban, 2001). Few researchers have actually gone into classrooms to see how teachers and students actually use technology daily (Cuban, 2001). There have only been a few studies that have used systematic classroom observations to investigate technology use in classrooms (Padrón, Author, Lee, Lin, & Michko, 2102; Author, Evans, Boriack. & Kilinc, 2013), but these studies have not focused on first-year teachers.

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Observation research allows for the study of naturalistic classroom settings to collect detailed information regarding any number of educational components, including student-teacher interactions (Pianta, la Paro, Payne, Cox & Bradley, 2002), instructional quality (Stuhlman & Pianta, 2009), specific teaching and learning behaviors (Author, Padrón, Franco-Fuenmayor & Huang, 2009), and technology integration (Inan, Lowther, Ross & Strahl, 2010). Classroom observation protocols focus solely on the aspects of teaching and learning that can be reliably observed and assessed (Hamre et al., 2013). In the present study, we used the *T3 Overall Classroom Observations Measure* to answer the following questions: (1) what technology is available in the secondary classrooms of first-year teachers?; (2) to what extent is the available technology used by first-year secondary teachers?; (3) how do first-year secondary teachers integrate technology into their instruction?; and (4) how do secondary students in the first-year teachers' classrooms use technology?

Methods

Participants

Each of the 30 participants was a first-year intern teacher as well as a student in a Master's of Education program with an embedded secondary initial teaching certification at a large research-based university in Texas. Technology training is a key component in the certification program, and each candidate is issued an iPad at the beginning of training for use in their own teaching practice. The interns held teaching positions at a variety of middle and high school campuses in both rural and urban areas across the state. Their teaching assignments varied, including English/language arts/reading, mathematics, social studies, science, foreign language, and professional communication from grades eight through twelve.

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Instrument

The *T3 Overall Classroom Observation Measure* was adapted for the present study from the *Classroom Observation Measure* (COM) (Ross & Smith, 1996), which measures the extent to which various instructional strategies are observed throughout the course of a single class period. The *T3* instrument includes an inventory of what technology is available in the classrooms and the extent of its use as well as items that address the technology use and instructional behaviors of both teachers and students. At the beginning of the observed class period, the observer surveyed the classroom and indicated what types of technology were available and in what quantity. At the closing of each observation, the observer indicated the degree to which each type of technology was integrated into the teaching and/or learning and to what extent each type of technology use and instructional behavior occurred (1 = "not observed at all," 2 = "some extent (once or twice)," or 3 = "great extent (3 or more times)"). At this point, the observer also rated the classroom on its overall implementation of technology, using a 5-point scale (0= no use of technology; 1=low-level use of technology; 2=somewhat meaningful use of technology; 3=meaningful use of technology; 4=very meaningful use of technology). The mean inter-observer agreement across all observers was high ($\kappa = 0.87$).

Data Collection

The observation data was collected systematically over the course of single secondary class periods. These class periods were typically 50 minutes with a range of 45 to 90 minutes, depending on grade level and campus schedule. Each teacher and classroom was observed twice: once during the Fall semester and once during the Spring semester. Different class periods were observed each semester for all of the teachers.

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Data Analysis

To examine the (a) technology available, (b) use of the available technology, (c) teacher use of technology, (d) student use of technology, (e) teacher instructional behavior, (f) student instructional behavior, and (g) the rating for overall use of technology across the fall and spring semesters, a MANOVA and an ANOVA was conducted for each section. Changes from fall to spring captured any significant growth in technology use and instructional behaviors observed across the thirty teachers and their classrooms.

Results

Table 1 reports on the technology available in the 30 observed classrooms. Generally, the devices available for teacher and student use remained constant across the school year. Some devices intended for individual use, like mp3 players/iPods and DVDs/CDs and headphones, varied slightly in observed availability across the two semesters due to whether or not they were being used in the classroom and therefore were visible to the observer. Other larger devices, like interactive whiteboards/SMART boards, laptop and desktop computers, televisions, document readers, and projectors, varied in availability across the two semesters because several of the teachers floated in to different classrooms or held a class in either the library or the computer lab. Regardless of these small variations, there were no significant differences between semesters regarding the availability of technology. Overall, the predominant type of technology available was laptop computers (M=3.57, SD=8.63), followed by desktop computers (M=2.83, SD=6.20), and finally tablets/smartphones (M=2.23, SD=6.43). Two noteworthy things should be pointed out: (a) overall there was limited availability of technology, and (b) the standard deviations for several of the items are large due to the large variation of available technology across teachers' classrooms.

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Table 1

ANOVA and MANOVA Results Between Semesters for Available Technology

			Fall, 2013		**Spring, 2014**		
	df	*F*	*M*	*SD*	*M*	*SD*	*F*
Technology Availability	9	1.129					
MP3 player/iPod			0.13	0.35	0.00	0.00	
Interactive whiteboard/SMART board			0.40	0.50	0.37	0.49	
DVDs/CDs & headphones			0.03	0.18	0.00	0.00	
Laptop computer			2.43	7.51	4.70	9.61	
Desktop computer			2.30	4.43	3.37	7.62	
Television			0.13	0.35	0.20	0.41	
Document reader			0.43	0.57	0.53	0.51	
Projector			0.70	0.47	0.87	0.35	
Tablet/smartphone			1.43	4.99	3.03	7.60	

Note: The "Tech Availability" items represent the actual number of specific types of technology observed in the classroom.

Table 2 reports the overall findings for use of the available technology. There are no significant differences in average use for any device between the fall and spring semesters. Overall, projectors were the device most frequently used (*M*=1.93, *SD*=0.76), as they were used in tandem with both desktop (*M*=1.88, *SD*=0.72) and laptop (*M*=1.47, *SD*=0.77) computers, as well as document readers (*M*=1.28, *SD*=0.61). Interactive whiteboards/SMART boards (*M*=1.37, *SD*=0.71) were also used with some of the projectors, but very rarely were their unique capabilities utilized; they were predominantly used as simply screens to project material on to.

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Table 2

ANOVA and MANOVA Results Between Semesters for Technology Use

			Fall, 2013		Spring, 2014		
	df	*F*	*M*	*SD*	*M*	*SD*	*F*
Technology Use	8	0.922					
MP3 player/iPod			1.20	0.55	1.00	0.00	
Interactive whiteboard/SMART board			1.47	0.78	1.27	0.64	
Laptop computer			1.40	0.72	1.53	0.82	
Desktop computer			1.90	0.71	1.87	0.73	
Television			1.03	0.18	1.03	0.18	
Document reader			1.27	0.58	1.30	0.65	
Projector			1.93	0.78	1.93	0.74	
Tablet/smartphone			1.23	0.57	1.40	0.72	

Note: All "Technology Use" items used the following key*:* 1=not observed at all; 2=some extent (once or twice); 3=great extent (3 or more times).

Table 3 displays the overall findings regarding teacher use of technology. Overall and across the two semesters, the most commonly observed variables were teacher integrated technology into lesson (*M*=2.25, *SD*=0.70) and teacher used technology to display material/assignment (*M*=2.13, *SD*=0.72).

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Table 3

ANOVA and MANOVA Results Between Semesters for Teacher Use of Technology

			Fall, 2013		Spring, 2014		
	df	*F*	*M*	*SD*	*M*	*SD*	*F*
Teacher Use of Technology	9	1.473					
Teacher integrated technology into lesson			2.23	0.68	2.27	0.74	
Teacher assisted students with technology			1.13	0.51	1.47	0.78	
Teacher used technology as a communication tool (e.g., Skype, email/chat)			1.10	0.31	1.00	0.00	
Teacher used technology to create lessons			1.13	0.35	1.13	0.34	
Teacher used technology to access the internet			1.17	0.46	1.30	0.60	
Teacher used technology to display material/assignment			2.23	0.73	2.03	0.72	
Teacher used technology to assess/correct assignment			1.00	0.00	1.13	0.34	
Teacher used technology as a communication tool			1.10	0.40	1.10	0.40	

Note: All "Teacher Use of Technology" items used the following key*:* 1=not observed at all; 2=some extent (once or twice); 3=great extent (3 or more times). * $p < .05$

Table 4 reports the overall findings for the students' use of technology. The Multivariate Analysis of Variance (MANOVA) results revealed a significant multivariate effect for semester. Follow-up univariate tests revealed that the students (a) used technology to access the internet, (b) used technology for assessment purposes, and (c) used technology to produce new knowledge so a significantly greater extent during the spring semester than they did during the fall. Though these three uses increased from the first to the second semesters, across the entirety of the school

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year, the students consistently and predominantly used technology to learn basic skills through drill and practice.

Table 4

ANOVA and MANOVA Results Between Semesters for Student Use of Technology

			Fall, 2013		**Spring, 2014**		
	df	*F*	*M*	*SD*	*M*	*SD*	*F*
Student Use of Technology	8	3.354*					
Students used technology to enhance problem solving/creativity			1.17	0.53	1.23	0.63	
Students used technology to learn basic skills (e.g., tutorials, drill, & practice)			1.83	0.79	1.57	0.73	
Students used technology to access the internet			1.07	0.37	1.57	0.86	8.62**
Students used technology as a communication tool (e.g., Skype, email/chat)			1.03	0.18	1.00	0.00	
Students used technology for word processing			1.03	0.18	1.10	0.40	
Students used technology for assessment purposes (e.g., individualized tracking , Accelerated Reader)			1.00	0.00	1.23	0.63	4.167*
Students used technology for independent inquiry/research			1.13	0.51	1.30	0.76	
Student used technology to produce new knowledge			1.07	0.37	1.40	0.77	4.589*

Note: All "Student Use of Technology" items used the following key*:* 1=not observed at all; 2=some extent (once or twice); 3=great extent (3 or more times). * $p < .05$

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Table 5 reports the overall findings for the teachers' instructional behaviors. The Multivariate Analysis of Variance (MANOVA) results demonstrated a significant multivariate effect for semester. Follow-up univariate tests revealed that the teachers used a variety of modalities, including auditory, visual, and movement significantly more during the fall semester than they did during the spring, indicating that they reduced the amount that they varied their instructional modes during a single class period. The rest of the teachers' instructional behaviors remained fairly constant across the school year and there were significant differences. The year total means reveal that the most commonly observed teacher instructional behaviors were: (a) teacher allowed students to develop concepts or procedures (M=2.60, SD=0.59), (b) teacher asked many open-ended questions (M=2.70, SD=0.53), (c) teacher provided adequate feedback to students (M=2.77, SD=0.46), and (d) teacher appeared to have warm, supportive relationships with students (M=2.72, SD=0.49).

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Table 5

ANOVA and MANOVA Results Between Semesters for Teacher Instructional Behaviors

			Fall 2013		Spring 2014		
	df	*F*	*M*	*SD*	*M*	*SD*	*F*
Teacher Instructional Behaviors	14	2.017*					
Teacher actively facilitated students' engagement in activities and lessons to encourage participation			2.57	0.57	2.53	0.57	
Teacher applied new concepts to similar situations (elaborated)			2.00	0.69	1.80	0.66	
Teacher connected ideas and concepts			2.57	0.57	2.40	0.67	
Teacher acted as coach/facilitator			2.63	0.56	2.50	0.57	
Teacher allowed students to develop concepts or procedures			2.57	0.57	2.63	0.61	
Teacher provided students opportunities for problem solving			2.40	0.50	2.37	0.67	
Teacher asked many open-ended questions			2.80	0.41	2.60	0.62	
Teacher provided adequate feedback to students (answers, information, etc.)			2.83	0.46	2.70	0.47	
Teacher provided direct instruction for the entire class			2.00	0.64	1.87	0.63	
Teacher related concepts to students' actual lives			2.23	0.77	2.03	0.72	
Teacher used a variety of modalities, including auditory, visual, and movement			2.27	0.64	1.83	0.70	6.275*
Teacher varied styles of conversation and participation to include students' cultural preferences			2.03	0.76	2.20	0.61	
Teacher offered encouragement to students' efforts that increased students' involvement and persistence			2.57	0.63	2.57	0.63	
Teacher appeared to have warm, supportive relationships with students			2.63	0.55	2.80	0.41	

Note: All "Teacher Instructional Behaviors" items used the following key*:* 1=not observed at all; 2=some extent (once or twice); 3=great extent (3 or more times). * $p < .05$

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Table 6 displays the overall findings for student instructional behaviors. There are no significant differences between the fall and spring semesters in this area. The most commonly observed variables across the school year were: (a) students initiated and assumed responsibility for learning activities (*M*=2.58, *SD*=0.53), (b) students were engaged in classroom activities (*M*=2.58, *SD*=0.53), and students' activities were learner-centered (*M*=2.63, *SD*=0.58).

Table 6

ANOVA and MANOVA Results Between Semesters for Student Instructional Behaviors

			Fall, 2013		**Spring, 2014**		
	df	*F*	*M*	*SD*	*M*	*SD*	*F*
Student Instructional Behaviors	6	0.669					
Students initiated and assumed responsibility for learning activities			2.57	0.57	2.60	0.50	
Students connected ideas and concepts			2.37	0.56	2.37	0.56	
Students utilized different ways to answer			2.00	0.79	1.87	0.73	
Students were engaged in classroom activities			2.57	0.57	2.60	0.50	
Students' activities were learner-centered			2.53	0.68	2.73	0.45	
Students solved problems using real objects in the classroom environment			1.43	0.68	1.37	0.67	

Note: All "Student Instructional Behaviors" items used the following key*:* 1=not observed at all; 2=some extent (once or twice); 3=great extent (3 or more times). * $p < .05$

Table 7 displays the analysis of variance (ANOVA) results for the quality rating addressing the overall use of technology. There is a significant difference between the two

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semesters, showing an average growth of .67 points from the fall to the spring, which represents movement toward more meaningful use of technology in the observed classrooms.

Table 7

ANOVA Results Between Semesters for Overall Use of Technology

			Fall, 2013		**Spring, 2014**	
	df	*F*	*M*	*SD*	*M*	*SD*
Overall use of technology	1	5.206*	1.53	1.04	2.20	1.21

Note: The "Overall Use of Technology" item used the following key*:* 0=no use of technology; 1=low-level use of technology; 2=somewhat meaningful use of technology; 3=meaningful use of technology; 4=very meaningful use of technology. * $p < .05$

Discussion

Many factors affect how and to what extent technology is implemented in the classroom, such as: availability and access; teachers' attitudes toward integration and perception of technology's importance, usefulness, and ease of use in the learning environment; and teachers' perceptions of their own competence with regard to technology integration (Ma, Andersson, & Streith, 2005). Effective integration is especially challenging for first-year teachers because there are many personal, contextual, and professional issues that affect, when, and how first-year teachers integrate technology into their pedagogical routines (Clausen, 2007).

The current study demonstrated fairly consistent use of technology across the Fall and Spring semesters. While the available devices varied somewhat widely from classroom to classroom, laptop and desktop computers as well as projectors were dominantly used. When technology was integrated into the instruction, it was largely used by teachers as a simple content delivery tool for students to take notes and attempt practice problems. Technology use was rarely student-centered, as students had little opportunity for individualized use for exploration or inquiry, or even to produce new knowledge or create products with technology. These findings may be attributed to the students' limited access to individual technology devices and

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applications; however, that is not the only explanation. Teachers must be willing to not only participate in technology training, but also they must commit time and effort to explore the technology and figure out how to best use it in their own classrooms (Vannatta & Fordham, 2004). The first year of teaching is often an overwhelming experience in itself as novice teachers are inundated with challenges related to instruction and classroom management. While they are focused on managing that induction year, they may not see technology training, practice, and lesson development as primary concerns.

Although the way technology was accessed and used remained generally constant across the school year, the quality of the overall use of technology improved from the Fall to the Spring semester. In the Fall, the novice teachers were between "low-level use of technology" and "somewhat meaningful use of technology." In the Spring, the teachers were transitioning beyond "somewhat meaningful use of technology" toward "meaningful use of technology." This progress indicates increased familiarity and comfort with their role as teacher as well as with technology integration itself, demonstrating a willingness to make changes and take instructional risks as part of the learning process (Vannatta & Fordham, 2004).

In our technology-driven world, all students, including those in teacher preparation programs, must have the opportunity to learn to be tech-savvy and to adapt to the evolving demands of our social and professional worlds. To this end, it is important that researchers continue to explore the nature of preparing new and experienced teachers to integrate technology into their classroom pedagogy, while school districts and campuses must seek out ways to increase access for teachers and students alike. It is vital for teacher educators to prepare future teachers to use technology to facilitate 21st Century learning for their students. To do so, they must to understand how technology is used in schools and what effects those uses have, both

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good and bad, to ensure that students are using it in ways that are meaningful (Lei & Zhao, 2007). Teacher educators must make a conscious effort to educate themselves about the role technology can and should play in classroom pedagogy and pass that knowledge and those skills along to their teacher candidates to make technology integration a natural and accepted part of the teaching profession. Without further research in this area, augmented support from schools and districts, and increased and continued efforts on the part of teacher educators, the quality of technology use in classrooms will not improve.

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ATTITUDINAL AND BEHAVIORAL BARRIERS OF TECHNOLOGY ADOPTION BY TEACHERS

Sandra Fleming, B.S.
Sam Houston State University

James Hynes, Ph.D.
Sam Houston State University

Abstract

Effective use of technology by teachers models appropriate use and encourages technological gains for students. Using technology in the classroom is not a luxury anymore; it is an expectation of students and parents. Students who have been holding technology in their hands since before their first birthday speak a new digital language and it is imperative that the educational setting keep up with the students' needs. Many teachers are still not embracing technology in the classroom and this study aims to determine the attitudes and behaviors that are preventing teachers from adopting technology in their classrooms. In this qualitative research study, 25 elementary school teachers in south central Texas were interviewed. Findings include teachers are overwhelmed by the available technology, problems with the hardware, and restraints on time because of mandated state standardized testing.

Introduction

Technology continues to evolve in the field of education. Students today live in a digital environment where they have instantaneous access to information via their smart phone, a tablet, gaming device, or laptop. They communicate with other students all over the world through on-line gaming sites, Facebook, and twitter. In essence, the language of education is changing and technology has played a large role. If the education system is to keep up with the rate at which our students are learning and developing, it is essential that educators begin to speak their digital

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language in order to meet their ever-growing needs. Herein lies a significant issue in education: some teachers are not adopting or are slow to adopt technology into their classrooms. This study aims to answer the question: What is holding educators back from adopting technology in their classrooms?

Reviewing the literature has pinpointed various beliefs and attitudes that have kept teachers from adopting the use of technology in their classrooms. The purpose of this study is to seek out the attitudinal and behavioral barriers toward adoption of new technology by late adopters in education. By understanding what is causing teachers to either not adopt, or to abandon technology, administrators can make necessary changes in training and support to these teachers. Understanding why these teachers are reluctant adopters is the first step to successful remediation.

Literature Review

The level of complexity of the technology can influence its' adoption. Aldunate and Nussbaum (2013) explain the effect of a user's perspective on technology adoption.

> In the technology adoption process, more complex technology, from a user's perspective, has a greater chance of leading to abandonment than simpler technology. Early adopters exhibit a higher likelihood of adopting technology, almost independent of the level of complexity of technology. (p.524)

Without early adopters or innovators to assist and encourage the use of said technology, the more complex the technology the more likely it is to be abandoned. "These findings demonstrate that the exit points in the technology adoption process positively correlate with the type of teacher attitude towards new technology and that mass followers and late adopters are more prone to abandon the adoption process" (Aldunate & Nussbaum, 2013, p.524). Identifying why teachers

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do not adopt or the reasoning behind abandonment will enrich the process for scaffolding technology implementation for said teachers.

Much research is available on identifying predictors of technology integration success or failure. Many attitudes and behaviors of teachers are indicative of whether or not that teacher will successfully integrate technology into their classroom. Challoo, Green, & Maxwell (2011), noted

> that the inverse relationship between comfort and stage of adoption indicates that participants with a high degree of anxiety have a low stage of adoption and vice versa. Inverse relationships were also present where participants who experience computer avoidance or high degrees of concern report low interest. Comfort level was the most important and largest effecting factor, while interest added another critical factor that explains teachers' stage of adoption of technology for education through direct effect on the stage of technology for education and indirectly through comfort for a total effect. (p.38)

A recent research by Elsaadani (2013) of literature yielded mixed results regarding the relationship between age and attitude towards instructional technology.

> The results showed that there is a significant difference between the age of participants and their attitude towards instructional technology, indicating a relationship between both of them. The mean of males is higher than females, but statistically this is not significant, indicating no difference between males and females as regard to their attitude towards instructional technology. The regression factor determined to be moderate and positive, showed the percentage of change in the attitude toward instructional technology is explained by age differences. (p.223)

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Kim, Kim, Lee, Spector, and DeMeester (2013) discuss the effect of teacher beliefs.

> Teachers' beliefs about the nature of knowledge and learning (epistemology), beliefs about effective ways of teaching (conceptions), and technology integration are positively correlated with one another. The more sophisticated epistemology teachers have, their conceptions are closer to the student-centered approach, and their status of technology integration showed a seamless use of technology, meaning that focus and emphasis remained on the learning rather than on technology. (p.423)

Experience with computer technology and attitudes toward technology in the classroom have been noted as important variables that predict differences between teachers who successfully integrated computer technology from those who did not (Mueller, Wood, Willoughby, Ross, Specht, 2008).

A recent survey from An and Reigeluth (2012) revealed K–12 teachers' "positive attitudes toward the use of technology in teaching and" (p. 57) learning. Overall, participants had positive perceptions of learner-centered instruction with technology. "About 70% of participants agreed or strongly agreed that they were learner-centered teachers, and 27.6% were neutral. Lack of technology, lack of time, and assessment were identified as the major barriers to creating technology-enhanced, learner-centered classrooms" (An, & Reigeluth, 2012, p.57). Elementary school teachers, who do not receive sufficient in-service training for instructional technologies, use teacher-centered methods more. They do not use instructional technologies frequently when they prefer the methods of discussion, fieldtrip, observation, role-playing, drama, case study, problem-based learning, project-based learning, and cooperative learning. Senior elementary school teachers used technology less and teacher-centered teaching method more (Bektaş, 2013). Hermans, Tondeur, Braak, and Valcke (2008) discuss the effect of teacher beliefs.

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> Constructivist teacher beliefs were found to be a strong predictor of classroom use. Traditional teacher beliefs seem to have a negative impact on the integrated classroom use of computers. Teachers with a strong constructivist orientation are more prone to adopting tools that foster constructivist-learning approaches" (p.1506).

Districts where teachers have more experience with technology and perceive fewer obstacles to integration tend to have teachers who, on average, direct their students to use technology more often than do districts with less experienced teachers or teachers who report more obstacles with integration (Miranda, & Russell, 2011). Teachers mainly use the internet, text processing programs, e-mailing, educational CDs for teaching, and other types of software to create presentations. Although teachers use those types of technology for educational purposes, we do not know that they support, for instance, student-centered instruction (Varol, 2013).

Besides attitudes and beliefs, there are also physical and economical barriers to technology integration. Teachers' ratings suggest that external barriers were more impactful than internal barriers. The most impactful barriers were all external and included the following: support, state standards, money, access, time, and assessments. Attitudes and beliefs of other teachers were perceived to be the most impactful barrier on students' uses of technology. According to Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, (2012),

> In general, teachers were able to enact technology integration practices that closely aligned with their beliefs. For example, teachers who believed that technology was best used for collaboration purposes described interesting projects in which students collaborated with local and distant peers. Teachers who believed that technology provided more opportunities for student choice, described examples in which students chose to demonstrate their learning using a variety of technology tools." (p.423)

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Teachers who are willing to implement technology in their class will need constant support regarding technology use in their courses. Factors proved to be barriers to the implementation consist of the limited number of the staff to provide teachers with technological support at schools and the inability to provide teachers with instant support at the exact time when necessary. The lack of sub-structure, physical conditions, the quality of teachers' efficacy in technology use, and the lack of sufficient amount of time to become efficient in technology use contributed to the problems that teachers experience regarding technology use (Erişti, Kurt & Dindar, 2012).

In a survey by Hechter and Vermette, teachers were asked, "Are there factors (i.e. lack of available resources, limited budget) that prevent you from integrating technology into your science classroom?" Most responded by saying that technology was available to them, but there were many factors preventing them from using it effectively or at all. This has resulted in teacher frustrations as reported by nearly one quarter of their respondents. Approximately 95% of middle years teachers and nearly 90% of senior years teachers noted that technology was available, while only about 60% of early years teachers said that this was the case. Access to technology is the leading barrier to technology integration in Manitoban K-12 science classrooms, as 67% of teachers acknowledged that this was an issue for them. Over 55% of teachers reported that time was an issue in some capacity within their pedagogical practices (Hechter, & Vermette, 2013).

Kurt and Ciftci found that although there are many barriers, six are identified as the major ones based on teachers' responses. They are "(a) limitations of physical settings (b) availability of materials, (c) the condition of equipment and maintenance, (d) lack of training and interest, (e) low socioeconomic status and (f) crowded classrooms" (Kurt & Ciftci, 2012, p.225).

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With pre-service teachers, literature has shown there is a positive relationship between the attitudes toward the dimensions of the teaching profession and the attitudes towards technology. Pre-service teachers, who did not use technologic tools in their educational process, had a negative view of using these materials for the educational purposes of their future students. When pre-service teachers were immersed in technologic tools during their formal education, they developed a positive attitude and the self-efficacy for the use of technologic teaching materials (Akbaba, 2013). We often underscore the strength of value beliefs in predicting pre-service teachers' intentions regarding the frequency with which they would use technology with students and the variety of software they would use instructionally in their future classrooms (Anderson, 2011). The pre-service teachers' perceived usefulness of Web 2.0 technologies is often the strongest determinant of their attitudes. Sadaf, Newby, and Ether (2012) discussed the effect of teacher attitude.

> Attitude, in turn, had the strongest effect on their intentions to use Web 2.0 technologies in their future classrooms. This perception of the usefulness could be due to pre-service teachers' exposure to Web 2.0 technologies during the Web 2.0 project that helped them understand the value of using these technologies in the classroom. (p.171)

There is great difficulty for beginning teachers to identify, understand, and value technology that supports content-specific teaching and learning. It also appears to require more than cursory exposure (Hughes, 2013).

With the new generation teachers, fully immersed in technology implementation, we should begin to look at how these new generation teachers can influence existing teachers and move them into the next generation of teaching. One way some teachers are easing into the

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technology integration is through computer games. Proctor and Marks discusses this theory in depth (2103).

> Computer-based games are one of many recognized tools used by teachers in the classroom to achieve pedagogical success. This research indicates such notions are not characteristic of the majority of K–5 population or a minority of the 6–12 population. Trends for exemplar educator adoption of games for classrooms are increasing in a positive direction, and therefore more apt to adopt new technology more readily than the 6–12 categories who appear to progressing slowly. (p.176)

Burkhardt and Brass (1990) researched the attributes of early adopters and their ability to help facilitate adoption by others.

> "Identifying the attributes of early adopters of a change process, as in technology immersion in education, may aid in predicting those who are able to reduce organizational uncertainties. Those who become early adopters may increase their level of support relative to late adopters, thereby redistributing technological ability throughout the educational system. Stability or change is contingent on the chosen change in technology and the influence of early adopters. (p.107).

By utilizing the familiarity of early adopters to technology, the education system can hope to reach out to the late adopters and gradually change their ways (Jin, 2013). "The primary responsibility for training, technology, and technical support must be taken by school systems as they strive to reduce or eliminate barriers to technology integration" (Kotrlik & Redmann, 2009, p.70). In an article from *Electronics and Electrical Engineering*, the need to raise "awareness about the use of teaching technologies by teachers and reflecting technological improvements in learning and teaching environments is clearly demonstrated" (Meral, Akuner, & Temiz, 2012,

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p.96-97). Wozney, Venkatesh, and Abrimi (2006) took teacher beliefs into account when researching best practices for professional development.

> Professional development must attend to the enhancement of teachers' expectations of success. Teachers need to believe that they can successfully implement the innovation within their own context; if not, they may neither take the initial risk nor continue to persevere in implementing it. (p.195)

"Additional emphasis should be placed on preparing teachers to think "outside the box" particularly when faced with barriers such as limited resources and lack of professional development" (Wright, & Wilson, 2011, p.58).

Design and Methodology

Participants

A convenience sampling of 25 teachers from a South Central Elementary school in Texas participated in the study. The criterion used to determine the participants was on a volunteer basis. Thirty-six percent of the teachers came from kindergarten, first and second grades. Sixty-four percent of the population taught third, fourth, and fifth grades. The average age of the population was 35 years, with an average of 10 years in the teaching field. Twelve percent were male. Sixteen percent were Hispanic; 4% were African American, and the remaining white. Forty-eight percent represent the middle/upper class, while the remaining the lower/middle class.

In this qualitative study, teachers scheduled interviews with the researcher. The researcher teaches on the same campus as the participants and serves as technology support person teachers can call on when needed. Because of the relationship between the researcher and the participants, the participants were open and willing to answer questions truthfully and openly. The researcher has a history of troubleshooting technology issues with the participants.

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Participants were ensured that their answers were confidential and anonymous. Research questions were designed in order for the researcher to gain insight as to how to help the teachers increase technology use in the classroom. Each participant was assigned a random name and gender. The researcher took notes, and then transferred the information into a word document. If further clarification was needed, an additional interview was arranged. Reliability and validity were assured by member checking, triangulation of the responses and creating an audit trail (Appendix A).

Findings

Interview notes were analyzed with the following attitudes and beliefs emerged (Appendix A) as themes of this study: 1) overwhelmed by technology available, 2) not enough time to plan and implement technology, 3) restraints by state standardized testing, and 4) hardware technological troubleshooting difficulties. All participants expressed concern about the accountability of the state tests and that the current testing methods do not lend themselves to technology immersed teaching. The majority of the participants felt that change in teaching is eminent and there is a growing need for training of teachers to enable them to embrace the coming changes.

The most often cited common barrier to technology integration was the time it takes to learn, plan and implement it. Ninety-six percent of responding teachers noted that time was the biggest barrier they faced when dealing with technology. Teachers talked about the demands of their professions and the time that it takes to be effective in their positions. All of the teachers interviewed have a great sense of dedication to their students and their school. Often working late in the evenings and on weekends to prepare for their lessons, or work with students on

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developing skills needed to master that grade level. All of the kindergarten through second grade teachers are self-contained and teach all subjects to their class. One teacher said,

> "*When I plan for my week, it takes about one hour for each subject area. Roughly, I spend six to seven hours a week planning content for the following week.*"

With responsibilities of planning, grading, intervention paperwork, and communication it is difficult to learn the new technology handed to them. They often are not comfortable using it along-side their students. Although the third through fifth grade teachers reported less time planning, since they were typically teaching one to two subjects a day, time was still an issue. In these grades, the teachers mentioned differentiating plans to meet the varying needs of each grade level, they are all departmentalized, takes most of their time. Because they feel a great pressure for their students to perform at certain levels on assessments, finding technology that will ensure their success on those assessments takes time. Every year they learn about new programs to use with struggling or gifted students. Yet, when faced with the pressure to fulfill other requirements, technology is one area where they let go, and only add in when they find the time. An and Reigeluth (2012, p.58) confirm this in their study where "lack of technology, lack of time, and assessment were identified as the major barriers to technology" in the classroom.

The school where the interviews took place invests in adding technology each year. The principal and PTO actively and financially support the use of technology in the classroom. Every teacher has a mounted SMART board in their classroom as well as a ceiling mounted projector, a teacher issued laptop and document camera. Each grade level shares a class set of laptops, and 10 to 15 iPads. Of the 25 teachers interviewed at this campus, 14 reported a sense of being overwhelmed when expected to implement available technology into their daily lessons. One teacher reported,

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"*Imagine having iPads with over 250 apps being handed to you at one time. It is like swimming through the deep end of a pool looking for the one resource that would best fit my students' needs. Usually when I am looking for a resource, I download an app, play around with it, and become comfortable with it. Then, I can understand how it can be used in the classroom, but when I was given iPads with over 250 apps that I had no idea about, it was quite overwhelming just thinking about how in the world to find the time to learn them all, let alone sort through which ones to use at what times*."

Similar results were found in a recent study where the results showed "that much technology" integration "training appears to focus mainly on technology knowledge and skills while overlooking the dynamic" relationships "between technology, pedagogy, and content. As a result, teachers learn about much "cool" stuff, but they still have difficulty applying it for their students' learning"(An, & Reigeluth, 2012, p.60).

With the increased pressure from state standardized test, teachers are feeling pressure to ensure that their students preform to a state mandated level. With the current test design, technology implementation is on the bottom of the list when prioritizing skills necessary for mastery of the test, thus making the demands of standardized tests, another barrier to technology integration in the classroom. As one participant noted,

"Unfortunately, test accountability is the bottom line. Your kids do well, your school gets funding, and they do not do so well, you lose funding. With that kind of pressure, yes, we teach to test mastery. Until the requirements for the testing change, the teaching will remain the same. Teachers can not teach in a student-centered, problem based learning environment enriched with technology, while they have a set amount of time and a large

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amount of material to cover. When the test developers change the assessment to match that type of learning, then the teaching will change."

Challoo, Green, and Maxwell (2011) discovered the "inverse relationship between comfort and stage of adoption indicates that participants with a high degree of anxiety have a low stage of adoption and vice versa" (p. 39). When these teachers feel the pressure from administration to get their students to a certain level of performance, no matter the cost, a certain level of anxiety exists there. In a world where high-stakes testing is driving the instruction, the instruction will continue to match the testing. With new technologies developing, and more on-line learning opportunities, technology integration will soon become more necessary than it is today.

The final theme that emerged from the interviews was that of technical difficulties. Many teachers mentioned having a degree in instruction not technology and, when trouble happens, they tend to abandon the technology aspect and continue with the skill in another format. Some teachers mentioned being able to fix minor problems, or troubleshoot simple issues, but when the problem cannot be resolved easily, they have to move on to "Plan B." At the campus where the interviews took place, when teachers have problems with technology that they cannot resolve they report the issue to a technology team for the district, and will typically get a response in a day or two.

"When you're in the middle of the lesson, and the laptop quits communicating with the SMART board, or the student laptops refuse to log in to the server, you can't wait two to three days to finish that lesson; you have to find another way."

Many teachers use technology freely at home, and have minimal technical problem solving skills. When technology does not work the way they had planned for it to, it is frustrating, and

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they are less likely to try to use it again in the future. One teacher said that the technology experts in her family are her small children at home. It takes her a great deal of time to learn to use technology in the classroom. Sitting in a training with a bunch of other teachers, and not being able to use it first hand, just observing someone show her what it can do, does no good. She will not be able to implement that technology with confidence when returning to her classroom.

> *"If there was someone stationed here on our campus that could come in and teach me one-on-one, give me the time to play around with it myself, I might be able to use more technology in my class. If someone could be here for me when I am teaching and afraid of something going wrong, or even step in and model a lesson for me would definitely be the ideal situation in order for me to feel comfortable implementing more technology in my classroom.*"

With the rate at which technology is changing and constantly updating, teachers are struggling to keep up. Some of the participants mentioned that when they finally get comfortable with certain software or hardware, something new comes out and the learning process starts all over. Uncertainty and a feeling of loss of control when technology fails, is a primary barrier to adoption of technology in the classroom. A similar study found that such factors as the limited number of the staff to provide teachers with technological support at schools; inability to provide teachers with instant support at the exact time when necessary; along-side various other factors increase the problems that teachers experience regarding technology use (Erişti, Kurt, & Dindar, 2012, p.39).

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Implications

If educational technologies are used in learning and teaching environments, permanent and effective learning can be achieved. Use of educational technologies has become an unavoidable circumstance (Meral, Akuner, & Temiz, 2012, p.94). Yet many teachers have not adopted technology in the classroom. Understanding why teachers are reluctant to adopt technology is the first and most important step in reaching out to them with effective and meaningful training and support. Professional development aimed at improving technological skill, developed with the attitudes and behaviors of late adopters in mind, will be seen as less of a challenge. In order for teachers to not see technology as an insurmountable challenge we need to understand where they are coming form so we can begin to break down those walls and instil the confidence needed to be successful with technology.

"Professional development and the process of integration must address the attitudes of teachers and present them with opportunities for positive computer experiences within the context of their instruction" (Mueller, Wood, Willoughby, Ross, Specht, 2008, p.1534). Identifying "teachers who are successfully integrating technology and develop mentor programs or workshop training to expose teachers to successful integration in a practical way" could be useful. "Opportunities to observe classroom practice, and the introduction of technology, in gradual ways, to support current classroom practice may be of more benefit than attempts to alter teaching philosophy. Teachers need to see the potential of computer technology as a cognitive tool" (Mueller, Wood, Willoughby, Ross, & Specht, 2008, p.1534).

Biases

Biases that may have influenced this study were all the participants work at the same school and the participants were referred to the interviewer by a member of their administrative

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team. The investigator teaches at the same school as the participants and knows all of the participants personally.

Conclusions

Teachers face a great many challenges in their day-to-day lives at school and keeping up with technology and the rate of change is just one of them. Technology has the possibility to make teachers' lives at school easier, if we can overcome the attitudes and behaviors that are keeping teachers from adopting its use in the classroom. This study demonstrated that teachers feel overwhelmed and intimidated by technology, and with the demands of accountability on state tests, they lack the time and effort it takes to learn to use technology in such a way that will make their lives easier. It would be beneficial to do further research to determine what teachers believe and if the same barriers are present district wide or even statewide. These results of this study lead to the conclusion that training and support in the area of technology is imperative in order to ensure the success of our students. This study aligns with the findings of previous studies revealing the barriers of teachers adopting the use of technology in their classrooms (Aldunate & Nussbaum, 2013; An & Reigeluth, 2012; Challoo, Green, & Maxwell, 2011; Erişti, Kurt, & Dindar, 2012).

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Appendix

Audit Trail

Participant	Theme 1 Overwhelmed by technology available	Theme 2 Time it takes to plan and implement technology	Theme 3 Restraints by curriculum and state testing standards	Theme 4 Equipment technological problems / difficulty troubleshooting	Theme 5 Needs more support than is available
1	X	X	X	X	X
2		X	X		
3	X	X	X	X	X
4		X	X		
5		X	X		
6	X	X	X	X	X
7			X	X	
8		X	X		
9		X	X	X	
10		X	X	X	
11	X	X		X	X
12	X	X	X	X	
13		X	X		
14	X	X	X	X	X
15	X	X	X	X	X
16	X	X		X	X
17		X		X	X
18	X	X	X	X	
19	X	X	X	X	X
20		X	X	X	
21	X	X	X	X	X
22		X	X		
23	X	X		X	X
24	X	X	X	X	X
25	X	X	X	X	X

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METHODS FOR IMPROVING PRE-SERVICE TEACHER EFFICACY TO INTEGRATE MOVEMENT IN THE CLASSROOM

Stacia C. Miller, Ph.D.
Midwestern State University

Suzanne F. Lindt, Ph.D.
Midwestern State University

Christina Janise McIntyre, Ph.D.
Midwestern State University

Abstract

Integrating movement into lessons in the content areas can be a daunting task for new teachers; however, including movement into the curriculum is beneficial to students' holistic learning. Previous research indicates many pre-service teachers lack the knowledge and confidence to effectively integrate movement strategies into the content. The purpose of this study was to investigate pre-service elementary teachers' self-efficacy for integrating movement into the content classroom setting after participation in an undergraduate movement activities course for education majors and also to examine which course strategies students found most beneficial. Survey data was collected over five semesters from pre-service teachers enrolled in the course. Data analysis methods included a paired-samples t-test of Likert data and coding of open-ended responses for interpretational analysis. Data revealed several themes including the need for pedagogical instruction addressing movement integration, modeling of best practices in movement integration, and practice creating and delivering integrated movement lessons. Furthermore, using strategies developed from these themes led to increased efficacy in pre-service teachers improving the likelihood they will integrate movement into future content area lessons. This study indicates that a need exists for teacher preparation programs to develop strategies for improving pre-service teacher-efficacy in movement integration.

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Introduction

As the accountability for improving academic achievement has taken priority and physical education has been significantly reduced or cut entirely from the curriculum, the need for integrating movement into the classroom setting has increased. According to a nationwide survey of youth behaviors, only 28.7% of youth met the recommended 60 minutes of moderate-to-vigorous physical activity each day, while 28.2% were overweight or obese (Centers for Disease Control and Prevention, 2012). Classroom teachers have the opportunity to participate in the fight against childhood obesity by providing numerous opportunities for physical activity throughout the day. With the current momentum behind initiatives such as Let's Move!, Play 60, and Comprehensive School Physical Activity Programs (CSPAP), classroom teachers are being asked to get more involved in their students' health and to help students meet daily physical activity requirements. National organizations including the National Association of Sport and Physical Education (NASPE) and the Centers for Disease Control and Prevention (CDC) recommend that all P-12 schools implement a Comprehensive School Physical Activity Program to include supplemental physical activity time outside of the physical education class (CDC, 2013; NASPE, 2008). Two components of a multi-component CSPAP that directly involve classroom teachers are physical activity during school and staff involvement; therefore, if teachers are to take on responsibilities regarding student health and physical activity, they should be adequately prepared to meet the challenge.

In Texas, pre-service teachers (PSTs) seeking early elementary certification must pass a section of the TExES certification exam specifically addressing various components of health and physical education. Therefore, there is an expectation that classroom teachers will not only be prepared to implement health and physical education into their curriculum, but also confident

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enough to design and execute quality content lessons that integrate movement. One challenge for teacher education programs, especially with the 120-hour maximum degree plan requirement in this state, is providing opportunities for health and physical education content and pedagogy classes to prepare teacher candidates for the certification exam. Still, even after taking a few courses in health and physical education, there is concern about classroom teachers' ability to effectively implement appropriate content and activities.

Four years ago, the teacher education faculty in a small university in north Texas created two courses to address the addition of health and physical education competencies to the elementary teaching certification. The Concepts of Healthy Living course addresses health and wellness concepts and teaching strategies, while the Movement Activities for Children course addresses the physical education concepts and teaching strategies. Both courses are 2-hour course loads and have evolved over time to fit the needs of the PSTs. Initially, the courses were knowledge-based and served to inform classroom teachers of content material in health and physical education. As expectations for the classroom teachers' integration of health and physical education have changed, the addition of pedagogical strategies has been added to the courses. For the purposes of this study, data were collected from the Movement Activities for Children course because the curriculum focuses on movement integration.

While there is an assortment of research regarding classroom teachers' experiences teaching and leading physical education and physical activities, there is a dearth of research examining instructional strategies and best practices to serve as guidelines for developing physical education courses for teacher education programs. Though extensive research has examined teacher self-efficacy in PSTs, there is limited research available that focuses specifically on PSTs' self-efficacy to integrate movement (Callea, Spittle, O'Meara, & Casey,

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2008). This study provides insight into PSTs' self-efficacy for integrating movement, and suggests strategies for courses offered at the university level.

Literature Review

Integrating movement into lessons in the content areas can be a daunting task for new teachers (Pangrazi, Beighle, & Pangrazi, 2009); however, including movement into the curriculum is beneficial to students' holistic learning. Research suggests that opportunities for movement in the classroom provide learning experiences beyond those achieved through ordinary curricular practices (Nigles, 2003), increase student engagement (Blaydes-Madigan, 2004), and address multiple learning styles, all of which increase the likelihood for students to learn (Cone, Werner & Cone, 2009). Furthermore, there is mounting evidence that optimal learning can intensify from adequate physical activity (GENYOUth Foundation, 2003).

Although there is strong evidence for providing K-12 students with daily physical activity, the reality is that only six states currently require physical education in every grade level. In addition, the majority of states offering physical education do not require the recommended amounts of weekly physical education suggested by NASPE (2012). Although Texas requires a minimum weekly amount of 101-150 minutes of physical activity, the state does not mandate that this physical activity occur within the context of a physical education course, which is not in compliance with NASPE recommendations. As the inclusion of physical education in the existing curriculum continues to decline, and educators look for ways to increase student time engaged in physical education, one approach supported by experts is the encouragement of schools to incorporate physical activity opportunities before, during, and after school. Accordingly, training classroom teachers to implement quality content lessons that effectively integrate movement will provide students additional physical education benefits.

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While there is a wealth of research examining classroom teachers' experiences and perceptions of teaching physical education (DeCorby, Halas, Dixon, Winthrup, & Janzen, 2005; Faulkner et al., 2008; Morgan & Hansen, 2008), less is available about classroom teachers' efficacy for integrating movement activities into the classroom (Callea et al., 2008; Fletcher, Mandigo, & Kosnik, 2013; Tsangaridou, 2008). Results of a study conducted by Callea et al. (2008) indicated that PSTs with a higher interest in physical activities and a greater proficiency in motor skills were more likely to have a higher self-efficacy for leading students in physical activity. Providing PSTs a course targeted specifically at physical education has been shown to change how classroom teachers viewed themselves as teachers of physical education (Fletcher et al., 2013) and change how they effectively implement physical education teaching tasks into the content classroom (Tsangaridou, 2008). While the PSTs' self-efficacy for overcoming barriers increased when comparing the pre-test and post-test results, they still felt unprepared to teach physical education (Fletcher et al., 2013). Therefore, more research is needed to determine what course materials, experiences, and strategies will increase self-efficacy, thereby, affording PSTs the opportunity to develop the confidence to effectively integrate movement into their own classrooms.

Pre-service teachers seeking early elementary certification are required to pass the section of the TExES specific to health and physical education with a score of 80 or better, and in response, many teacher education programs offer health and physical education courses for elementary education majors, yet guidelines do not exist for creating quality courses to meet students' needs. According to the TExES standards for the EC-6 Generalist exam, PSTs must have adequate knowledge in both health and physical education topics, as well as the skills to deliver this knowledge to their students, recognize health issues, and integrate health and

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physical education into the curriculum. Consequently, faculty teaching these courses at the university level assume the responsibility of ensuring that PSTs have an appreciation, an understanding, and pedagogical content knowledge in the fields of health and physical education.

Therefore, it is important for teachers to feel confident and to develop the skills necessary for incorporating movement into the content areas, and it is vital that university faculty charged with preparing future teachers use the best methods for delivering the content and pedagogy. In order to shed light on PSTs' perceptions of what they need to effectively and confidently integrate movement into content lessons, the purpose of this study was to investigate PSTs' self-efficacy for integrating movement into classroom settings and to examine which strategies PSTs found most beneficial.

Methods and Procedures

Survey and open-ended data was collected over five semesters from PSTs enrolled in an undergraduate movement activities course. Pre-service teachers voluntarily completed both a pre-test, administered at the beginning of the semester, and a post-test, administered at the end of the semester. The total purposive sample included 102 PSTs (81.2% female, $N = 82$). Additional demographic information about the sample is located in Table 1.

PSTs completed the self-report survey, modified from the existing Teacher's Self-Efficacy Belief System-Self scale (Dellinger, Bobbett, Olivier, & Ellett, 2008; Linker, 2011). They responded to Likert-scaled items ranging from 1 (weak in my beliefs about my capabilities) to 4 (strong in my beliefs about my capabilities) on four subscales: Accommodating individual differences (AID, ex. Plan activities that accommodate the range of individual differences among my students in integrated movement activities; $\alpha = .91, .85$), Managing learning routines (MLR, ex. Use allocated time for integrated movement activities that maximize learning; $\alpha = .87, .84$),

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Managing a positive classroom climate (CC, ex. Maintain a classroom climate that is fair and impartial during integrated movement activities; α = .90, .91), and Monitoring and feedback for learning (MFL, ex. Provide students with suggestions for improving learning in integrated movement activities; α = .92, .90). The AID, CC, and MFL subscales contained between six and ten items. Three additional items were added to the MLR scale because the original subscale contained only three items.

As part of the post-survey, administered at the end of the course, PSTs also responded to an eight-item open-ended questionnaire. These questions were designed to determine course features that may have lead to their increased self-efficacy. For example, PSTs were asked if the class impacted their confidence to integrate movement into the classroom, which learning activities in the course had the greatest impact on their self-efficacy, and changes they would make in the course to better help them integrate movement into the classroom.

Table 1

Demographics for Sample

	N	%		N	%
Classification			**Age**		
Freshman	12	11.7	Under 21	49	48.0
Sophomore	21	20.6	21-25	34	33.3
Junior	49	48.0	26-34	12	11.8
Senior	19	18.6	35-44	6	5.9
Post Baccalaureate	1	1.1	Above 44	1	1.1
Ethnic Identity			**Gender**		
Hispanic or Latino	11	10.7	Male	19	18.6
Not Hispanic or Latino	90	88.3	Female	82	80.4
Racial Identity					
Asian	2	1.9			
Black/African American	9	8.8			
Hawaiian/Pacific Islander	2	1.9			
White	80	78.4			
Other	5	5.0			

Note. N=102

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Results

Data analysis methods included a paired-samples t-test of Likert data and coding of open-ended responses for interpretational analysis. Because of the small sample size, a t-test was the most appropriate means of analysis of self-efficacy because researchers were interested in determining the change in means for each subscale from the beginning to the end of the semester. In addition, coding of survey responses highlighted important themes and spoke to the strategies that PSTs felt were most helpful in them developing a higher self-efficacy to integrate movement activities.

Paired Samples t-Test

In order to determine whether PSTs' reported self-efficacy increased following participation in the course, a paired samples t-test was conducted to compare the means of PSTs' self-efficacy for each subscale from the beginning of the semester to the end of the semester. Results from paired t-tests revealed that PSTs' beliefs about their abilities to integrate movement into the classroom were significantly different from the beginning to the end of the semester for each subscale (see Table 2). There was a marked increase in PSTs' beliefs from the beginning to the end of the semester about their ability to accommodate individual differences ($t(55)= 10.14$, $p<.001$), which indicates that those enrolled in the class reported that their self-efficacy to accommodate students' individual differences in a physical education class increased after the content of the course was learned. In addition, PSTs also indicated that their self- efficacy to integrate movement regarding manage learning routines also increased significantly following learned content from the semester ($t(55)= 7.95$, $p<.001$). They indicated that their self-efficacy to manage a positive classroom climate in physical education also increased from the beginning to the end of the semester in the course ($t(55)= 9.64$, $p<.001$). Finally, they reported that their self-

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efficacy to integrate movement in the are of monitoring feedback and learning also increased from the beginning to the end of the semester ($t(55)= 9.36$, $p<.001$). Results suggest that the instruction throughout the semester provided PSTs with greater confidence in their abilities to add movement into their elementary classrooms.

Table 2

Results from paired samples t test indicating PSTs' change in self-efficacy during a semester

	t
Accommodating Individual Differences	10.14***
Managing Learning Routines	7.95***
Managing Positive Classroom Climate	9.64***
Monitoring Feedback for Learning	9.36***

Note. *** p < .001

Coding of PSTs' Responses

PSTs' responses to open-ended questions were analyzed and coded according patterns identified in the responses. Several themes emerged and were organized into three main categories with related sub-categories including the need for pedagogical instruction addressing movement integration, modeling of best practices in movement integration, and practice creating and delivering integrated movement lessons.

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Table 3

Coding Categories

Themes	**Sub-Categories**
Pedagogical Instruction Addressing Movement Integration	Locating and utilizing resources, lesson development, gaining strategy knowledge, learning best practices, classroom management
Modeling of Best Practices in Movement Integration	Observing best practice, observing in a classroom setting, addressing individual student needs, observation of integrated activities
Practice Creating and Delivering Integrated Movement Lessons	Practice teaching integrated activities to peers, delivering lessons to actual elementary students, preparing lessons, receiving feedback, collaboration with peers

Pedagogical Instruction Addressing Movement Integration emerged as a theme because many of the PSTs' responses were related to the need for specific pedagogical instruction related to teaching in a physical environment and integrating movement into the classroom. For example, one PSTs felt that they needed to learn more about "age-appropriate motor skills" while another wanted to make sure that they were able to "make the movement integration meaningful and provide a quality physical education experience." Others reflected on the distinct differences between managing a physical classroom versus a typical classroom environment and felt that they needed more guidance and preparation in developing and implementing classroom management strategies that specifically address the issues that surround more intense levels of movement in the classroom.

Modeling of Best Practices emerged as a main theme because the PSTs felt that the modeling of strategies provided by the instructor were some of the most beneficial training materials in the course. In general, most respondents mentioned that they wanted concrete examples of activities and games for the classroom and that they wanted the instructor to model

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more example integration activities during the class. One PST remarked, "I think the video examples that the instructor provided were spot on with the lesson we were covering in class, and really helped the material tie together for me".

Practice Creating and Delivering Integrated Movement Lessons emerged as a main theme because most of the PSTs indicated that practice teaching was enjoyable and helped to increase their confidence to teach in a physically dynamic classroom setting. They overwhelmingly listed the practice experience as the course component with the greatest overall impact on their confidence. For instance, PSTs commented, "the integration lesson plan activities helped to improve my confidence the most" and "the feedback that was given after the lesson impacted my confidence to integrate movement activities." However, many felt they could use additional practice and suggested that in the future course requirements should include delivering the lessons at least once to a group of elementary students.

Discussion

The existing research on classroom teacher self-efficacy for teaching physical education establishes that classroom teachers feel unprepared to teach physical education (Fletcher et al., 2013) and that integrating movement can be a challenging endeavor for teachers to initially attempt (Pangrazi et al., 2009). Therefore, the purpose of this study was twofold. First, researchers sought to examine whether PSTs' self-efficacy for integrating movement into the classroom settings increased after participating in a course designed to improve their knowledge and pedagogical skills. Second, researchers looked to determine which strategies PSTs found most beneficial in the course.

Results from this study indicated many PSTs initially lacked the self-efficacy to effectively integrate movement strategies into the content. However, after a semester in an

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undergraduate movement activities course for education majors PSTs reported an increase in self-efficacy to integrate movement into the classroom. The results of this study suggest that a need exists for teacher preparation programs to develop courses to provide strategies for improving PSTs self-efficacy in movement integration. The results are similar to those found in previous research studies, which suggest that elementary teachers have low levels of confidence and lack the skills and knowledge to teach physical education (Ashy and Humphries, 2000; Callea et al., 2008; Rink and Hall, 2008). However, providing PSTs with strategies, skills and opportunities to practice those skills, appears to be an effective method for improving PSTs' self–efficacy, which supports the need for more exploration of teachers' beliefs about physical education and the effects of methods courses for pre-service classroom teachers (Tsangaridou, 2012).

In addition, results from the open-ended questionnaire revealed that students reported receiving pedagogical instruction specific to movement integration, observing quality modeling of best practice, and creating and delivering integrated movement lessons to peers were the most impactful course components. The PSTs overwhelmingly selected the pedagogical training and practical experiences as the most beneficial, but as previous research has shown, elementary classroom teachers lack PE content knowledge (Rink and Hall, 2008). Seminal research conducted by Shulman (1986) in the area of pedagogical content knowledge supports the notion that when preparing pre-service teachers, content and pedagogy should not be taught in isolation. Therefore, teacher preparation programs must emphasize the attainment and processing of PE content knowledge while continuing to strengthen practical knowledge (Siedentop and Tannehill, 2000) and pedagogical knowledge in PE (Tsangaridou, 2012).

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This study is not without limitations. The researchers gathered data from classes limited in number and restricted to one university. Researchers can provide a more extensive portrayal of PSTs by including various institutions and teacher education programs. In addition, the PSTs' perceptions and beliefs about physical education might be a strong predictor of their self-efficacy for integrating movement into their classroom. Previous research has reported that teacher perceptions and beliefs influence their practices (Tsangaridou, 2006); consequently, understanding their belief systems is requisite to improving teaching practices. Although the results of this study demonstrated improvement in teacher self-efficacy for integrating movement into the classroom, there is no assurance that increased self-efficacy will lead PSTs to integrate movement into their future classrooms as an in-service teacher. Further research should explore the transition from pre-service to in-service experiences to determine if increased self-efficacy leads in-service teachers to more readily incorporate movement into their curriculum.

Conclusion

Research confirms that students do better in school when they are physically healthy (GENYOUth Foundation, 2013), yet there is increased pressure to reduce time spent in physical education and health. With less than 30% of students meeting the recommended amount of time for physical activity each day, a need exists to increase students' physical activity throughout the school day (Centers for Disease Control and Prevention, 2012). One way to address the absence of or reduced time spent engaged in physical activity is through movement integration activities in the classroom. NASPE (2008) and Centers for Disease Control and Prevention (2013) suggest that an increase in student activity should occur throughout the day, and they stress the involvement of school staff in the integration process. In addition, interdisciplinary learning is a beneficial method for addressing different learning styles in the classroom (Cone, 2009) and may

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lead to higher levels of student engagement. Teachers well equipped to teach through the integration of movement will be prepared to use a more holistic approach to learning. Additionally, teachers can encourage critical thinking and application skills through the use of integrated movement activities. Quality integrated lessons give students an opportunity to apply learned content to authentic or "real-world settings," potentially allowing for stronger connections and increased learning gains.

Introducing PSTs to the possibilities of integrated learning appears to be a feasible approach for preparing them to understand the interdisciplinary environment. Learning to integrate movement into the classroom is a process which develops over time and, as the results of this study demonstrate, through early introduction in a specified course that includes focused instruction, modeling of best practices, and opportunities for practice, PSTs can begin to build their self-efficacy potentially becoming more confident in their ability to use integrated movement activities and possibly improving the likelihood of using these activities in their future classrooms.

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IMPROVING TEACHER CERTIFICATION RATES: AN EXPLORATION OF THE ROLE OF CRITICAL THINKING ABILITY IN TEACHER CERTIFICATION EXAMINATIONS

Renea Fike, Ed.D.
University of the Incarnate Word

David S. Fike, Ph.D.
University of the Incarnate Word

Ashley Natale, MAT
University of the Incarnate Word

Abstract

The Teacher Certification Program at the institution where this study took place relies on predetermined minimal scores on the Texas Higher Education Assessment (THEA) Reading, Writing, and Math test, the Nelson-Denny Reading Test, and a writing sample to predict a student's probability of success in the professional development coursework and mandated certification tests. This study introduced the Collegiate Assessment of Academic Proficiency Critical Thinking test in addition to the other tests to determine if there is a correlation between critical thinking skills and Pedagogy and Professional Responsibilities (PPR) exam scores.

Findings indicated that THEA Reading, critical thinking, THEA Math and THEA Writing are the best predictors of success on the state PPR exam. Additionally, scores from these tests can be used as a diagnostic to identify students for whom interventions may be needed after enrollment in a teacher certification program. From a longitudinal perspective, these scores can also be used when evaluating program effectiveness. The unique contribution of this study is the review of critical thinking skills and their relationship to student performance on high stakes state teacher certification exams.

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Introduction

All pre-service teachers in Texas must pass the state Pedagogy and Professional Responsibilities (PPR) examination in order to become certified to teach. The Teacher Certification Program (TCP) where this study occurred encourages every pre-service teacher to score at least 80 percent as an indicator of readiness on a practice PPR exam before taking the state PPR exam. Students are encouraged to begin taking the practice PPR the semester prior to their student teaching. At this institution the practice PPR test is free and may be taken every three weeks throughout the school year. Many students take the practice PPR exam multiple times before achieving the 80 percent that indicates readiness to take the state PPR exam. The data from this institution suggests that once the students achieve an 80 percent on the practice PPR exam, it is almost certain that they will pass the state PPR exam.

A previous study, (Fike, Martinez, & Fike, 2010), found that Texas Higher Education Assessment (THEA) Reading and Math scores were predictors of success on the PPR exam. Since the PPR exam does not cover mathematics skills and yet THEA math scores were found to be predictors of success, the faculty hypothesized that critical thinking was being measured on the math component thus indicating a need for strong critical thinking skills. Clearly, strong reading skills allow a tester to both comprehend and analyze PPR scenarios. Currently, the Teacher Certification Program relies on predetermined minimal scores on THEA Reading, Writing, and Math, the Nelson-Denny Reading Test (NDRT), and a writing sample to predict a student's probability of success in the professional development coursework and mandated certification tests. The finding that math THEA scores were an indicator of success on the PPR exam led the researchers to theorize that critical thinking skills are involved as students must be able synthesize and evaluate information. Thus, this study introduced a critical thinking test in

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addition to the other tests. The intent of the research was to determine if there is a correlation between critical thinking skills and PPR exam scores.

Literature Review

> To meet the demand of a highly qualified teacher in every classroom, universities must be held accountable and adjust, modify and fine-tune their admittance procedures, intervention strategies, and teacher preparation programs to better develop a talented, qualified, and diverse pool of potential future teachers (Barton, 2008, p. 4).

All teacher preparation programs must provide teachers with solid and current content knowledge and essential skills (U.S. Department of Education, 2005). Additional responsibilities of teacher preparation programs include preparing pre-service teachers to manage the classroom, implement the curriculum, and equip them with the knowledge and skills necessary for passing teacher certification tests. Anyone who seeks permanent certification to teach in elementary or secondary schools in most states is now required to achieve a qualifying score on a set of tests administered by the State Teacher Certification Examination Program (Burke, 2005). The pressures of such tests can become overwhelming and failure to pass can result in delayed entrance into the field. However, by administering practice tests the probability of success can be predicted and course curriculum can be modified to better fit the demands of standardized tests required for teacher certification (Barton, 2008).

In Texas, pre-service teachers seeking their certification are required to take a Pedagogy and Professional Responsibilities exam composed of 100 multiple choice questions. Test questions require more than just the ability to recall factual information, to successfully achieve a qualifying score one must be able to think critically about the information, to analyze it, to

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consider it carefully, compare it to other knowledge you have or make a judgment about it (Texas Education Agency, TExES Preparation Manual, 2011).

It can be understood that for successful mastery of a teacher certification test to occur, one must acquire knowledge of the test's content. In addition to this, one must also be able to think critically. Critical thinking can be described as in depth, carefully articulated, well thought out, developed thinking. When one thinks critically, he or she is reflective, analytical, and judgmental. Because colleges often put much effort on "what to think rather than how to think" (Daud and Husin, 2004, p. 479) too often students are left struggling when it comes to thinking critically.

Hooks (2010, p.7) states "by the time most students enter college classrooms, they have come to dread thinking." Hooks also recalls entering into Stanford University and being surprised at the expectation of obedience and conformity by her professors. She goes on to write "the heartbeat of critical thinking is the longing to know –to understand how life works" (hooks, p. 7, 2010). Critical thinking is a process of inquiry and curiosity. Critical thinking instruction should focus on how students approach a question and reason about it (Facione, 1990). It is important that educators develop methods to teaching and strengthening their students' critical thinking skills so that college graduates can solve the world's most pressing problems and contribute to society (Hooks, 2010).

Critical thinking can be utilized in many aspects of life, both inside and outside of educational settings. The ability to think critically reflects one's capacity to contribute to an ever evolving and intellectually demanding society. Critical thinkers problem solve, brainstorm, and create innovative ideas. Critical thinking should be valued in all academic disciplines but is indispensable in the field of teacher education (Williams, 2005). Educators teach future

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generations and therefore have the ability to truly make an impact on building and strengthening such skills but before educators can do this, they themselves must be knowledgeable in how to think critically. Too often students within universities are asked to identify correct answers using a multiple choice test but such tests hinder critical thinking. As a result, responses to assessment items requiring explanations of criteria, analysis of texts or defense of a judgmental point of view can be disappointing (Fahim and Masouleh, 2012).

While knowledge about subjects can change, fade or become obsolete, ability to think effectively remains constant (Johnson, 2000). "In 1900, 8 out of 10 jobs involved working with one's hands. In 2000, the statistic flipped--8 out of 10 jobs involved working with ideas" (Cabrera and Colosi, 2012). Critical thinking is a vital component of education. In order to help future generations develop and strengthen their critical thinking skills teachers must first be taught how to do so themselves. Teacher preparation programs can assist pre-service teachers in the strengthening of these skills as well as helping them to face the challenge of passing state certification tests.

Theoretical Framework

The theoretical framework for this study is based upon Astin's (1991) Inputs-Environment-Outputs (I-E-O) assessment model. According to Astin, outputs (degrees earned, number of graduates, etc.) must always be evaluated in terms of inputs (student ability, gender, age, major, etc). Even so, input and output data are of limited usefulness by themselves. The environment (courses, programs, facilities, faculty, peer groups, etc.) completes the model. Assessing student outcomes accurately requires input, output, and environmental data, and the inclusion of all three elements in the model is necessary to assess the impact of educational programs.

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For this study, the inputs of the I-E-O model include demographic characteristics of the student such as age, sex, race, and educational level. In addition, every student admitted into the Teacher Certification Program must possess the following inputs: a minimum of 60 credit hours, a GPA of 2.75 or higher, minimal pre-set scores on the THEA test, the Nelson-Denny Reading Test, and an in-house writing test, as well as a successful interview. Astin (1991, p. 18) states that inputs "refers to those personal qualities the student brings initially to the educational program (including the student's initial level of developed talent at the time of entry)."

The environment, in this study, refers to that which the student experiences through the educational program (e.g. Teacher Certification Program). The Teacher Certification Program is responsible for preparing pre-service teachers for a successful teaching career. This begins with the development of curriculum which provides students with the knowledge and experiences they need to flourish in the classroom after successful completion of their required state certification examinations. For this research, a critical thinking test was given to the pre-service students to determine if there is a correlation between critical thinking and PPR scores. Findings from this study may influence the Teacher Certification Program (e.g. curriculum, course content, instructional strategies, student intervention and support) and, thus the TCP environment.

The final component of the I-E-O model relates to outputs. Outputs assessed in this study included scores on the PPR practice and state exams. If it is determined that critical thinking ability positively influences student outcomes, then the TCP will be prompted to make programmatic changes that will lead to improved student outcomes.

This theoretical framework conveys the importance of using input, output, and environmental data to impact change within the TCP as needed to support student success.

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Study Purpose

The primary purpose of this study was to determine if Teacher Certification students' critical thinking skills may serve as a predictor of performance on the TExES Pedagogy and Professional Responsibilities exam. The research questions were:

1. Are student scores on the critical thinking exam associated with performance on the practice and state PPR exams?
2. Are student scores on other potential predictors, including THEA and Nelson-Denny Reading Test assessments, associated with practice and state PPR exam scores?
3. Are student demographics/control variables (sex, age, education level, GPA) associated with practice and state PPR exam scores?
4. Do students who demonstrate mastery with a score of 80 percent or better on their practice PPR first attempt differ on critical thinking and state PPR scores?

Answers to these questions will be useful in several ways. Scores on instruments including the Collegiate Assessment of Academic Proficiency (CAAP) Critical Thinking test, THEA and Nelson-Denny Reading Test exams can be used when considering an applicant's admission to a teacher certification program. These scores can also be used as a diagnostic to identify students for whom interventions may be needed after enrollment in a teacher certification program. From a longitudinal perspective, these scores can also be used when evaluating program effectiveness in teacher certification program reviews. For example, these scores can be used as baseline controls when assessing whether a change to a teacher education program is producing improved student outcomes on the PPR. The unique contribution of this study is the review of critical thinking skills and their relationship to student performance on high stakes state teacher certification exams.

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Methods

Setting

This study was conducted at a private, urban university in Texas. The institution has annual enrollment of about 9000 students. The university is federally-designated as a Hispanic Serving Institution (HSI). Degrees offered by the institution include baccalaureate, masters, professional doctorate and doctorates of philosophy.

Design

For this correlational study, data was collected on students enrolled in the Teacher Education program at this university in 2011-2012. Students admitted to the Teacher Certification Program had scores on all sections of the THEA, the Nelson-Denny Reading Test, and an in-house writing test. Students included in this study were also administered the CAAP Critical Thinking Test. THEA, Nelson-Denny Reading Test and CAAP Critical Thinking scores were identified as predictor variables for this study. In preparation for completing the state-mandated PPR required for teacher certification, teacher education students took a practice PPR. Multiple attempts of the practice PPR were promoted as a means of assuring preparedness for the state PPR, with the goal of achieving a score of 80 percent or higher on the practice PPR serving as the indicator of preparedness. Outcome variables of interest for this study included students' scores on their first attempt on the practice PPR, the number of attempts on the practice PPR, the best score on the practice PPR, and the score on the state PPR.

Demographics variables included students' sex, education level, age, race/ethnicity, and GPA category. In addition to the predictor variables, these demographics variables were reviewed to determine their association with students' prospects for successful completion of a teacher education program leading to teacher certification.

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Sample

The sample for the study was comprised of 69 students enrolled in the Teacher Education program in 2011-2012. Student characteristics are provided in Table 1. The sample was predominantly comprised of upper-level undergraduates. The majority of the students were females from traditionally-underserved populations.

Table 1

Sample Description (N = 69)

Variable	N (%) or Mean ± SD
Sophomore	1 (1%)
Junior	7 (10%)
Senior	51 (74%)
Graduate	10 (15%)
Caucasian	21 (30%)
Female	59 (86%)
GPA ≥ 3.5	38 (55%)
GPA < 3.5	31 (45%)
Age (months)	297 ± 76
CT score	62 ± 5
Nelson-Denny score	68 ± 18
THEA Math score	260 ± 19
THEA Reading score	268 ± 17
THEA Writing score	254 ± 22

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Instruments

The instruments utilized in this study included the following standardized tests: CAAP Critical Thinking Test, Texas Higher Education Assessment, Nelson-Denny Reading Test, and the TExES Pedagogy and Professional Responsibilities test.

Collegiate Assessment of Academic Proficiency critical thinking test. CAAP is a validated, standardized assessment program from ACT that enables postsecondary institutions to assess, evaluate, and enhance student learning outcomes and the outcomes of their general education programs. The CAAP Critical Thinking test measures students' skills in clarifying, analyzing, evaluating, and extending arguments. It is a 32-item, 40-minute multiple-choice test that consists of four passages that are representative of the kinds of issues commonly encountered in a postsecondary curriculum. Each passage presents one or more arguments in a variety of formats, including case studies, debates, dialogues, overlapping positions, statistical arguments, experimental results, or editorials (CAAP Technical Handbook, 2009-2010).

Texas Higher Education Assessment test. The THEA skills and item specifications were developed and approved by committees of Texas faculty from community colleges and universities. The skills were validated in surveys of Texas educators and were finalized for testing by the test development committees. Committees reviewed and validated test items. The test items were pilot tested in Texas and finalized by the committees based on pilot test results. Independent panels of Texas higher education faculty reviewed and revalidated the items and provided input to the Texas Higher Education Coordinating Board and the State Board of Education for use in setting passing standards. These boards are responsible by law for setting the passing standards (THEA Faculty Manual, 2013).

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Nelson-Denny Reading test. The test was developed in 1929, and named after its creators, M.S. Nelson and E.C. Denny. There are two parts to the exam: Vocabulary, and Reading Comprehension. The Vocabulary section has 80 multiple choice questions, and test takers will choose from five possible answers on each one. For the Reading Comprehension section, the test taker will read five brief passages taken from high school and college textbooks, and then answer 38 multiple choice questions testing both direct comprehension skills, and the ability to make inferences based on what they have read. Schools use the NDRT for a variety of purposes. It is commonly used as a diagnostic exam. One of the main purposes is screening incoming students for their current level of reading skills, as well as any problems that need to be addressed. The exam is also a very reliable indicator of which students will be successful in college. It can also be used for measuring progress, either for overall reading skills, or in specific problem areas (Nelson-Denny Practice Test Review, 2014).

TExES Pedagogy and Professional Responsibilities exam. The TExES tests are criterion-referenced examinations designed to measure a candidate's knowledge in relation to an established criterion rather than to the performance of other candidates. Validation of the TExES tests is undertaken to establish that the tests meet the purposes for which they are designed. The test development process involves accepted procedures for the validation of licensure and certification tests. The validation approach is content-based, as is appropriate for tests of this type that measure content knowledge required for licensure or certification. The content of each TExES test is specified clearly in the competencies and test questions. The test development process is structured to gather validity evidence consistently at multiple points (Texas Examinations of Educator Standards Faculty Manual, 2013).

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Statistical Analysis

Descriptive statistics including means, standard deviations, Ns and percents, were calculated. Correlation coefficients were calculated to determine the association of predictor and demographics variables with outcomes variables of interest. Pearson correlation coefficients were calculated to test the relationship of continuous variables. Point-biserial correlations were calculated to test the relationship of dichotomous and continuous variables. Spearman correlations were calculated for ordinal variables. The independent-samples t test was used to determine if students who achieved an 80 percent or higher on the first practice PPR exam differed on critical thinking exam score, best practice PPR score and state PPR score from those who scored below 80 percent on their first practice PPR. The level of significance was .05 for all inferential analyses.

Results

Table 2 provides the correlations of salient variables. In response to research question 1, critical thinking scores correlate significantly with outcomes including practice PPR first attempt scores and state PPR scores. Students with higher scores on the CAAP Critical Thinking Test tend to earn higher scores on the state PPR. Critical thinking scores correlate negatively with the number of attempts on the practice PPR; in other words, students with lower critical thinking scores tend to make more attempts on the practice PPR before demonstrating mastery with a score of 80 percent or greater.

In response to research question 2, THEA Reading positively correlates with practice PPR first attempt scores, but Nelson-Denny Reading Test, THEA Math and THEA Writing scores are not associated with practice PPR first attempt scores. Of the predictor variables, only critical thinking and THEA Reading scores are predictors of practice PPR first attempt scores.

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All of the predictor variables except Nelson-Denny Reading Test are significantly associated with scores on the state PPR. This finding suggests that Nelson-Denny Reading Test scores may not be as useful as a predictor of performance on PPR exams.

Table 2

Correlations[a]

	Critical Thinking	Nelson-Denny	PPR Practice First Attempt	Best Practice PPR	State PPR
Predictor Variables:					
Critical Thinking	1	.514**	.293*	.048	.407**
Nelson-Denny	.514**	1	.231	.320*	.212
THEA Math First Attempt	.446**	.167	.093	-.108	.378**
THEA Math Final	.456**	.171	.107	-.060	.400**
THEA Reading First Attempt	.539**	.408**	.299*	.345**	.292*
THEA Reading Final	.558**	.543**	.294*	.243	.409**
THEA Writing First Attempt	.236	.189	.242	-.004	.356*
THEA Writing Final	.250*	.185	.193	-.048	.356*
Outcome Variables:					
PPR Practice First Attempt	.293*	.231	1	.486**	.473**
Best Practice PPR	.048	.320*	.486**	1	-.070
Practice PPR No. of Attempts	-.385**	-.099	-.322**	.195	-.445**
State PPR	.407**	.212	.473**	-.070	1
Demographic Variables[b]:					
Sex	-.006	.140	-.199	.133	-.187
Educational Level	-.094	.236	.159	.253*	-.008
Age (months) at first Practice PPR	-.262*	-.002	-.108	.134	-.045
Caucasian	.218	.250	.065	.104	.249
GPA Category	.229	.349**	.311**	.320**	.310*

[a]Statistical significance: * indicates $p < .05$; ** indicates $p < .01$

[b]Variable codings: Sex is Male=1, Female=0. Education Level is Sophomore=1, Junior=2, Senior=3, Graduate=4. Caucasian is Yes=1, No= 0.GPA Category is 3.5 or greater = 1, <3.5 = 0.

In response to research question 3, most demographic variables are not associated with practice or state PPR scores. The only demographic variable that correlates significantly with the outcome variables is GPA Category. Students with a GPA of 3.5 or higher earn significantly higher scores on the practice and state PPR exams. On a positive note, these findings may suggest that the PPR exams do not favor or discriminate among students based upon their sex,

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age, or race/ethnicity. However, students who demonstrate the best academic performance (i.e., higher GPA) perform better on the PPR exams.

Table 3 presents a comparison of students who demonstrated mastery with a score of 80 percent or higher on their first attempt of the practice PPR versus those who do not demonstrate mastery on their first attempt. Less than 20 percent of the students demonstrated mastery (i.e., score of 80 percent or higher) on their first attempt of the practice PPR. In response to research question 4, students who demonstrated mastery on their first attempt on the practice PPR did not have significantly different critical thinking scores than students who did not demonstrate mastery. Students who demonstrated mastery on their first attempt of the practice PPR earned significantly higher scores when they take the state PPR. This suggests that student scores on the first practice PPR attempt may be a useful diagnostic to identify individuals for whom interventions are needed.

Table 3

Mean Differences based upon First Practice PPR Score (passed vs. did not pass)

	Passed First Practice PPR	N	Mean	Std. Deviation	P-value*
Critical Thinking Score	Yes	12	63.33	6.372	.219
	No	55	61.31	4.826	
Best Practice PPR Score	Yes	12	83.14	2.503	.798
	No	40	82.90	3.022	
State PPR Score	Yes	11	278.55	9.964	.004
	No	40	267.20	11.157	

* Independent samples t-test

Discussion

A goal of the TCP is to prepare pre-service teachers for success on the state PPR exam. This study found that students with higher scores on the CAAP Critical Thinking Test earned

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higher scores on the state PPR exam. Additionally, the lower a student's critical thinking score, the more times the student was likely to have to take the practice PPR exam before demonstrating mastery. The more attempts a student makes to score an 80 per cent on the PPR practice exam, the lower the score on the state PPR exam. These data make it clear that a student who struggles to pass the practice PPR exam may not have full command of the material and may struggle with the state exam. Fewer than 20 percent of the students passed the practice PPR exam on the first attempt. The remainder of the students eventually passed the practice PPR exam after multiple attempts. The custom of the TCP is that after testing on the practice PPR exam, students are given an analysis of their scores. The analysis provides data for each PPR competency. The data provides the students with the percentage of correct responses on each of the 13 PPR competencies. This data informs the students of their areas of strength and of weakness. The students are advised to study during the required three-week wait period, and then retest. The majority of students eventually score the ideal minimum score of 80 per cent on the PPR practice exam. In fact, the students who eventually caught up scored almost the same as those who passed the exam on the first attempt (83 for those who passed on first attempt and 82 for those catching up). However, when these students took the state PPR exam, they did not perform nearly as well as those who passed the practice PPR exam on the first attempt (278 for those who passed on first attempt and 267 for those who had to test multiple times on the practice PPR exam). Those who passed their practice PPR exam on the first attempt had significantly higher scores on their state PPR exam. The lower scores on the state PPR exam may indicate that these students never learned the material as thoroughly as the others or perhaps their critical thinking skills are weak. It is also possible that the students retesting may be learning the practice test rather than learning the PPR content. Regardless, this finding suggests that the TCP

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may need to provide support specifically to those students who do not pass the practice PPR exam on the first attempt.

These findings may prompt a review of some of the Teacher Certification Program policies. For example, the TCP may elect to add a critical thinking test as part of the admission criteria. A critical thinking test could be used as a complement or an alternative to the Nelson-Denny Reading Test and THEA exams. However, since the critical thinking test has to be purchased and can be given only one time, the cost may be prohibitive. The students do not have to pay for the Nelson-Denny Reading Test, and it may be used multiple times. However, this study found that the Nelson-Denny Reading Test may not be an effective predictor of success on the PPR exam and; therefore, may not be as useful for screening admission to the TCP as the other criteria. Finally, there would be no advantage to eliminating the THEA exam since predetermined THEA scores are approved by the Texas Education Agency as demonstration of adequate basic skills in reading, written communication, and mathematics, a requirement for admission to educator preparation programs in Texas (Texas Administrative Code, 2014).

The Teacher Certification Program may also want to provide an intervention to those students who do not pass the practice PPR exam on the first attempt. For example, a PPR review could be provided or a group study session could be required.

Finally, as a program, an emphasis may need to be placed on the development of students' critical thinking skills. The Teacher Certification Program faculty may need training or review on the importance of developing critical thinking skills in every student in every course. Students found to have weak critical thinking skills may be at risk of failing and need additional support. The creation of a stand-alone critical thinking course may also be considered.

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This study highlights the importance of critical thinking skills in pre-service teachers; however, results from an informal survey indicated that very few universities offer a stand-alone critical thinking course. Rather, most reported that they imbed the development of critical thinking of pre-service teachers into educational courses and assess it through in-class discussion, assignments, and exams. Additionally, most Teacher Certification Programs do not require a critical thinking test score as a criterion for admission into the program.

Demographic characteristics such as sex, educational level, age, race, GPA, and classification were analyzed to determine if these characteristics influenced student success on the PPR exam. The findings indicated that student demographic characteristics had little likelihood of influencing success on the PPR exam. However, students with a higher GPA did perform better on both their practice and state PPR exams. Students with a 3.5 or higher GPA, performed better on both the practice and state PPR exams. Currently, the TCP requires a minimum GPA of 2.75. Perhaps the program should look at the possibility of increasing the required GPA for admittance to the program. An interesting finding was that there was a negative correlation between older students and the critical thinking score--the older the student, the lower the critical thinking score. Since an important aspect of critical thinking is prior knowledge, this finding might be contrary to what one would expect. The finding also suggests that some older students may need more support to pass the PPR exam. Overall, these findings provide assurance that the TCP is not discriminating against any of the demographic characteristics reviewed.

In summary, THEA Reading (.409), critical thinking (.407), THEA Math (.400), and THEA Writing (.356) are the best predictors of success on the state PPR exam. If the Teacher Certification Program desires to admit students who will most likely be successful, or wants to

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identify which students will need an intervention, then the focus should be on the THEA test that is already used to assess basic skills and perhaps a critical thinking test that could be administered early in the program as well.

Implications for Practice

Teacher education programs can gain an increased understanding of candidates' developmental needs by identifying predictors of success and potential challenges. Specifically, the TCP may want to evaluate the current requirement of using multiple tests for admission criteria. Since the THEA test in its entirety is a good predictor of success on the state PPR exam, then perhaps the Nelson-Denny Reading Test can be eliminated, along with the extra writing sample, and the critical thinking test.

Another possibility is to require the THEA test and a critical thinking test early in the program. These tests could be a part of the Foundations of Education class that is normally taken as a freshman or sophomore. Scores from these early tests would allow time for an intervention to support the students who are at risk of not passing the state PPR exam.

Limitations

There are some limitations to this study. First, the demographic data were self-reported; these data were not validated. Second, because this study is retrospective and is not based on an experimental design, causality cannot be established. Third, findings from this study should not be generalized to student populations that differ from those in this study. Replication with similar findings for other populations will serve to strengthen the external validity of this study.

Conclusion

Teacher candidates must complete many requirements in their quest for teaching certification. While most students successfully complete coursework, perform well in field-based

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experiences, and present the social and professional skills to indicate expected success in the profession of teaching, many candidates struggle with the required certification exams, despite their success on the practical requirements. This challenge often presents at the culmination of the preparation program. Teacher candidates are sometimes left to struggle through this last hurdle without university support which can result in incurred financial burden, mental and emotional anguish, and even in abandoning their intent to become a certified teacher.

Teacher certification programs can gain an increased understanding of candidates' developmental needs by identifying predictors of success and potential challenges that can be addressed early. Understanding student needs will allow programs to examine established and needed supports throughout the program, allow for early identification of at-risk students, and provide an opportunity for assessment-informed program design. Based on findings from this study it was determined that the Teacher Certification Program should evaluate the possibility of making program changes that address the needs of students entering the program with lower THEA and critical thinking scores.

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THE CHANGE IN TEACHING METHODS FOR WORLD HISTORY WITH NO STATE EXAM

Kaci D. Felder, M.Ed.
Sam Houston State University

Sam Sullivan, Ed.D.
Sam Houston State University

Jalene P. Potter, Ph.D.
Sam Houston State University

Abstract

High-stakes exams such as the World History STAAR End of Course (EOC) have played a large role in the curriculum of World History courses in Texas high schools. Recently, Texas has removed the World History STAAR EOC exam from the list of required state exams. This study seeks to determine if teaching methods changed due to the absence of the STAAR EOC. A population of 25 World History teachers from a suburban school district in Texas was surveyed. The participants include Pre-AP, AP, and level teachers of World History. Results revealed that teaching methods, including mode of instruction and quantity of content, have changed due to the absence of the state exam. Additionally, data indicate that a new allowance of time that was previously dedicated to the STAAR EOC, is being used in a productive manner with additional projects and writing assignments.

Introduction

The mode and design of an assessment frequently defines how course material is presented. "Educators and critics, however, believe there is a connection between the way a test is designed and the way teachers teach and students learn" (Xie & Andrews, 2013, p.51). Therefore, if a standardized test that is required of the entire state has a general form, it is to be expected that teachers frequent that form in their own assessments. Although the new STAAR End of Course (EOC) exams incorporate open ended questions, the majority of questions asked

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in the social studies content area are in the form of multiple choice items. Diane Ravitch (2010) argues that teaching students how to fill in answers to multiple choice questions is not the solution for assessing achievement of education.

Rather than promoting teachers to increase their skills and knowledge, high-stakes testing "both disempowers and deskills teachers" (Au, 2011, p.30). According to Pace (2012), accountability of state testing influences teacher's instructional decision making in social studies. Influences are seen in the form of the underlying philosophy of education, testing materials for non-state assessments, daily curriculum and emphasis on Texas Essential Knowledge and Skills (TEKS) that are frequently on state exams versus TEKS that are not frequently included on state exams. Longo (2010) contends that "teachers constantly find themselves trying to balance motivating instruction with state assessment requirements" (p.56). Teachers are often placed in a position to omit lessons of history to make time for TEKS that will be featured on the state exam.

State exams are not always accurate in illustrating success gained by students academically. Carnoy, Elmore and Siskin (2013) performed a study on the effects of Texas Assessment of Academic Skills (TAAS) results on traditional community high schools. The results demonstrated that although one high school scored significantly low on the exam, "more than 50 percent of its graduates attended two – or four-year colleges, and school attendance was always high" (Carnoy, Elmore & Siskin, 2013, p.76). The school researched was also mostly economically disadvantaged and consisted largely of minority students. Therefore, state exams are not always accurate predictors for college readiness.

Although the purpose of high-stakes testing policy is to increase student learning across the board, there are some obvious deficiencies that must be addressed in order for public

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> school students to enter college with the academic knowledge and skills that are essential for obtaining a postsecondary degree (Featherston, 2011, p.70).

With state testing no longer impacting World History, these deficiencies may be addressed in curriculum that was previously hindered by time constraints.

Stress related to the high stakes accountability has led educators to place a higher emphasis on state standardized assessments more than common assessments integrated into the normal curriculum. "For instance, due to the pressures exerted through policies associated with high-stakes testing, teachers are teaching to the tests with increasing regularity, consistency and intensity" (Au, 2011, p.30). These test preparation practices include practicing material that is predicted to be on the test repeatedly, while at times, leaving out curriculum that is also vital, but not necessarily included on the state exam.

In January of 2014, the Texas Legislature held the second reading and final adoption of House Bill 5. This bill only entails the high school student to take three credits of social studies; allowing the student and/or school to choose from either World Geography or World History. Previously, students needed to take six credits, resulting in four traditional years of social studies courses. A state exam was also previously required for World Geography, Word History and U.S. History. The state of Texas no longer requires a STAAR EOC exam for either World Geography or World History (Texas Education Agency, 2014).

With the stress of high stakes accountability no longer there, teachers have the opportunity to change and adapt how they instruct World History. This study will focus on the shift of teaching methods from having a state exam to not having a state exam.

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Purpose of the Study

"The problem is this: Testing is killing education. Not only does it narrow curriculum generally, but it also promotes bad pedagogy" (Au & Tempel, 2012, p.73). For years a form of a state exam has influenced the teaching methods of educators in World History. Due to House Bill 5, the current form of state exam, the STAAR EOC, is no longer an influence over this particular course. Teachers have the opportunity to change and adapt how they present and teach curriculum for World History. This study will focus on the shift of teaching methods from administering a state exam to not administering a state exam by asking: Are educators developing new methods of teaching without the concern of a World History End of Course exam? Investigating how teachers have changed and adapted their teaching methods as a result of this new requirement is useful to current and future educators in this subject.

Methodology

The participants in the study have taught World History for at least two years; including at least one year with a World History STAAR EOC exam and at least one year without. All of the participants were current educators in the same Texas suburban school district. The school district was selected through convenience sampling and included five high schools with a total of 36 World History teachers. Nearly 70%, or 25 teachers, chose to participate in the research study. Years of teaching experience and subject matter within World History varied between the participants. Forty percent of the participants taught either Pre-Advanced Placement (Pre-AP) or Advanced Placement (AP) World History, while the other 60% taught level World History. There were no participants who switched from Pre-AP or AP to level during the past two years, which was the time frame being investigated.

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This research was performed using a mixture of qualitative and quantitative methods through the form of a researcher designed survey regarding demographics, teaching methods, and personal opinions over teaching methods before and after the discontinuation of the STAAR EOC exam. The first section of the survey consisted of open ended questions asking how and if participants' teaching methods had changed due to the lack of a state exam and how exactly had they changed. The next section of the survey asked participants what level of World History they currently were teaching and their years of experience in teaching World History. This section was composed of three tables of questions requiring of Likert-scale responses designed to measure frequency regarding instructional methods before and after the STAAR EOC exam, along with the inclusion or exclusion of TEKS. The tables included questions regarding particular teaching methods such as the amount of writing assignments and projects. Though the first few questions of the table were general in regards to the overall study, the questions become more specific as to the mode of instruction. Additionally, the questions measured frequency of stress related to the World History STAAR EOC exam. This survey was designed to take no longer than 15 minutes and all surveys remained anonymous. Participants were emailed a link to a web-based Google Form survey that asked questions.

Results

The study surveyed educators who have taught World History for at least two years with one year including administering the STAAR EOC exam and one year without. The years of experience in teaching varied, with the majority of teachers having taught for two to five years. A total of 13 (52%) respondents have been teaching for two to five years, 10 (40%) respondents have been teaching for 6 to 15 years, and two (8%) respondents have been teaching for 21+ years. Figure 1 illustrates respondents' years of service in teaching World History.

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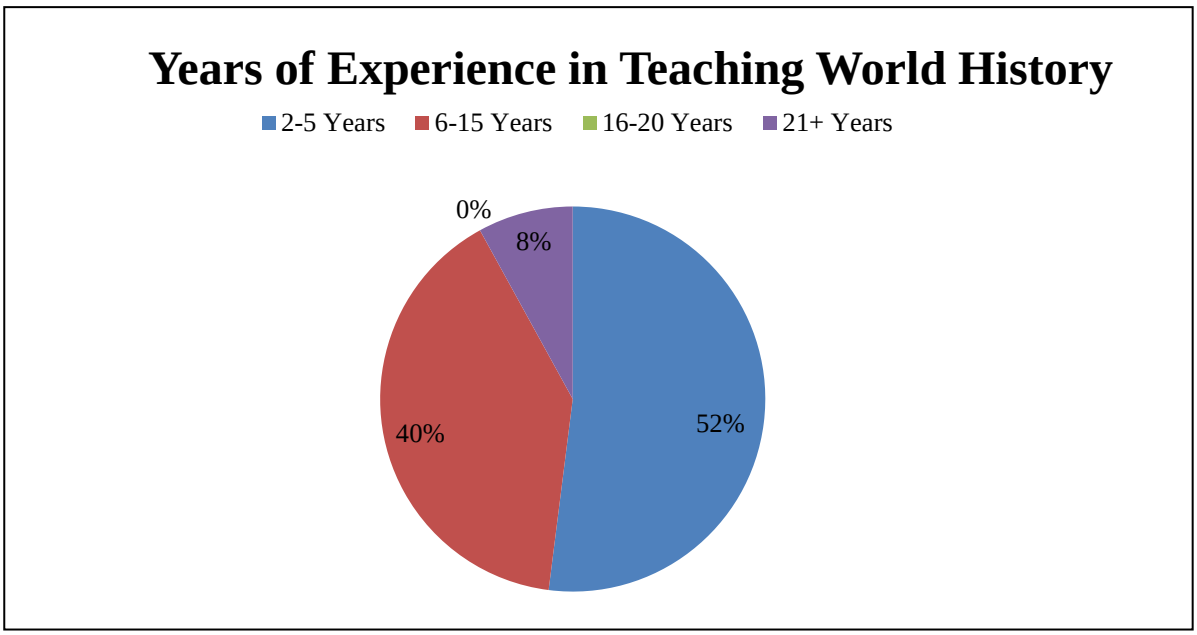

Figure 1. Respondents' years of teaching World History.

Teaching Methods

The study sought to determine if teaching methods had changed in relation to mode of instruction and content. The first question presented on the survey was an open-ended question that asked participants to briefly explain if their mode of instruction had changed without the inclusion of the STAAR EOC exam. The responses were initially analyzed through identifying if the respondents included a yes or no in their answers. Table 1 illustrates the results.

Table 1

Changes in Method of Instruction Without a STAAR EOC

YES	15 Participants	60%
NO	10 Participants	40%

The second open-ended question targeted teaching methods. The question asked participants to describe the amount of time they dedicated to content after the STAAR EOC

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exam and if it had increased, decreased, or stayed the same. Participants were also asked to explain their answers. The responses were initially analyzed through identifying if the respondents stated that they had included more, less, or the same amount of time to content of the exclusion of the STAAR EOC exam. Table 2 illustrates the results.

Table 2

Amount of Time Dedicated to Content without a STAAR EOC

MORE	8 Participants	32%
LESS	7 Participants	28%
SAME	10 Participants	40%

Responding to the question "Had teaching methods changed with no STAAR EOC?", 60% (15), chose Agree or Strongly Agree, while 40% (10), chose Disagree or Strongly Disagree. The frequency and the percentage of yes and no identifiers in the first open ended question asking the same thing were identical. The open-ended interview question shed more light as to why participants had changed methods of instruction. In relation to the benefit of no STAAR EOC exam, one participant stated, "Without the STAAR EOC I have been able to go in depth about topics my students will be most impacted by. We spend more time researching and engaging in debates than we did last year. We have more discussion and spend time re-teaching topic that students didn't fully understand, rather than having to move on because of the lack of time".

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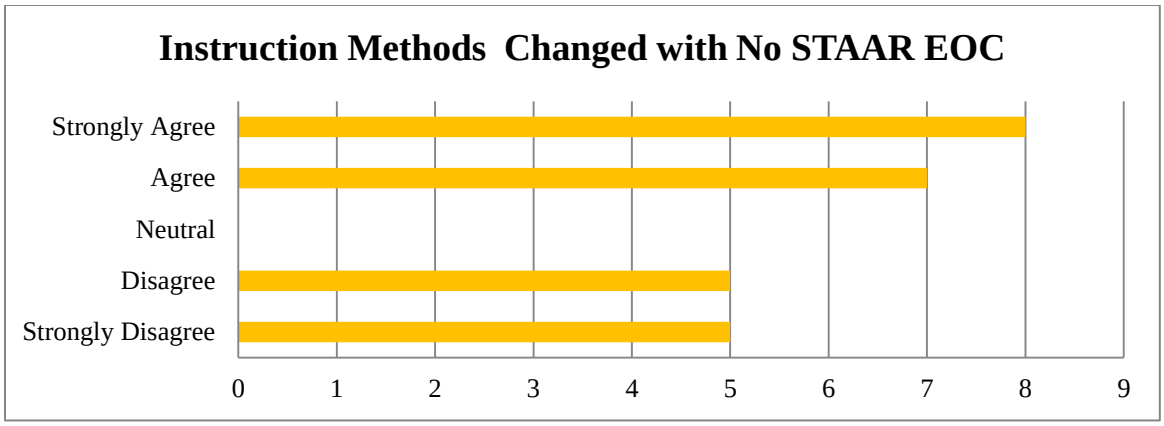

Figure 2. Respondents' perceptions of a year of teaching with no STAAR EOC exam.

Seven other respondents had similar answers, including additional time as one of the main reasons for the shift in instructional methods. Other participants described the year of teaching with no STAAR EOC exam as a shift which focused more on processing and skills. A participant included more complex reading to "force students to make connections between subjects," while another also included more primary readings to "increase basic skills of connection and analysis."

The majority of participants, who agreed that their teaching methods had changed, agreed that they had changed in a positive manner, such as adding more projects or time for skills and processing. However, 20% or three respondents who agreed there was a change, explained their change in a negative light. One explained, "My teaching methods have changed, and not for the better. I do not hold students accountable to the missed information, I feel the student receive a better education with the inclusion of a STAAR EOC exam. They do not feel the pressure and the lack the desire to work harder for an end of year goal". The other two participants who displayed negative change also attributed the negative adjustment to lack of pressure and incentive.

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Those who chose no change were mainly Pre-AP and AP teachers. Out of the 10 who chose no change, only one was not Pre-AP or AP. A participant explained the reason behind the lack of change in Pre-AP and AP classrooms: "My teaching methods have not changed because I teach AP World, so the standard remains the same, high". The single non Pre-AP or AP teacher who chose no change, attributed the lack of change to always being dedicated to teaching the TEKS that the state has determined to be essential.

The Inclusion of More or Less TEKS

The next section of questions asked respondents if they emphasized more or less TEKS without the STAAR EOC. Figures 3 and 4 illustrate the responses. When asked if teachers had emphasized more TEKS, 20% (5), chose Agree or Strongly Agree, 28% (7), chose Neutral, and 52% (13), chose Disagree or Strongly Disagree. The majority of the respondents chose either Disagree or Strongly Disagree, indicating that less TEKS had been taught during years with no STAAR EOC. These results were in accordance with the results of the following question regarding if teachers had emphasized less TEKS. When asked if teachers had emphasized less TEKS, 48% (12), chose Agree or Strongly Agree, 32% (8), chose Neutral, and 20% (5), chose Disagree or Agree.

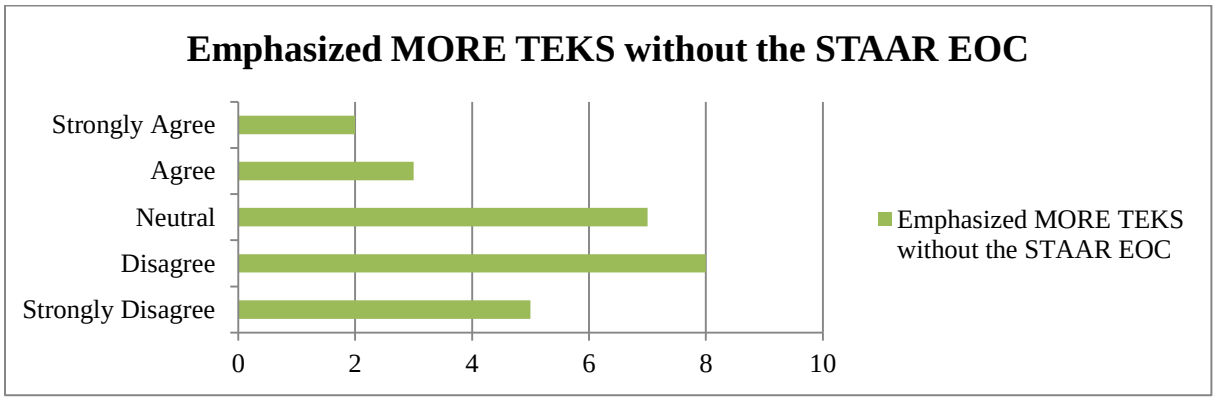

Figure 3. Respondents reply that they emphasized more TEKS without the STAAR EOC.

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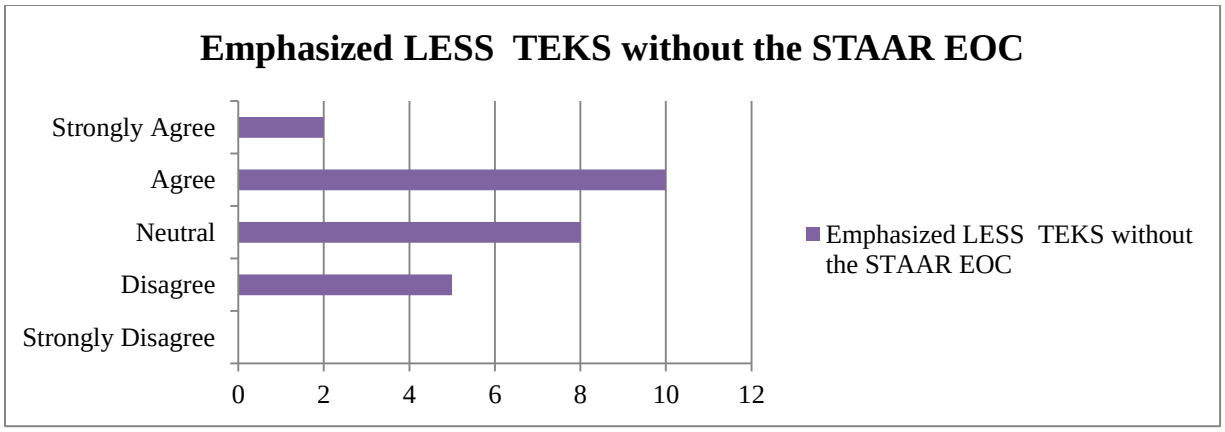

Figure 4. Respondents reply that they emphasized less TEKS without the STAAR EOC.

The open-ended question asking participants of the change in the amount of time spent on content without a STAAR EOC exam further explained the results. One participant explained a main reason behind the inclusion of less TEKS,

> I have dedicated less time to those TEKS that I deem to be less than vital. Last year, covering every single TEKS at warp speed led to confusion because I had to mention the TEKS, but not explain it because of time. Some TEKS didn't fit into any units smoothly. They seemed more a distraction from the main idea of the unit.

The other participants who claimed to have included less TEKS attributed the change to the same reason. Another participant further explained that "certain TEKS about certain people require more time for little gain, so it was better to exclude them."

The five participants, who stated that they had included more TEKS, attributed the change to more time and less pressure. One explained that "With the added time of no STAAR EOC, I was able to go over TEKS that I often skimmed over in previous years." The remaining participants who chose Neutral, or stated in the open-ended question that the amount of time spent on content remained the same, were either Pre-AP or AP teachers.

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The Inclusion of More or Less Projects

This section asked participants if they had included more or less projects in their lesson plans without the STAAR EOC exam. Figures 5 and 6 display the results.

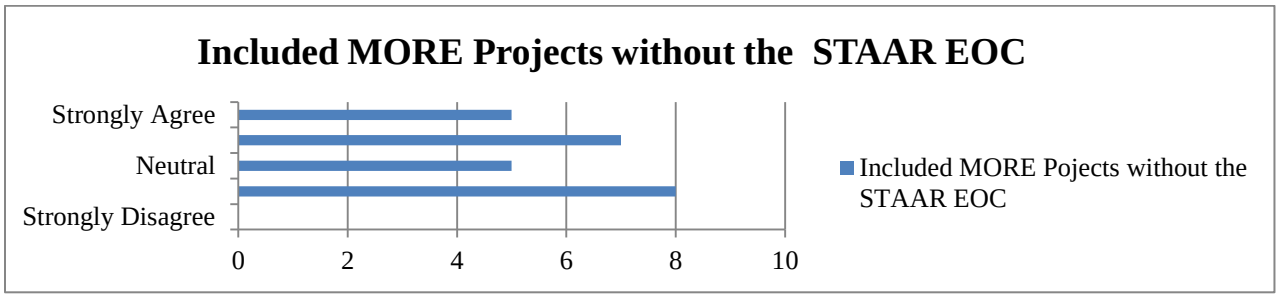

Figure 5. Respondents reply they included more projects without the STAAR EOC.

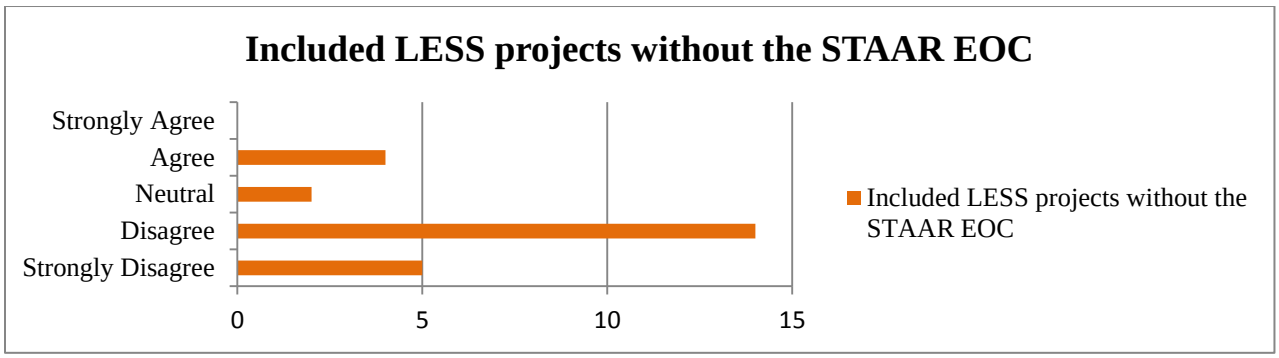

Figure 6. Respondents reply they included less projects without the STAAR EOC.

When asked if teachers had included more projects without the STAAR EOC exam, 48% (12), chose Agree or Strongly Agree, 20% (5), chose Neutral, 32% (8), chose Disagree or Strongly Disagree. The majority of respondents chose Agree or Strongly Agree, indicating that projects took a larger role in teaching methods after the discontinuation of the STAAR EOC exam. These results were in accordance of the following question regarding if teachers had included less projects. When teachers were asked if they included less projects, 16% (4), chose Agree or Strongly Agree, 8% (2), chose Neutral, and 79% (19), chose Disagree or Strongly

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Disagree. The small shift in percentages from the first questions referencing projects to the second could be due to the second question including a negative rather than a positive adjective with projects. Projects are viewed as a useful tool in instruction and allow students to take control over their own learning. Teachers do not see projects as negative, which is validated with the small shift in percentages from the first to second question.

Participants also explained reasoning behind including more projects into lesson plans in their open-ended responses. When asked if teachers included more time on content, one participant answered, "Yes, spending more time on units and more time on projects." Once again, time was a contributing factor that allowed an increase in projects.

Increased or Decreased Amounts of Writing Assignments

These questions asked participants if they had included more or less writing assignments in their lesson plans without the STAAR EOC. Figures 7 and 8 display the results. When asked if teachers had increased the amount of writing assignments, 60% (15), chose Agree or Strongly Agree, 8% (2), chose Neutral, and 32% (8), chose Disagree or Strongly Disagree. The majority of the respondents chose either Agree or Strongly Agree, indicating that writing assignments increased after the expulsion of the STAAR EOC exam. When asked if they had reduced the amount of writing assignments, zero respondents chose Agree or Strongly Agree, 20% (5), chose Neutral, and 80% (20), chose Disagree or Agree. The small shift in percentage from the first question regarding writing assignments to the second can also be attributed to adding a negative adjective. The first questions simply asked the participants if they had increased the amount of writing assignments, which is a positive use of dictation. The following question then replaced increased with decreased and subsequently changed the tone of the question from positive to negative. Writing skills, like those required to complete projects, are considered fundamental

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skills in World History and social studies. Therefore, teachers are more likely to Disagree and Strongly Disagree when writing assignments are paired with a negative adjective such as "less".

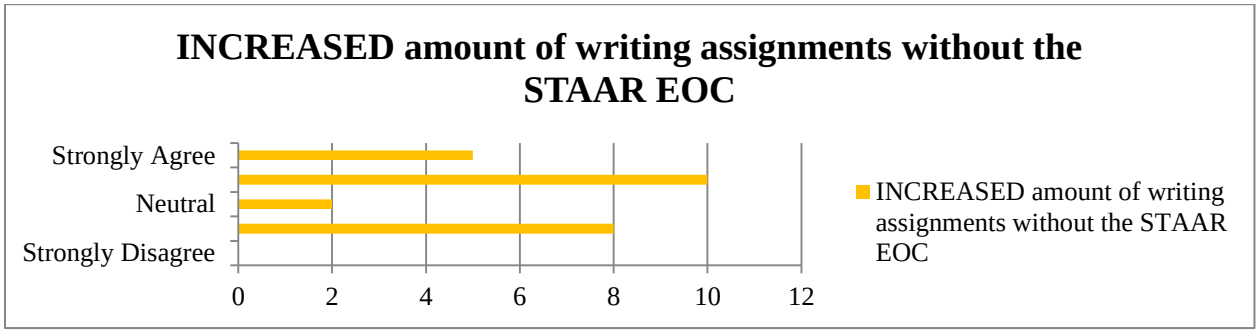

Figure 7. Respondents reply they increased writing assignments without the STAAR EOC.

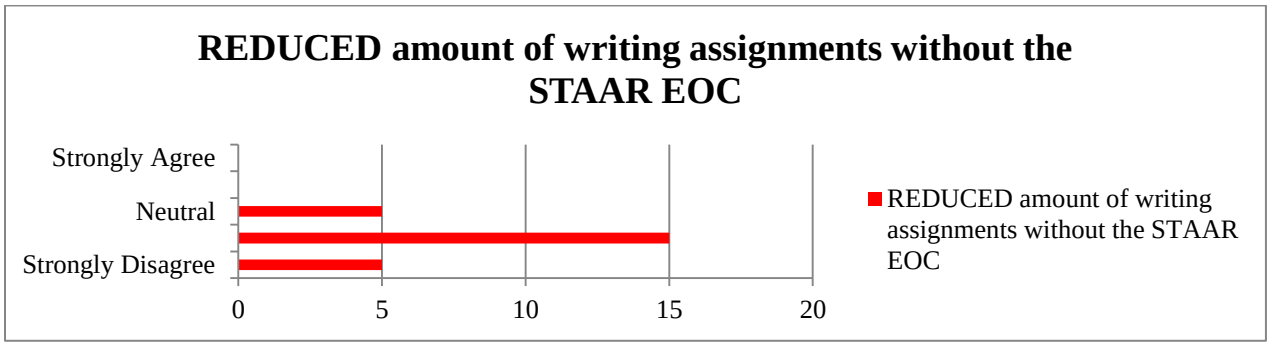

Figure 8. Respondents reply they reduced writing assignments without the STAAR EOC.

Participants also explained reasoning behind increasing writing assignments into lesson plans in their open-ended responses. When asked if teachers included more time on content, one responded by saying that "Writing can now take more of a center stage in my curriculum." Another also emphasized the increased amount of writing through stating, "I now have time to let students actually explain in writing how they feel about certain historic events and how it has affected them in their present life."

Stress Related to the STAAR EOC

Previous literature has indicted that stress is correlated with high stakes testing such as the STAAR EOC exam. In his book, *High-Stakes Testing: Coping with Collateral Damage*,

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R.M Thomas (2005) asked teachers to describe the pressure and stress that they felt were induced by state exams. This is an excerpt from his research: "A secondary education pre-service teacher responded, "There is not enough space for me to list all of the concerns I have about teaching in such a pressured environment due to high-stakes testing." (Thomas, 2005, p.178) Therefore, questions related to stress from high-stakes testing were included in the research to analyze if less stress was evident in the classroom with no STAAR EOC. The first question asked in the final section asked teachers if they felt less stressed without a STAAR EOC exam. Figure 9 illustrates the results. When asked if they felt less stress without a STAAR EOC, 72% (18), chose Agree or Strongly Agree, 20% (5), chose Neutral, and 8% (2), chose Disagree. The large majority of respondents who chose Agree or Strongly Agree indicate that the STAAR EOC exam was in fact a major source of stress and the classroom environment is less stressful without it. The teachers who chose Neutral and Disagree were all either Pre-AP or AP teachers. The STAAR EOC exam only covers the basics of their curriculum and it is surprising that they did not feel stress related to that exam.

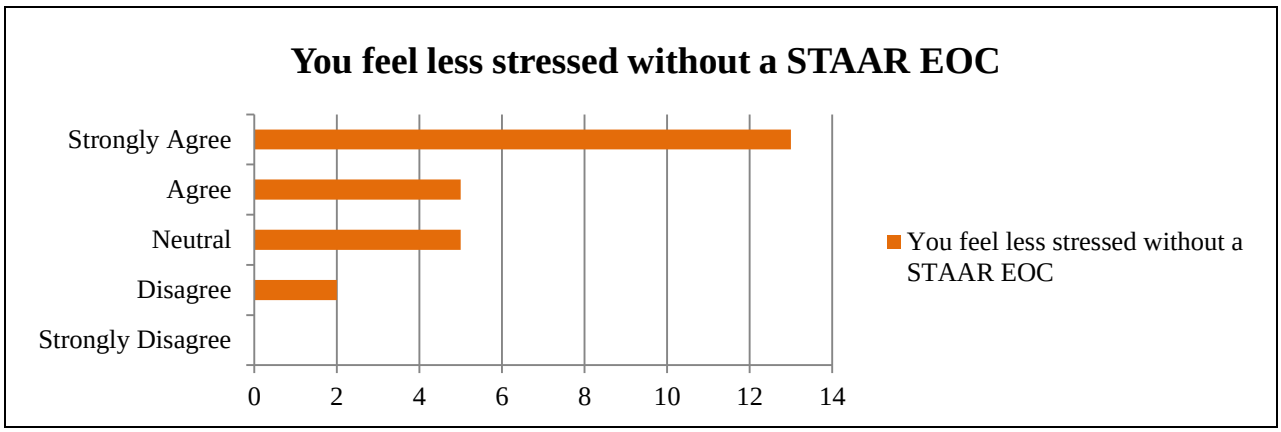

Figure 9. Respondents reply they feel less stressed without a STAAR EOC.

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The next question related to stress asked participants if they are more relaxed in the classroom without a STAAR EOC exam. Figure 10 displays the results. When asked if their classroom was more relaxed without the STAAR EOC, 72% (18), chose Agree or Strongly Agree, 8% (2), chose Neutral, and 20% (5), chose Disagree. There were no participants who chose Strongly Disagree. The large majority of respondents who chose Agree and Strongly Agree indicated that the classroom is more relaxed without the STAAR EOC exam. This could attribute to the increase of projects and varying instructional methods. Those who chose Neutral and Disagree were either Pre-AP or AP teachers.

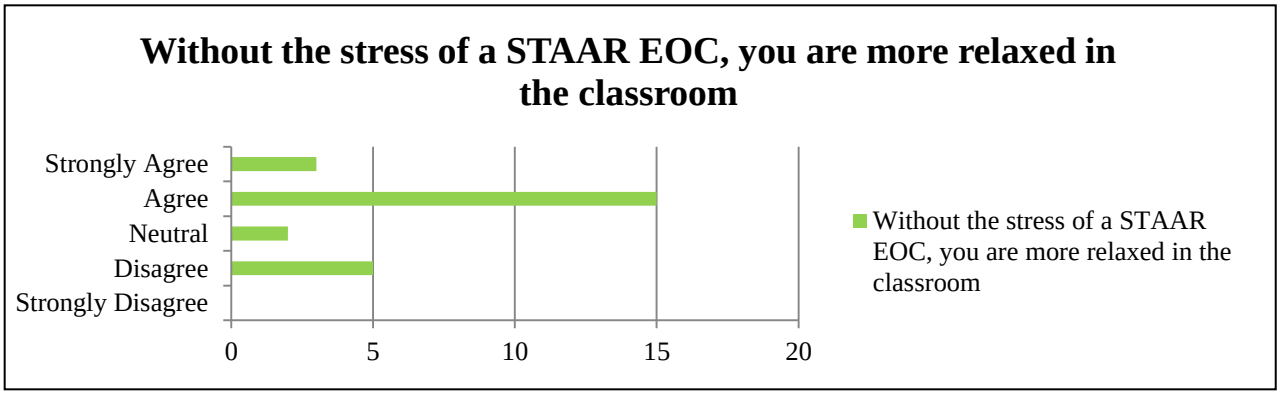

Figure 10. Respondents reply they feel more relaxed without the STAAR EOC.

The final question of the survey and the last of this series of questions asked participants if they felt a decrease of pressure to perform after the STAAR EOC exam was taken out of the curriculum. Figure 11 illustrates the results. When asked if the pressure to perform had decreased after the discontinuation of the STAAR EOC exam, 28% (7) chose Agree or Strongly Agree, 12% (3), chose Neutral, and 60% (15), chose Disagree or Strongly Disagree. With the majority of respondents choosing either Disagree of Strongly Disagree, it is evident that the pressure of producing high quality students has not escaped the classroom with the absence of the STAAR EOC exam.

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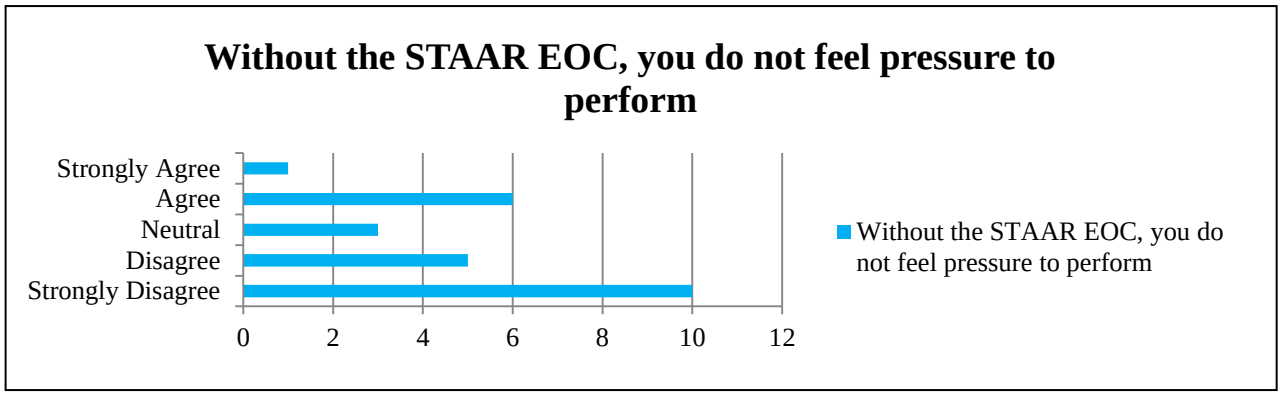

Figure 11. Respondents address the pressure to perform without the STAAR EOC.

Discussion

Have teaching methods changed as a result of the removal of the World History STAAR EOC exam? The data collected from 25 World History teachers indicate that teachers have altered their mode of instruction. Teachers have also altered what content and to what extent they teach the content as a result of no STAAR EOC exam. The survey responses indicate that teachers who teach Level World History have experienced the most change. Teachers who teach Pre-AP or AP World History experienced little change and associated little stress with the STAAR EOC exam in comparison to those who teach level. The data adds to the body of evidence that teachers have more time in their curriculum without the STAAR EOC exam to incorporate an increased number of projects and writing assignments. Detailed responses further clarified particular ways that classroom focus has shifted after the removal of the STAAR EOC exam. The state exam is no longer the end goal; rather the focus is on process, skills and connections.

Data collected through the survey also indicates that teachers are less stressed in their work environment with the exclusion of the STAAR EOC exam; however, Pre-AP and AP teachers were less affected by the stress of the STAAR EOC exam both before and after its

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removal. The data also indicates that the decrease of stress has not led to a decrease in pressure. World History educators still feel pressure to perform and produce highly knowledgeable students.

The World History teachers who experienced a change in teaching methods were not limited to number of years in experience. Novice to experienced teachers changed teaching methods with the removal of the STAAR EOC exam. The only teachers who were either mildly affected or not affected at all by the removal of the state exam were those who taught Pre-AP and AP World History. AP World History courses have an additional set of standards that are created by the College Board. These standards are higher and are often in more detail than those of the state for level students. The AP standards did not change with the removal of the STAAR EOC exam; therefore it is reasonable for those teachers to have experience little to no change.

Time was the main contributing factor that the participants identified as the reason to the change. With the STAAR EOC exam in place, content need to be taught by the end of April, allowing students time to review before the exam in May. Without the state exam, teachers are able to teach until the end of the school year in early June. Nearly 90% of the respondents, who agreed to change in teaching methods, mentioned the benefits of additional time in their responses.

Although participants had more time, less TEKS were covered during the year with no state exam. Half included less TEKS in their lesson plans. The detailed interview responses revealed that certain TEKS did not fit smoothly into lesson plans and were not as essential as other TEKS. Participants also noted that the time to cover less general TEKS, such as specific individuals who were not related to major events, was not worth a significant gain in the long run. Rather than rushing through all of the TEKS, participants took the extra time to re-teach

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lessons that were not fully grasped and spend more time on primary readings. Overall, they focused on the end gain of social studies skills so their students would be successful in the future, and not the results of the STAAR EOC exam. The lack of decrease in pressure felt by the teachers in combination with their changed teaching methods indicates that the educators are still teaching to high standards, yet are able to do so without being overshadowed by a state exam.

Implications, Future Research and Recommendations

While this research studied the effect of no STAAR EOC exam on the years following of its dismissal, further research should be completed to determine if the shift in teaching methods remains a continual trend. This research study was also limited to one district in Texas. It would be beneficial to repeat this study with other districts in Texas to compare results and their similarity to the original study.

Further research should also be completed to determine the effect of following a year with no social studies EOC exam to a year with a social studies EOC exam. Although the World History STAAR EOC exam has been removed, the U.S. History STAAR EOC exam is currently administered and included in the curriculum for students' Junior year. It would be beneficial to compare U.S. History STAAR EOC exam results of students who took the World History STAAR EOC and students who did not. The change in teaching methods and exclusion of TEKS in World History could possibly have an impact on future U.S. History STAAR EOC exam scores.

The data from the surveys has indicated that teachers have shifted teaching methods to include less TEKS, and an increased number of writing assignments and projects. A recommendation for World History teachers is to include professional development that focuses on project-based learning as well as writing in social studies. The participants in this study have

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displayed interest in project based learning and a more intensive role for writing. Professional development seminars can address this growing interest as there is now more time to include them.

A recommendation for the modification of the current district benchmarks is also merited. While participants felt that the benchmarks were challenging and useful, they did not feel that they could serve as an adequate replacement of the STAAR EOC exam. Several teacher expressed frustrations with the current form of the exam and the material being asked. The questions in particular indicate that a modification in the benchmarks could lead to a greater appreciation from the students and the staff.

World History is not the only subject that has been affected by the change in required exams. Other subjects, such as Math, have also experienced similar changes to state exam schedules. A recommendation to continue this study throughout other subjects would also be beneficial to determine if teaching methods change throughout subjects.

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COLLEGE READINESS FOR HISPANIC FUTURE TEACHERS: THE EFFECTIVENESS OF A COGNITIVE LEARNING COMPUTER SYSTEM IN IMPROVING MATHEMATICAL SKILLS

Mr. Julian Viera Jr., M.S.
University of Texas at El Paso

Judith Munter, Ph.D.
University of Texas at El Paso

Olga Kosheleva, Ph.D.
University of Texas at El Paso

Abstract

Web-based learning systems have been in use for many decades. However, curriculum and critical pedagogy have yet to be discussed in hybrid courses utilizing such software. The purpose of this pilot study was to explore the potential of education research on innovative teaching and learning approaches, such as 'intelligent' tutoring systems, to enhance Latino students' mathematics achievement as part of a college readiness program. This interactive mathematics program was embedded in a summer bridging program for high school students preparing for college at a university on the U.S.-Mexico border that aims to improve students' basic math skills and college readiness. Findings from this study may inform policy and practice for educators who work with Latina/o students in schools and communities throughout the U.S.

Introduction

Data indicate that Latinos have not fared well in the U.S. education system in comparison with other ethnic populations, with lower success rates in high school completion and bachelor degrees earned (see Figure 1, NCES, 2012). For the academic year 2009-2010, forty three percent of high school seniors taking the ACT were declared college ready in Math by the

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National Center for Education Statistics while only 26% of Latinos met ACT college readiness benchmarks in 2008 (NCES, 2012). The purpose of this study was to explore the potential of innovative approaches to teaching and learning, such as an 'intelligent' tutoring system, to enhance Latino students' mathematics achievement as part of a college readiness program. As Mexican-American researchers-practitioners on the U.S.-Mexico border, we are committed to serving a predominantly Latino population from diverse social economic backgrounds. Findings from this study may inform policy and practice for educators who work with Latino students in schools and communities throughout the U.S.

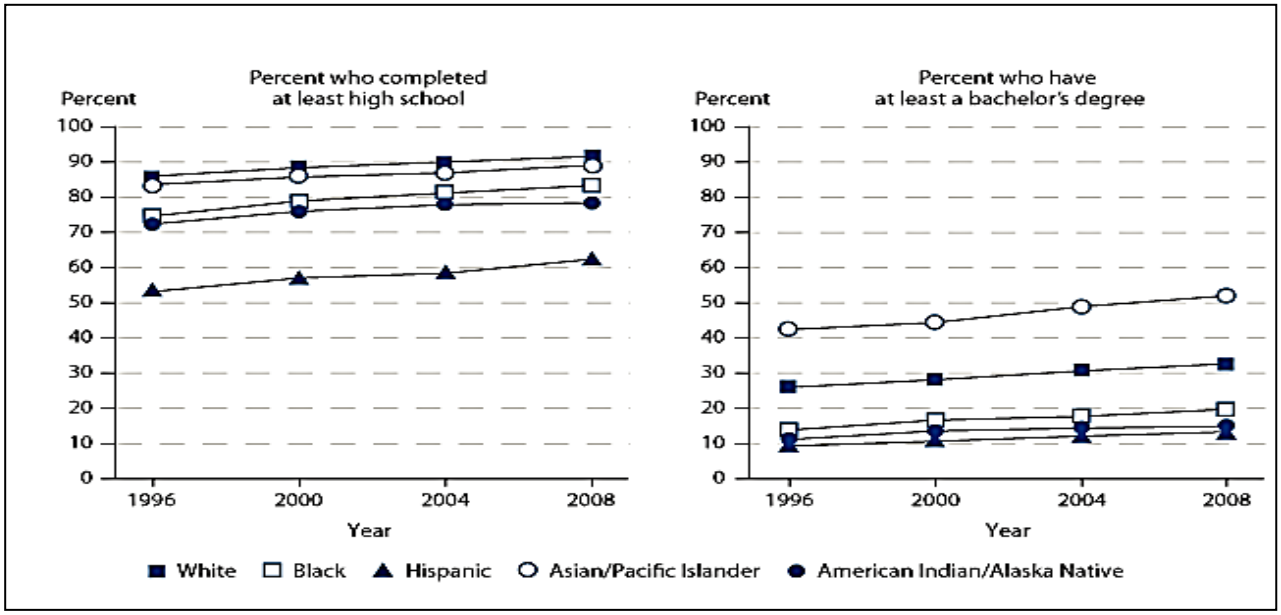

Figure 1. *Percentage of adults ages 25 and over who completed high school or college.*

One of the programs that has had noteworthy success in providing access for future Latino educators is a summer bridge program, established in partnership at Frontera University (pseudonym) with surrounding school districts and community members. This program has provided local high school seniors the opportunity to achieve college readiness levels in mathematics and continue onto higher education to achieve their goal of becoming an educator.

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In 2013 the summer bridge program focused attention on college readiness for mathematics. The emphasis on math aimed to help students succeed in mathematics and become interested in STEM/mathematics related teaching fields, closing the educational gap impacting many students from a lower SES (Lam, Srivatsan, Doverspike, Vesalo, & Mawasha, 2005). This study focused on research conducted on innovative approaches, using 'intelligent' tutoring systems in a summer bridge program to increase Latino students' basic math skills.

Intelligent Tutoring Software

Intelligent tutoring software provides opportunities to rethink mastery learning using innovative technologies, allowing students to become self-regulated learners. In Bloom's 2011 study, he found that one-to-one tutoring produced two standard deviations in achievement scores above those in control groups, which he termed as the 2-sigma problem. He further found that mastery learning came closest to achieving this 2-sigma deviation at 1-sigma. Kennedy, Ellis, Oien, and Benoit (2007) and Hampikian, Guarino, Chyung, Gardner, Moll, Pyke, and Schrader (2007) also found the mastery learning approach enabled students to improve their grades in pre-calculus classes. These scholars utilized intelligent tutoring software, ALEKS, in their research.

Assessment and **LE**arning in **K**nowledge **S**paces (ALEKS) is described as an artificial intelligent assessment and learning system (ALEKS, 2012). ALEKS uses adaptive questioning to quickly and accurately determine the knowledge state of a student. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics practiced in working memory are encoded into long-term memory.

ALEKS is based on Knowledge Space Theory. Knowledge space theory is based on the premise that mastery learning is accomplished by the integration of previous knowledge into long term memory. For example, a set of problems in a linear functions chapter for pre-calculus

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is given in Table 1 (Falmagne, Doignon, Koppen, Villano, & Johannesen, 1990). If a student masters problem *f*, it is highly likely this student has an understanding of all preceding problems. If a student masters problem *e* then he/she will be able to answer *b*, *c* and *a*. Hence, the student does not have to learn the material linearly, $a \rightarrow b \rightarrow c \rightarrow e$. The mastery of all five problems creates a knowledge state, i.e., a set of problems $\{a, b, c, e\}$ which are implied by mastering problem *e*. An example of ten learning states is *K* = *{∅, a, b, ab, ac, abc, abcd, abce, abcde, abcdef}*.

Table 1

Six Types of Problems in Linear Functions Chapter for Pre-Calculus

	Name of problem type	**Example of instance**
a	Word problem on proportions	A car travels on the freeway at an average speed of 52 miles per hour. How many miles does it travel in 5 hours and 30 minutes?
b	Plotting a point in the coordinate plane	Using a pencil, mark the point at the coordinate $(1,3)$.
c	Multiplication of monomials	Perform the following multiplication: $(4x^4y^2)(2xy^3)$
d	Greatest common factor of two monomials	Find the greatest common factor of the expression $14t^4y$ and $4t^2y^4$. Simplify your answer as much as possible.
e	Graphing the line through a given point with a given slope	Graph the line with slope -7 passing through the point $(-3, -2)$.
f	Writing the equation of the line through a given point and perpendicular to a given line.	Write an equation for the line that passes through the point $(-5, 3)$ and is perpendicular to the line $8x + 5y = 11$.

A student can master problem *b* independent of *a*, then learn problem *c* followed by *d* or *e*. While one student is on one learning path, another student will be on a different learning path. Their knowledge states may not coincide. ALEKS' formative assessments create self-regulated learners and allow students to become agents of their own learning. By practicing and

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assessing new knowledge with ALEKS, students are more likely to develop a metacognitive understanding of the math topics. Human learning requires that "some prerequisite skills should be practiced until they are learned to the level of automaticity" (Ormrod, 2004, p. 421) and practice creates successful transfer which allows students the greater likelihood to problem solve.

Previous research on summer bridge programs for college readiness have found that the use of ALEKS has led to improved students test scores on ACT and Accuplacer tests (Barrus, Sabo, Joseph, & Atkinson, 2011; Reisel, Jablonski, Josseini, & Munson, 2012). These two studies along with others found that the amount of time spent on ALEKS contributed to success (Spradlin & Ackerman, 2010; Stillson & Alsup, 2001; Watson & Angus, 2008). For example, Reisel et al (2012), found that the incorporation of ALEKS with immediate tutoring was very beneficial for students. In their study, two groups of students, an on-campus and an on-line group participated in a study focusing on the use of ALEKS. The on-campus group participated in an on-campus 4-week residential summer bridge program with morning session, in which students worked on ALEKS and an afternoon session that concentrated on engineering activities. This study found that students left to their own devices in the fully on-line program did not do as well as the on-campus group in improving ACT scores.

These studies show that intelligent tutoring systems can be advantageous for improving test scores. However a key recommendation is that students spend a good amount of time working on the tutoring system accompanied by immediate tutoring. Reisel et al (2012) found that summer school provided opportunities for effective implementation of a program utilizing ALEKS to improve placement and ACT scores. In this study, a summer bridge program at Frontera University builds on these findings to research how an intelligent tutoring system will work with predominantly Hispanic, low-income students to strengthen college readiness.

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Methodology

This innovative approach to teaching and learning was the focus of the research study examining the mathematical achievement, and college readiness of Frontera University's student population (i.e., predominantly Latino students) while using an intelligent tutoring system in an eight week summer bridge program. The program also incorporated undergraduate Latino college students as peer leaders who encouraged the use of native language both in the computer lab and in the classroom settings. Participants were recruited from the three border high schools that had scored between 2000 and 2200 on the Texas Assessment of Knowledge and Skills (TAKS) test and had self-identifies as future educators. A control group of twenty-two students took an identical pretest and posttest. The students in the control group did not participate in the ALEKS treatment; they attended a summer school math review course at their home schools. Assent and informed consent were collected from all participants, and primary data were collected through focus groups, online course forum questionnaires, and a pre-/post-test. All student data and identifying markers were coded and kept in an encrypted file on the researchers' laptop.

As the instructor/researcher, the primary author was engaged as participant observer throughout the study. The summer bridge math course had over 170 topics and assessment results were given by the percent of topics completed. The average initial assessment for all students was 20.9%. Participants in the study participated in focus groups during the third week of the program and they answered questions posed in the online course forum. Students in the summer bridge program and in the control group were given a Texas Higher Education Assessment (THEA) pretest and posttest. The researcher kept a daily journal on student attitudes and work habits.

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Results

Preliminary assessment progress for the first month is given in the Figure 2 below. Students worked on an intelligent tutoring system in a computer lab for two hours each day. Students were given instruction by the researcher on basic math skills that were adapted from topics found on the tutoring system. After several days of PowerPoint presentations and worksheets, a few students asked if they could work on the intelligent tutoring system instead. Anecdotal evidence indicated that most students preferred working on the tutoring system to participating in traditional group work with worksheets.

Figure 2. Percent of topics completed.

Students took a pretest of the first day of the program and a posttest during the last week of the program. A one-sample t-test was performed and found statistical significant ($t = 25.58$; $p < 0.05$) increase in posttest results, Table 2. Participants also showed a statistical increase on several THEA subtopics ($p < 0.05$). These subtopics were Graph numbers or relationships (GN), Algebraic expressions & functional notation (AEFN), and Combination of mathematical skills (CMS). When compared to the control group the increase in posttest scores

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was also statistically significant ($F = 869.36; p < 0.05$). The treatment group also showed statistical significance in THEA subgroups when compared with the control group. The treatment group fared better in the following subgroups, Graph numbers or relationships (GN), Algebraic expressions & functional notation (AEFN), Quadratic equations (QE), Problem Solving (PS) and Combination of mathematical skills (CMS).

Table 2

Tests of Between-Subjects Effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4414595.590	1	4414595.590	869.364	.000
Groups	5809.032	1	5809.032	1.144	.289
Error	299599.804	59	5077.963		

Students were asked to give their opinions to questions/statements posted on the online course forum. The first forum statement was: *In one or more sentences explain how you felt about your initial assessment*. One student response was an "eye opener." "I felt it was pretty simple but an eye-opener as well. It showed me how much I didn't retain and had already forgotten." Another student responded; "*Pues creo que estuvo un poco difícil porque ya tenía tiempo que no estudiaba sobre eso."* [Well, I think it was a little difficult because it had been some time that I had studied over it.].

Students had not been notified they were not college ready, but they developed understanding of what they can do to improve their mathematical skills. Another forum question was: *Did you take an assessment this week? If yes, explain your feelings about your improvement from the last assessment*. To which one student responded, "Yes, I did take an assessment at the beginning of the week, and I felt really proud of myself because before the

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assessment I had completed 51% [completion of topics practiced and mastered] and when I took the assessment I got 50% done on the test. I think that was a good improvement." This student was concerned that she would have to repeat topics that she had already practiced and mastered.

Focus groups were conducted in the third week of the program. Focus groups consisted of two to three students, engaged in dialogue about the program (Marshall & Rossman, 2010). Students described their experiences with the program, stating they were learning more about math with the intelligent tutoring program. They liked the immediate feedback and because of that felt it made math easier. Additionally, the one on one support from Hispanic college students as peer leaders brought about positive attitudes in general; Students pointed out that the peer leaders provided more one to one attention, allowed the use of native language, and were overall more supportive than in a traditional class with one teacher in the classroom.

A number of concerns were raised as well. Our informants pointed out that the intelligent tutoring system resulted in more work for the student (i.e., the system adds more question to the student's workload when they get a problem incorrect). Another concern raised, focused on the short length of time (one summer session), with one student noting that he was concerned that he would not be able to retain topics worked on ALEKS because he had completed the topics quickly.

Individual interviews were conducted with two participants in which the behaviors of the students were addressed. One student was asked if she change the ALEKS explanation into Spanish, which is a feature of the program. She responded: "en Inglés, por los exámenes…porque hay palabras en Inglés que no sé qué son en Español pero si sé que es Inglés." [in English, because of the exams…because there are some words in English that I don't know what they are in Spanish but I do know them in English.] This finding was of particular

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interest for future study. Understanding how English Language Learners (ELLs) engage with online intelligent tutoring systems to learn mathematics is not easily found in the literature.

Scholarly Significance

Online intelligent tutoring systems coupled with peer leaders, use of native language and immediate feedback has proved to be an effective learning environment for Latino students from lower SES in this pilot study. A key feature was the use of native language teacher support. A future study could be conducted with a teacher education program to have pre-service teachers participate in a summer bridge program of this kind. Pre-service teachers would receive invaluable experience teaching mathematics with bilingual students. They would also gain experience with online tutoring systems. Further research is also required to study how ELLs engage in online mathematics courses at the university level as well as creating innovative approaches to practice and policy providing Latino students with an opportunity to continue their education and bridge the educational gap.

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