The Benefits & Drawbacks of Integrating

Cloud Computing and Interactive Whiteboards in Teacher Preparation

By Elfreda Blue and Rose Tirotta

Abstract

Twenty-first century technology has changed the way tools are used to support and enhance learning and instruction. Cloud computing and interactive white boards, make it possible for learners to interact, simulate, collaborate, and document learning experiences and real world problem-solving. This article discusses how various technologies (blogs, wikis, GoogleDocs, and interactive white boards) have been used at one private university in teacher preparation courses. Authors discuss the benefits and drawbacks of each tool for students and faculty and how technologies are made user-friendly for learners of different technology ability. Authors highlight tool usage and issues encountered by students and faculty and how the use of these tools can be useful for the students in their careers.

***Keywords*:** educational technology, cloud computing, interactive whiteboards, pre-service teachers, blogging, collaborative writing

Cloud computing and interactive whiteboard technologies are 21st century computing resources. During this age of virtual simulation, real time interaction, and flexible resource use, these tools provide teachers and students the tools for creativity, innovation, and engagement. "Cloud computing" refers to the "large scale distributed computing paradigm...in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet" (Foster, Zhao, Raicu & Lu, 2009, paragraph 8). Some examples include blogs, social networking sites (e.g. Facebook), and wikis. Blogs refers to web logs or online personal on-going journal reflections made available to the general public via the internet. Social networking sites are online repositories of photos, personal profiles of individuals and their friends. A wiki is an online website that houses information that is flexible and dynamic. Users who have access to the website are able to upload links, images, documents, etc, sharable as determined by the owner of the site.

Cloud computing has taken colleges and universities by storm as university professors use Web 2.0 resources to enhance education (Fernando, 2008; Thomas & Qing, 2008). It has drastically changed technology access, use, and connection both inside and outside educational settings. However, in classrooms across the US, access to many Internet resources is blocked to protect education communities from harmful web resouces. Consequently, students and educators have very limited experience with virtual, online technologies.

Interactive whiteboards (IWBs) are a viable alternative to online virtual technology. IWBs offer flexibility and virtual interactivity which

mirrors cloud computing without accessing the Internet. IWBs enable the creation of electronic documents, activities, interactive calculators, maps, stopwatches, and videofiles of lessons for activity. IWB use is increasing across colleges and universities as teacher preparation programs recognize the usefulness and efficiency of the tools.

Blogs, wikis, Google Docs, and interactive white boards are some of the tools integrated into many teacher preparation graduate courses. Research touts the pedagogical implications of these on students and teachers (Albion, 2008; Norton & Hathaway, 2008; Thomas & Qing, 2008) as graduate, pre-service and in-service teachers benefit from learning about these tools and ways to integrate them into their future classrooms (Byrne, 2009; Thomas & Qing, 2008). Once students become comfortable with technology tools, exploring others becomes easier. School-age learners benefit when teacher preparation courses provide pre- and in-service teachers exposure and much-needed experience with new technology tools.

"Cloud computing has taken colleges and universities by storm as university professors use Web 2.0 resources to enhance education…"

Integrating technology into graduate teacher preparation courses with a mixed group of technological abilities can be challenging. Some learners, often described as digital natives, have a tremendous depth of knowledge about the technology tools they meet. Others, often described as digital immigrants, have limited or no knowledge about technology tools introduced (Prensky, 2001; Bennett, Maton & Kervin, 2008; Guo, Dobson & Petrina, 2008; Jones, Ramanau, Cross & Healing, 2010). The purpose of this study was to clarify the benefits, and challenges of integrating cloud computing and interactive white board technology into teacher preparation courses for graduate pre-service teachers with mixed technological ability. This article reports findings from observations, focus group discussions, and conversations with university faculty justaposed within the context of relevant research.

This research can be an important contribution to research on teacher preparation programs and technology integration. Findings provide insight to university faculty who seek to make research-based decisions about incorporating cloud computing and/or Interactive White Board technology into the courses they teach. It highlights the benefits and drawbacks of technology integration in teacher preparation curriculum relative to pre-service teachers' preparation for the 21st century classroom.

This article is not specifically focused on how to prepare technology users to be socially and legally responsible. Neither does it address the issues of technology addiction and inappropriate use by school-age students. For discussions about cyberbullying, see Anderson and Sturm (2007) and Aricak, Sylahhan, Uzunhasanoglu, Saribeyoglu, Ciplak, Yilmaz, and Memmedov (2008). For discussion of electronic safety and Web 2.0 applications, see Sharples, Graber and Harrison (2009). Principles for wise use of computers is discussed by Straker, Pollock, and Maslen (2009).

Research Context and Focus

This study was conducted at Hofstra University, a mid-sized private university in the northeast United States, which offers approximately 150 undergraduate and 160 graduate programs in six schools and three colleges of study. The university has 1,180 faculty members whose average undergraduate class size is 22 students with a student to faculty ratio of 14 to 1. The School of Education, Health and Human Services currently houses three departments including 46 graduate pre-service programs and 72 full-time faculty members.

Some graduate pre-service teachers have limited experience using technology in school settings. They feel unprepared to adequately navigate technology applications as they matriculate through their teacher preparation program. In addition to learning how to use technology personally, they are intimidated about how to use it with school-age learners, without real awareness of the importance of useful integration into the school curriculum as well as the benefits and limitations to student learners (Ertmer, Conklin, Lewandowski, Osika, Selo, & Wignall, 2003). Others are quite experienced with technology use, agile with navigation of technology applications. They know how to use technology, they have an initial understanding of how to use it in school settings, and they recognize the importantance of integrating technology into the school curriculum. This wide range of experience presents a real challenge in technology-ladened courses in teacher preparation programs.

Overview

This study reports the contexts, challenges, and benefits of incorporating social networking tools, collaborative writing tools, and interactive whiteboards into graduate teacher preparation courses. Researchers outline suggestions for technology integration and essential qualities of cloud computing technology amenable to users preparing for the teaching profession.

This article reports the findings of a year-long review of authors' observations, focus group discussions about the use and integration of various computing applications in the graduate teacher education courses. Participant observations, on-going focus-group discussions, and conversations about technology applications comprise data sources which document integration trends as well as the challenges and benefits to teacher educators and pre-service teachers.

The first author teaches a technology and assistive technology course and a curriculum methods course for diverse learners. The second author is an instructional designer who works closely with School of Education faculty as they incorporate technology applications into teacher preparation programs. Their collective perspective provide them access to faculty and their integration of technology in teacher preparation graduate courses at Hofstra.

Social Networking Tools: Facebook & Blogging

Facebook and Blogs are social networking tools which have become mainstays in the life of graduate students in teacher preparation programs. Facebook is the most popular. According to a 2010 Pew Internet survey, Facebook is currently the most commonly used online social network among adults ages 18 and older (Lenhart, Purcell, Smith, & Zickuhr, 2010).

Blogging, which may require more focused thought than Facebook, has become quite prevalent in society. Lenhart & Fox (2006) reported that approximately 12 million American adults maintain a blog (8%), 57 million read blogs (39%), and 57% of bloggers are between the ages of 18 and 30 (this report only sampled adults ages 18 and up). Blogging is becoming more and more familiar in our society. Not only does it give students the opportunity to discuss, reflect, and engage, but it also gives them the experience of blogging itself--articulating an idea, position, or perspective to others (Ray & Hocutt, 2006).

Social Networking's use in Teacher Prep Courses

At our university, ten teacher educators who actively incorporate technology into graduate courses reported their reluctant to incorporate Facebook their courses. They found it difficult to find educational relevance for these tools in their classes and in K-12 classes. Some have searched out ways to incorporate blogging into their course curriculum. Two faculty members who are more accustomed to the discussion boards available through our learning management system, Blackboard, reported that the transition from discussion boards to blogging as a means to engage students was easier than Facebook.

Blogging was more readily incorporated into course instruction. Some used blogging to elicit interactive electric dialogue around course-related topics. Each week, these instructors post an entry and require students to write their comments and respond to the entries written by at least two other class members. One faculty member simply set up the blog and asked students to write their thoughts and to comment on the thoughts of others about class discussions and assigned readings at least once per week. Another wrote generic, open-ended guidelines like, "Feel free to blog here about how each class session prepares you for the teaching profession."

Another faculty member reported that students' blog comments focused reflection about their own learning processes and the importance of specific content knowledge and experiences and gained insight into students' understanding about specific concepts. She reported that her students' posted blog entries served a number of instructional purposes: 1) they provided much-needed insight into students' understanding of assigned readings, 2) they provided the teacher topics to address, questions to answer, and 3) they provided an explicit instructional direction.

Benefits of using Social Networking

Ellison & Wu (2008) suggest college students may be more invested in their writing if they participate in the activity of blogging. Results of their study indicate that some students found blogging provided opportunity for meaningful engagement and interactivity as they developed their own casual voice (Ellison

& Wu, 2008). For those students not ready to blog publically, class blogging in a learning management system is a good starting point.

Blogging helps to establish a community of active exchange on academic topics. It extends class discussions outside the classrooms, and it sets the stage for responsible thinking about academic topics, including resource sharing and reflection (Norton & Hathaway, 2008; Ray & Hocutt, 2006).

According to faculty, blogging provides pre-service teachers a virtual world in which to practice listening to the perspective of others as peers grapple with ideas and opinions different from their own and learn to craft responses in professional language (Hung-Ling, 2009). They gained access to the perspectives of their peers on topics, issues, and ideas discussed in class while they offered their own position, perspective, and reflections (Hemmi, Bayne & Landt, 2008). The blog feature in the learning management system gave faculty the option to make blogs private. This gave students the opportunity to learn how to use a blog appropriately without the fear of it being public. Collectively, these benefitted pre-service teachers' establishment of an online voice which may eventually transcend from private to public.

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Challenges of using Social Networking

As an assignment, blogging was deemed intimidating for some. Faculty found their blogging assignment description yielded very general blog entries and extensive text. The act of reading the entries of others was deemed an enormous addition of work to some. According to Norton & Hathaway (2008) while blogging provides a space for reflection, the entry does not always reflect depth of thought. Faculty realized the importance of clearly defined expectations and an assessment structure in assignment descriptions.

Another major concern is privacy. This is especially true when writers vent frustrations or experiences (Ray & Hocutt, 2006). Faculty reported that pre-service teachers were cautious about voicing their thoughts and opinions, feeling vulnerable about the "publicness" of the experience. Norton & Hathaway's work suggest one explanation -- that media attention given to the consequences of sharing personal information on Facebook makes users cautious about posting comments and interacting with their peers in this manner (Norton & Hathaway, 2008).

Collaborative Writing Tools: Wikis and Google Docs

Traditionally, teacher preparation programs require pre-service teachers to independently complete projects and assignments. As universities prepare learners for the 21st century, collaborative efforts, including problem solving, planning, development, and implementation are a must. Wikis and Google Docs, cloud computing tools conducive to collaborative writing, are webpages that can be accessed, viewed, and edited through browser software. Collaborative writing spaces such as wikis and Google Docs can be a new experience for students unaccustomed to collaborative writing and planning. For many, the idea of sharing with colleagues draft documents and giving them editorial privilege can be unnerving. Yet these tools can also be highly productive ways to:

1. work on group projects virtually and asynchronously (Caverly & Ward, 2008)
2. share resources and content (Nevin, 2009)
3. provide faculty an electronic space for feedback, commenting, and editing work (Pace & Blue, 2010).

Like blogs, wikis can be either public or private. There are many free wiki sites available for pre-service teachers and university faculty. In graduate teacher preparation programs, wiki applications are also embedded in the password-protected learning management system.

Use of Collaborative Writing Tools in Teacher Prep Courses

One university faculty member used wikis to provide a platform for peer collaboration on group projects and for submission of in-progress assignments for instructor review. Each of these provided hands-on experience in shared writing. Another faculty member used Google Docs to support group projects and for submission of assignments for instructor review. Users added essential content, images, and references and, oftentimes used the final version of the document for group presentation. Users worked

on their projects over time, without having to physically meet. They submited paperless assignments for feedback. Another faculty member had students write weekly feedback on each class session using their own wiki. Each of these uses are consistent with those reported by Nevin (2009) who reports school-age learners' increased opportunity to collaborate virtually using Google Docs.

Benefits of using Collaborative Writing Tools

Tools such as wikis can be easy to use and, sometimes, more streamlined than typical learning management systems (Schroeder, 2009). Pre-service teachers shared their work and, knowing that others would view it, were more diligent in their writing. Some users enjoy the shared environment and have self-reported an improvement in their academic writing skills as a result (Wheeler & Wheeler, 2009). But the main strength of collaborative spaces is of course the ability to share space. Wikis increase participation and collaboration (Schroeder, 2009). Some pre-service teachers have noted that after using wikis they recognize the importance of peer collaboration (Norton & Hathaway, 2008) to inform practice in preparation for their own classrooms. Others who recognize the usefulness of shared spaces for school-age learners incorporate wikis and Google Docs prominently in content-area instruction (e.g., English, Social Studies).

Challenges of using Collaborate Writing Tools

Three challenges to collaborative writing tools are the need for demonstrative instruction, instructing users about copyright laws, and interruptions to Internet access. As with any new addition to a class, modeling and faculty direction is crucial (Schroeder, 2009). With wikis and Google Docs, it may be difficult for students to acclimate to online collaboration. A small study by Wheeler and Wheeler (2009) reported that "their collaborative writing was limited due to their reluctance to edit each others' work" (p. 9). Careful attention must be given to ensure the work reflects a collaborative effort, not a singular one.

Copyright violations may occur when one or more collaborators plagarize an Internet source. Users can easily plagarize another's work using wikis and Google Docs; integrity of resources, references, quotes, etc, must be vetted by pre-service teachers to thwart the dissemination of misinformation. Some users violate copyright laws because they are unaware of legal ramifications of using text, video, pictures, and audio files in their own work (Taleb & Butler, 2007).

University faculty encouraged pre-service teachers to give instructional attention to responsible use of Internet resources and copyright laws in teacher preparation courses. Pre-service teachers who incorporated wikis and Google Docs into their instructional plans recognized the need to teach school-age students how to use technology legally and responsibly.

The greatest challenge to collaborative tools is Internet access interruption—through the server or through the global applications provided by companies like Google (Holschuh & Caverly& Ward, 2010). If users cannot access the Internet, their efforts are thwarted. Intermittent access may result in lost data and lost productivity. The most viable solution is backing up documents offline and printing files in progress when working outside a reliable Internet access area.

Interactive Whiteboard Tools: SMART Board

Interactive whiteboards (IWBs) are widely used in K-12 education. Therefore, the ability to competently use them is critical for pre-service teachers. Numerous studies document the benefit of IWBs in school settings in which they are related to an increase in student motivation (Beeland, 2002; Burden, 2002; Hennessy, Deaney, Ruthven, & Winterbottom, 2007; Levy, 2002; Slay, Siebörger, & Hodgkinson-Williams, 2008; Smith, 2000; Thompson & Flecknoe, 2003; Wall, Higgins & Smith., 2005). Reasons for increased motivation include tactile manipulation (Hennessy, et al., 2007) and IWB use in conjunction with mathematics software (Thompson & Flecknoe, 2003). In higher education, IWBs have been positively received as well. According to Damcott, Landato, Marsh, and Rainey (2000), survey results indicate that more students supported the use of the IWB in instruction than did not. Reasons for such support varied from flexible writing on the board to the innovative use of "drag-and-move" to manipulate content.

Use of Interactive White Boards in Teacher Preparation Courses

At our university, teacher education faculty have ready access to the SMART Board interactive whiteboard and its corresponding software. Pre-service teachers have access to training sessions on a regular basis outside their scheduled class time. A SMART Board introduction is also provided during a one-credit technology course required for all elementary pre-service teachers. Often, faculty request one or more session presentations in specific courses aimed at providing a focused approach to integrating the technology in a specific content area.

University faculty reported limited use of SMART Boards in their teacher preparation courses. Four faculty members reported integration of SMART Board technology into course curriculum. Their goal was to provide students the opportunity to become more comfortable with the tool and its functionality and explore ways to integrate it into the classroom. Each of the four require SMART Board integration in course assignments.

Benefits of using Interactive White Boards

Faculty recognize the benefit using the SMART Board on two levels. According to one faculty member, SMART Board integration "can lead to a more interactive class and can increase motivation as pre-service teachers learn how to use and integrate SMART Boards. Schools are looking for potential teachers to have this skill and the more practice pre-service teachers get in college, the more marketable they will be."

Challenges to using Interactive White Boards

The challenges lie in access and use during teacher preparation courses. Interviews with three faculty members yielded consistent comments about their own integration of the SMART Board into course instruction. One faculty member admitted, "I don't know enough about how to use all of its applications. I use it as a projection screen." Another faculty member commented, "I don't know enough about SMART board to hold pre-service teachers accountable for its use in course assignments." Another concluded, "The limited knowledge of university faculty prevents regular use of SMART Board integration consistent with best practices for their K-12 classrooms. It is also difficult for all faculty to keep up to date on technologies that might be useful for pre-service teachers as they move into the classroom."

When hands-on use and application of SMART Board resources is limited, university faculty and pre-service teachers may lack confidence to incorporate this resource into their own instruction. According to Ertmer and Ottenbreit-Leftwich (2010), "To use technology to facilitate student learning, teachers need additional knowledge and skills" …. This knowledge and skill expands past learning how to use hardware to applications of technology tools in pedagogical practices (p. 259). Ongoing practice and application may yield greater confidence for pre-service teachers and university faculty.

Discussion

The 21st century is a digital age. Technology innovations have changed rapidly and morphed in directions unimaginable 40 years ago. As university faculty prepare pre-service teachers for today's classrooms, the goal of preparation should be to guide future teachers toward integrating select technologies into the classroom. The work for pre-service teachers is to expand their knowledge past learning how to select programs and applications toward evaluating the usefulness and possibility of multiple technology applications.

Using modern technology applications in the pre-service teacher preparation programs can encourage learners to keep their sights on the bigger picture--using technology in their future classrooms (Coutinho, 2007) and deepening their understanding of the potential role of such tools in K-12 environments (Norton & Hathaway, 2008). As university faculty model technology use, pre-service teachers gain the opportunity to explore and use new applications and experiment with ideas about how they can integrate technology into classroom instruction for school-age learners.

The computing experiences of all learners is shaped by their attitudes, anxiety, proficiency, and coping strategies (Ropp, 1999). Some learners are nervous and anxious about the whole technology experience. They are concerned that their limited experience will thwart their success and publicly embarrass them during the learning process. They have basic computer knowledge, but are afraid to experiment with the unknown. To address their learning needs, university faculty must plan opportunities for guided hands-on use after modeling how to navigate unfamiliar technologies.

The results of this study suggest the need for careful consideration of instructional decisions by university faculty to ensure user engagement and support in teacher preparation courses. To increase users' comfort level, follow these simple suggestions:

- Make an effort to check student progress during practice activities.
- Plan two-person activities so that the intimidated user has access to built-in support during the experience.
- Keep each technology goal simple and open-ended.

More experienced technology users have little patience for slow demonstrations and regimented one-step activities. Many times, they have already encountered the technology and made an evaluative decision about the usefulness of the technology. In order to make technologies user-friendly for this population, university faculty must plan opportunities for independent or divergent activity to ensure active engagement for this ever-growing population. Some suggestions include:

- Extend their knowledge by working on an unfamiliar technique for using the technology.
- Encourage them to share their comments, experience, and words of advice.
- Incorporate demonstration of products generated.

Meeting the needs of diverse learners in teacher preparation courses requires a clear understanding of each learners' need for instructional support from tool to tool. When learners use unfamiliar technology, they need explicit visible support. They want the instructor close by, in case something goes wrong in the process. When learners use familiar technology, they need less support; they can troubleshoot technology difficulties, welcoming independent exploration. To address the learning needs of all students, university faculty are encouraged to navigate the classroom. Look at screens, student applications, and comment audibly about what appears on the screen. Flexibility is essential as savvy users navigate from the "beaten path" in search for a similar application to share with the class. Additional suggestions for making technologies user-friendly for all include:

- Access a lab to ensure individual engagement.
- Introduce, model, and practice each application.
- Make room for partnered use of technology in a well-planned learning environment.
- Plan meaningful activities—connected to the curriculum—which provides opportunity for technology use.
- Require use of technology in course assignments.

Conclusion

When it comes to technology, faculty and pre-service students alike need to be comfortable enough to believe they have the ability to use technology in their classes (Ertmer, et al, 2003). University faculty are encouraged to increase their self-efficacy to ensure pre-service teachers' ongoing use of ever-changing technology resources. (Ertmer, et al, 2003). Doing so requires consideration of the wide range of ability that pre-service teachers bring to teacher preparation programs. By allaying anxiety felt during new learning experiences with technology and affirming the capability during familiar learning experiences, university faculty can model the path toward making technology user-friendly in the learning context.

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