**Web 2.0 Technologies for the Teaching and Learning of Mathematics:**

**Studying A Collaborative Model**

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**ABSTRACT**

*The study presented in this chapter examines preservice secondary mathematics teachers’ perceptions of a blogging activity used as a supportive teaching and learning tool in a college Euclidean Geometry course. Self-reported attitudes toward the blogging activity and the perceived effectiveness of the blogging activity were measured and analyzed quantitatively. Attitudes and perceived effectiveness scores were compared across gender and self-reported time on the Internet to determine if differences existed across these categories. Additionally, the study determined if a relationship exists between either participants’ attitudes toward the blog or perceived effectiveness of the blog and their total quiz scores as measured by eight in-class quizzes. The qualitative component of the study analyzed the advantages and disadvantages of the blogging activity as reported by the students and determined the trends that emerged in the students’ contributions to the unguided discussion section of the blog. The chapter closes with ten implications for practice and a conclusion suggesting that the use of blogging activities could have a positive effect on the teaching and learning of mathematics.*

Keywords: Technology, Internet, Blogging, Social Media, Euclidean Geometry, Collaborative Learning, Preservice Teachers, Problem Solving, Online Discussion, Perceptions.

**INTRODUCTION**

Technology is one of six important principles included by the National Council of Teachers of Mathematics’ (NCTM) in their Principles and Standards for School Mathematics (NCTM, 2000). Highlighting the importance of technology in the teaching and learning of mathematics, Principles and Standards encourages teachers and students to use technology to broaden and deepen their mathematical understanding. According to Principles and Standards, with appropriate use of technology students can better understand the underlying meaning of mathematics and learn mathematics more easily. Technology can enrich the range and quality of mathematical investigations by providing a means for viewing mathematical ideas from multiple perspectives (NCTM, 2000). NCTM’s (2000) Principles and Standards recommends that students use technology as an aid to help solve mathematical problems and enhance learning skills. Further, they expect that teachers will play multiple roles in a technology-rich classroom to facilitate students’ learning in appropriate ways (pp. 25-26). Finally, NCTM (2000) acknowledges that the effective use of technology in the mathematics classroom depends heavily on the corresponding effort and experience of the teacher.

Unfortunately, however, information technology has not reached its full potential in mathematics education programs across the country. (Gunter, 2001; Kurz & Middleton, 2006). Many prospective mathematics teachers’ view on the role of technology in mathematics education is not satisfactory (Habre & Grunmeier, 2007). In many mathematics classrooms technology is used improperly in ways that focus more on the technology than on mathematical understanding or calculation (Habre & Grunmeier, 2007). The use of computers for instructional purposes lags behind the integration of technology in the corporate world and is not used as frequently or effectively as is needed (Powers & Blubaugh, 2005). Many newly graduated preservice mathematics teachers do not have sufficient experience in the use of computers in the teaching and learning process (Kurz & Middleton, 2006). Most preservice mathematics teachers identified technology as important in education; however, many of them felt that after graduation they might not be well prepared to teach with technology (Carlson & Gooden, 1999; Kurz & Middleton, 2006; Terri, 2011).

Web 2.0 technology, a new development of Internet services available on the World Wide Web, allows Internet users to collaborate and share web information actively (O'Reilly, 2005). Web 2.0 applications have great potential to create new opportunities, especially for mathematics students, teachers, and educators seeking to develop new models that will be available and affordable to almost all students, teachers, and mathematics classrooms in the world. The continuing spread of Web 2.0-based free applications could provide an alternative means of supporting a large population of mathematics students, teachers, and classrooms who cannot afford to purchase licensed mathematics software or flexible online teaching-learning systems. This may be an especially effective avenue for fostering mathematics learning in today’s technologically advanced students, who tend to use the Internet through wireless means.

The purpose of this study is to explore the effects of a blogging activity used as a supportive teaching and learning tool in a college Euclidean Geoemtry course. Specifically, this study sought to answer the following research questions:

Research Question 1a: Are there significant differences by gender with regard to preservice mathematics teachers’ attitudes toward the blogging activity in a college Euclidean Geometry course?

Rresearch Question 1b: Are there significant differences by gender with regard to preservice mathematics teachers’ perceived effectiveness of the blog for the learning of Euclidean Geometry?

Research Question 2a: Do preservice teachers who report spending more time on the Internet differ significantly from those who report spending less time on the Internet with regard to their attitudes toward the blogging activity in a college Euclidean Geometry course?

Research Question 2b: Do preservice teachers who report spending more time on the Internet differ significantly from those who report spending less time on the Internet with regard to their perceived effectiveness of the blog for the learning of Euclidean Geometry?

Research Question 3a: Is there a relationship between the cumulative quiz scores attained by preservice mathematics teachers enrolled in a college Euclidean Geometry course and their attitudes toward the blogging activity in a college Euclidean Geometry course?

Research Question 3b: Is there a relationship between the cumulative quiz scores attained by preservice mathematics teachers enrolled in a college Euclidean Geometry course and their perceptions of the effectiveness of the blog for the learning of Euclidean Geometry?

Research Question 4: What do preservice secondary mathematics teachers perceive as the advantages and disadvantages of using a blog as a supportive tool in a Euclidean Geometry course?

Research Question 5: What trends emerge in the analysis of preservice secondary mathematics teachers’ contributions to an online discussion board on a blog used in a college Euclidean Geometry course?

**BACKGROUND**

Mathematics is a subject that requires considerable interaction between students and teachers when a difficulty occurs. Most mathematics learning software, however, does not provide an opportunity for students to ask questions when they are struggling (Frank, 2008). Moreover, most mathematics teaching and learning software as well as traditional web-based programs can be costly and require frequent updates of purchased licenses. Some require a yearly license fee and a high-speed Internet and computer system to run; thus, they may be beyond the accessibility of students and teachers in many rural school districts (Sledge & Morehead, 2006). As a result, a large portion of students, teachers, and classrooms across the world cannot afford to purchase mathematics software and web-based applications.

The advancement of Web 2.0 technologies and their access through laptop, netbook, iPad, iPhone, and handheld cellular devices has made a radical change in the lifestyles of young students in the U.S. and worldwide (Baker, Wentz, & Woods, 2010; Hodson, 2008). Research shows that young students spend more time with computer, Internet, and mobile phone use than any other age group, with most of that time spent on social network sites (Clark, Logan, Luckin, Mee, & Oliver, 2009; Lenhart & Madden, 2009; Selouani & Hamam, 2007). Text messaging, blogging, online discussion groups, social networking sites, and other Web 2.0 tools have become integral parts of their lives (Baker et al., 2010). These students are arriving in high schools, colleges, and universities having multitasking operation skills in blogging, podcasting, tweeting, and other Web 2.0 applications. Due to their inclination toward Web 2.0 technologies, mathematics instruction in the traditional static mode might not be sufficient to meet their needs (Hossain & Wiest, 2011a, 2011b).

Thus, the possibility exists for using the interactive features of Web 2.0 technologies to motivate today’s technologically advanced students to create and participate in virtual platforms where they can enrich their mathematical knowledge and understanding by posting mathematical problems and quizzes; providing solutions to problems posted by others; and sharing their thinking in solving and creating mathematics problems. Such activities may change the lackluster attitudes toward learning mathematics held by many U. S. students who are more willing to spend their time on social networking sites than practicing mathematics. This may improve their performance in national and international mathematics assessments. More importantly, it might provide an effective means of teaching and learning mathematics for teachers and students who cannot afford costly mathematical software.

**COLLABORATIVE LEARNING WITH WEB 2.0 TECHNOLOGY**

Collaboration, constructivism, and motivation are the fundamental features of Web 2.0 technologies (Anderson, 2007; Cash, 2010; Kamel Boulos & Wheeler, 2007). Collaborative activities lead to improved knowledge acquisition compared to instruction delivered through non-collaborative activities (Bonk & Wisher, 2000). In an online classroom, collaborative learning can take the form of discussion among the whole class or within smaller groups (Brindley, Blaschke, & Walti, 2009). Collaborative learning can help young learners advance their Zone of Proximal Development (ZPD), the area between a learner’s independent problem-solving ability and his or her potential for solving problems under the guidance of an expert or in collaboration with more capable peers (Vygotsky, 1978). Vygotsky (1978) holds that knowledge does not preexist in the world but is constructed first socially and then absorbed by young learners individually. Accordingly, collaborative work with Web 2.0 technologies can help young learners advance their knowledge and skills.

Constructivist learning theory is based on the premise that students build their knowledge through interactions between their previous experiences and ideas (Piaget, 1965). Constructivism offers promising new approaches to teaching (Bruner, 1990). Constructivism and socioculturalism (Vygotsky, 1978) are the elements of the two most dominant cognition theories that have been applied to mathematics teaching (Crowe & Zand, 2000). In Web 2.0-based teaching and learning activities constructivist theory is applied explicitly in the sense that students play an active role in creating their own study materials, solving realistic and meaningful problems, and collaborating with other participants (Ullrich et al., 2008). Thus, learning takes place in context and in collaboration while the control over the learning process shifts from the teacher to the students. In such an activity, the teacher acts as a supervisor who initiates, advises, and provides support when assistance is needed.

Studies have revealed that motivation is a key component that affects student performance and learning, particularly in online learning (Cole, Field, & Harris, 2004; Papastergiou, 2009; Ryan, 2001; Tuzun, Yilmaz-Soylu, Karakus, Inal, & Kizilkaya, 2009). According to Butler and Butler (2008), “One method of motivation is to use technology to engage students inside and outside of the classroom” (p. 1). In Web 2.0-based collaborative environments students and teachers become self-motivated to engage themselves inside and outside the classroom. Interactive features of Web 2.0 tools motivate participants to spend more time online, and share their creativity to a broader audience than might be possible in a regular classroom (Malhiwsky, 2010).

Given the emphasis on these features, many educational commentators argue that Web 2.0 technologies can offer great potential for supporting students’ learning in online mathematics education (Alexander, 2006; McLoughlin & Lee, 2008; Waycott et al., 2010). Thus, it has become a recent quest to understand what young learners do with the emerging features of Web 2.0 technologies, and how information technology use and Web 2.0 activities can be incorporated into classroom instruction for the teaching and learning of mathematics.

ADVANCED FEATURES OF WEB 2.0 TECHNOLOGIES

Web 2.0 is a collaborative Web development platform (O'Reilly & Battelle, 2004). It allows users to develop user-centered, participatory Web applications to add, control, and share information interactively, simultaneously, and interoperably, accessible entirely through a browser from anywhere with an Internet connection (O'Reilly, 2005). Web 2.0 enables users to create, share, consume, revise, and extend data from multiple sources and exercise control over that data (O'Reilly, 2006a). Accordingly, Web 2.0 includes additional Web-based features beyond traditional Web 1.0 tools, allowing users to customize information to suit their needs. Web 2.0 applications are those that make the most of the intrinsic advantages of the Web 2.0 platform. Building Web 2.0 applications improves as more people work together to use them (O'Reilly, 2006a). Numerous applications are included under the label of Web 2.0 Technologies. These include Blogs, Wikis, Audio-Video and Photo Sharing Sites, Social Networking Sites, and online document management applications. These social broadcasting tools have been in use in their current form and at their current capacity for less than a decade, and, for some tools, less than five years. Currently, many websites offer one or more of these applications, each of which has a unique purpose that may or may not benefit the user. Many Web 2.0 applications are created for educators to use in their classroom, while others allow for easy access and communication between the user and the outside world.

Compared with traditional Web 1.0 development tools, Web 2.0 includes some additional features that are accessible to users entirely through a browser located anywhere – connected to the Internet via personal computer or handheld mobile device (O'Reilly, 2009). Web 2.0 applications provide web hosting, audio-video sharing, social collaboration, and many more web-based applications and services. They permit free online collaboration, social connections, and resource sharing among users. Web 2.0 tools allow users to add their own content with few or no restrictions on it. Users can not only retrieve information but also enhance applications as they use them (Downes, 2005). Web 2.0 not only has additional features not possessed by its predecessor, Web 1.0, but it is qualitatively different from Web 1.0 in many ways. Web 2.0 enables users to interact with other users actively as well as to view information passively. The dynamic features of Web 2.0 allow users to interact with each other and to change website content jointly over time. A Web 2.0 site allows its users to interact with other users or to simultaneously change website content from any location at any time (Downes, 2005).

Other improved functionality of Web 2.0 includes open source applications, open sharing of information, open control, and open communication with an emphasis on Web-based communities of users free of charge (O'Reilly, 2005, 2006b). In the Web 2.0 platform everyone may be both a consumer and producer of information that appears on the Web. The interactive features of Web 2.0 technologies enable users to actively participate and contribute to developing and extending web page content. Web 2.0 users are also able to develop, share, and enhance their knowledge and thinking through interactions with other users. Most Web 2.0 sites are hosted by individuals, non-profits, or commercial organizations and are dedicated for free use; and customizable to the desire of the users (Solomon & Schrum, 2007).

SIGNIFICANCE OF USING WEB 2.0 TECHNOLOGY

The high costs for purchasing and updating mathematics software and the problems associated with traditional and Web-based online courses call for the use of Web 2.0 technologies in the teaching and learning of mathematics. With the rapid growth of social network services, Internet, and mobile web usage, it is expected that Web 2.0 tools will be a popular alternative to traditional teaching and learning software and Web-based online courses.

Moreover, due to the free accessibility of online resources, traditional and authoritative printed material may no longer serve as the standard means of resource sharing (Thomas & Li, 2008). These online resources may better meet the demand of a new generation of students. Hossain and Wiest (2011a, 2011b) support this prediction with an additional concern that due to the inclination of the young generation, both students and teachers, to use Web 2.0 technologies in their personal lives, mathematics instruction in the traditional static mode might not be sufficient to meet the needs of today’s students.

As a standard example of Web 2.0 applications, a blog is free, easy to use, fast, and requires only basic computing knowledge (Solomon & Schrum, 2007). Researchers expect that over the next few years blogs will be one of the fastest growing Web 2.0 applications (Kairer, 2009). Thus, a blog was considered to be an appropriate tool to evaluate the possible usage of other Web 2.0 technologies. Moreover, since the students in the course in which the study was conducted were preservice or in-service teachers, measuring their perceptions regarding a blogging activity was expected to provide evidence of the effectiveness of using Web 2.0 technologies in learning, teaching, and professional perspectives.

RAPID GROWTH OF INTERNET AND MOBILE WEB USAGE

As information technology becomes more prevalent, more and more advancements are being created to help nations work interactively under a global network. If we think back to the information technology of only a few years ago, we notice several things that were not previously available that are available now. The number of worldwide Internet users surpassed 2.1 billion on March 2011; up from 1.2 billion in 2006; 430 million in 2000 and only 45 million in 1995 (Internet World Stats, 2011). The number of worldwide Internet users in 2011 represented about one-third of world population (30.2%) up from 16.6%, about half-of this percentage in 2006. By the end of 2010, the number of worldwide mobile phone users exceeded 5 billion, 4 billion in 2008; and 2.5 billion in 2006 – that number was predicted to reach six billion by the middle of 2012 (BBCNEWS, 2010). In 2010, mobile web usage grew 110% in the United States and 148% worldwide compared to the previous year (Schonfeld, 2010). In 2009, there were more than 450 million mobile Internet users worldwide. This number is expected to have more than doubled by the end of 2013; and the number of mobile devices accessing the Internet is expected to surpass the one billion mark worldwide (Kairer, 2009). Thus, it is most likely that within a few years more than two-thirds of the world population will have a mobile device with high speed Internet connection; and soon, the number of mobile Internet users will overtake fixed Internet users (Ingram, 2010).

The proliferation of iPhone and smartphones has resulted in rapid growth of Internet users. As information and communication technology continues to develop, the cost of using the Internet through cellular devices is decreasing, and the number of Internet users is expected to increase very quickly. Even in developing and newly industrialized countries where the number of mobile phone users is growing fast, Internet access through cellular devices is becoming cheap, easy, and popular. According to International Data Corporation’s (IDC) Digital Marketplace Model and Forecast, in 2008 roughly 40% of all Internet users worldwide had mobile Internet access which was more than 1.5 billion; by the end of 2012, the number of worldwide mobile devices accessing the Internet will double to more than 3 billion, including PCs, mobile phones, and online videogame consoles, half of which will be mobile devices (IDC CEMA Telecommunications Newsletter, 2008). By the end of 2010, wireless broadband subscriptions in the Organization for Economic Co-operation and Development (OECD) countries exceeded half a billion (TelecomPaper, 2011). According to another prediction by Juniper Research, the number of subscribers using mobile Internet services will have risen to 1.7 billion worldwide by 2013; Internet access by mobile phones will represent around 50% of the total Internet usage (ICT Statistics Newslog, 2008).

It is very likely that, within a couple of years, the number of mobile Internet users will overtake fixed Internet users (Ingram, 2010). This prediction is supported by a statewide survey in California in 2011 that revealed that Californians are twice as likely to use their cell phones to access the Internet than they were just three years ago (Public Policy Institute of California (PPIC), 2011). The report says that 55-56% of California residents are more likely to go online from their desktop or laptop computers, whereas 40% connect to the Internet from their cell phones – that number was 19% in 2008 and 26% in 2009. In early 2008, 71% of American teens, ages 12 to 17, had a cell phone with Internet connection (Lenhart & Madden, 2009). This supports S. Keshav’s prediction that cell phones will dominate the future Internet (Keshav, 2005).

YOUNG STUDENTS’ TRENDS ON WEB 2.0 TECHNOLOGIES

Due to advancement of Web 2.0 technologies young students have changed their lifestyles radically. They are growing up with new technologies and spending their time surrounded by and using computers, laptops, videogames, digital music players, webcams, cell phones, and many other toys and tools of the digital age (Roberts, 2005). Prenksy (2001) calls them digital natives and Roberts (2005) calls them net generation students. However, web generation sounds more appropriate as Web 2.0 applications are integral parts of their lives. Use of Web 2.0 technologies has pushed them one step ahead (Prenksy, 2001).

These web generation students are most likely arriving in high schools, colleges, and universities having firsthand experience with multitasking operations in blog, podcast, tweeting, and other Web 2.0 applications, which are one step ahead of traditional voice and text messaging, and emailing. Web 2.0 tools provide today’s students with new outlets for global interaction. These tools allow web generation students to post their own views on public forums that are accessible from anywhere, anytime, with a computer or hand held cellular device with Internet connection. These technologically advanced students are ready for Web 2.0-based learning to be delivered on a flexible learning schedule that is not tied to the classroom setting in a certain time and location. Thus, there is a concern regarding whether web generation students can be fully satisfied with the traditional education system designed to teach them before Web 2.0 technologies emerged.

According to a 2009 Pew Internet & American Life Project survey, 56% of adult Americans had Internet access by wireless means, such as using a laptop, mobile device, game console, or MP3 player; and about one-third of Americans (32%) had used a cell phone or smartphone to access the Internet for emailing, instant messaging, or information-seeking. Thirty seven percent of Internet users age 18-24 use Twitter or another service, up from 19% in December 2008 (Pew Internet, 2009). The Public Policy Institute of California (2011) survey found that by the first half of 2011, 52% of Californians used social networking sites –that number was 26% in 2008. Older, less-educated, and lower-income Californians are less likely than others to participate in most of these activities. According to Mark Baldassare, president and CEO of PPIC, "The growing use of cell phones for accessing the Internet is changing the way Californians relate to work, and this trend also has promise for reducing the digital divide” (Baldassare, Bonner, Petek, & Shrestha, 2011) (p. 3).

Research shows that young students spend more time with computer, Internet, and mobile phone use than any other age group, and most of that time is spent in social network sites (Lenhart, 2009). A 2007 nationwide survey conducted by the U.S. National School Boards Association finds that young students from ages 9 to 17 reported spending at least nine hours per week online on social networking and other websites, a time almost equal to the ten hours per week spent watching television (National School Boards Association, 2007). The study found that young students actively contribute to their own content in the social networking sites. Ninety-six percent of students surveyed said that they were familiar with using Web 2.0 or open source resources. Seventy-one percent of students reported using these resources almost every day; and 50% of them said they used Web 2.0 applications to get help in completing their homework (National School Boards Association, 2007). The study also found that 76% of parents believe that social networking helps to strengthen their children’s reading, writing, and social skills.

Another 2008 British study found that 94% of British teenagers had Internet access at home and school; 92% owned or had access to a mobile phone, 88% a computer with 29% using an additional laptop, 69% an iPod/mp3 player, 73% a game console device, 40% a standalone digital camera, and 10% a video camera (Clark et al., 2009). Another research report commissioned by the British Educational Communications and Technology Agency (BECTA) finds that teens had higher levels of access to the Internet and many technologies that support Web 2.0: 98.4% had access to a computer; 96.6% had access to the Internet; 74% had at least one social network site account; and over 50% had shared pictures, video, or music in the last week of the survey (Luckin et al., 2008). By that time more than 71% of American teens had mobile phones with an Internet connection; and about 85% of them said that they visited Facebook, MySpace, or Twitter regularly (Lenhart, 2009).

According to a statistical study of Online Schools (2011), reported by DigitalBuzzBlog (2011), as of 2011, there were over 500 million Facebook users worldwide; over 50% of them logged on to Facebook every day; and every Facebook user had about 130 friends on average. The report said that 48% of 18-34 year olds check Facebook when they wake up, with 28% doing so before even getting out of bed. Almost 72% of all American Internet users use Facebook, while 70% of Facebook users are outside of the United States. According to the report, over 700 billion minutes a month are spent on Facebook, 20 million applications are installed per day and over 250 million people interact with Facebook from outside the official website on a monthly basis, across 2 million websites. Over 200 million people accessed Facebook via their mobile phone; 48% of young people receive their news through Facebook. Meanwhile, in just 20 minutes on Facebook over 1 million links are shared, 2 million friend requests are accepted, and almost 3 million messages are sent (DigitalBuzzBlog, 2011).

Teens spend more time on the Internet for gaming, instant-messaging, file and photo sharing, and social communicating than on studying or information searching (Clark et al., 2009; Selouani & Hamam, 2007). They participate in Web 2.0-based activities as authors and consumers of content from file sharing to online gaming and writing on blogs (Boyd, 2007; Lenhart & Madden, 2009; Richardson, 2006). One survey showed that about 35% of all teens do blogging, 54% post photos online, 19% post videos, 39% share their own artistic creations online, 26% remix content, 27% maintain personal web pages, 28% have their own blogs (Ivanova, Ivanova, & Smrikarov, 2009). Clark et al. (2009) finds that young students surf about 30 social networking sites. Most use these sites in and out of school for social communication; only a few, however, use them for academic purposes. This might be because schools or students are unaware of the educational advantages of using social-networking sites and social-networking tools. Young students enjoy the benefits of getting multiple resources from the Web (Douma, Ligierko, & Romano, 2009).

Text messaging, playing online games, downloading music, audio, video, and accessing news, sports, financial or credit information have already become the most common activities among mobile Internet users worldwide (IDC CEMA Telecommunications Newsletter, 2008). Participation in social networking is becoming very popular among teen Internet users through personal computer or cellular devices (Internet World Stats, 2011). A growing number of kids are using social networking sites. According to two surveys released in 2009 by Pew Internet Research, 38% of respondents ages 12 to 14 claimed to have an online profile; while 61% of those from ages 12 to 17 claimed to use social networks; 42% of them daily (CNN Tech, 2009). Once on the Internet, teen users are most likely to spend their time on newly emerging Web 2.0 activities, such as watching user-generated videos, reading and posting blogs, and participating in social networks rather than the traditional Web 1.0 activities like searching, chatting, playing online games, and sending and receiving emails (IDC CEMA Telecommunications Newsletter, 2008). The IDC expects that, over the next few years, making online purchases, participating in online communities, and creating blogs will be the fastest growing applications among teen Internet users (Kairer, 2009).

IMPACT OF WEB 2.0 TECHNOLOGIES ON TEACHING AND LEARNING

The emergence of Web 2.0 technologies has led to exploring their potential use in the teaching and learning process. Increased access to and use of electronic classrooms, Web 2.0-based interactive applications, and contemporary web-based conferencing tools are changing the ways students learn and teachers teach (Greenhow, Robelia, & Hughes, 2009; M. J. W. Lee, 2005; Tammets, Tammets, & Laanpere, 2009). Students, teachers, and educators now seek to have any time, any place, any path, and any pace learning opportunities (Lamb & Callison, 2005). Participants in Web 2.0-based asynchronous learning environments get more time for reading, writing, and posting in discussion forums. This allows them to participate in online discussions by providing reflections after thinking about how they should reply (Saade & Huang, 2009).

According to Conrad and Donaldson (2004), collaborative attainment of knowledge is one key component of creating a successful online learning environment. Activities that require interactive collaboration among the participants, and encourage sharing of ideas promote a deeper level of thought and a lifelong understanding environment (Conrad & Donaldson, 2004). Interactive learning tools that engage and stimulate students more than a face-to-face classroom can compensate for the absence of direct interaction between teachers and students in online education (Dong, Xu, & Lu, 2009). Web 2.0 technologies provide such interactive tools and technology that ease the development of active collaboration among participants in the United States and abroad. The openness, collaborative, and interoperability features of Web 2.0 technologies can enable teachers to engage students in working together inside and beyond the classrooms (Solomon & Schrum, 2007). Using these features Web 2.0 users can easily publish and share their work, connect with a community of like-minded people, and comment on other users’ contributions (Waycott et al., 2010). Given emphasis on these features, many educational commentators argue that Web 2.0 technologies offer great potential for supporting students’ learning in online education (Alexander, 2006; McLoughlin & Lee, 2008; Waycott et al., 2010).

WordPress is an open source blog-publishing service that has been available for a couple of years. WordPress allows anyone to create a blog without paying a registration or annual license fee. WordPress has a web template system that allows considerable customization. In WordPress, users can re-arrange widgets without writing or editing program codes. They can use built-in themes or edit themes for more

advanced customization. WordPress provides integrated link management features –a search engine-friendly, clean permalink structure, and the ability to assign nested and multiple categories for articles. It includes an automatic filter option for spam; provides standardized formatting and styling of text in articles; supports the tagging of posts and articles; and provides trackback and pingback standards for displaying links to other sites that are related to a post or article (Pardamean & Susanto, 2012). WordPress has become a popular self-hosted blogging tool, used on millions of sites and seen by tens of millions of people every day (WordPress.com, 2011). WordPress is widely used for developing personal and commercial blogs; however, it has started to get the attention of students, teachers, educators, and researchers to be used for teaching and learning purposes.

Edmodo is another free and secure social learning network that is compatible for teaching and learning purposes. It is best described as a micro-blogging platform for students, teachers, and schools. Edmodo’s user interface is very similar to Facebook; moreover it has built-in security features that give teachers privacy controls over their virtual classrooms (Carta, 2011). Edmodo promotes anytime, anyplace learning both inside and outside the classroom. Using Edmodo, teachers can post messages, discuss classroom topics, and assign and grade homework for students. Students can then submit the homework and view their grade (Waters, 2011). A teacher can divide the class into several groups and assign a common or individual assignment to each group member. After a course period is completed the teacher can close out the network and log on to another course (Waters, 2011). Similarly, after completing a semester or an academic year the teacher can close out the network and start up new sessions. Launched in late 2008, as of February 2011, there were over 1.5 million Edmodo users worldwide. A number of school districts in the United States are now promoting Edmodo for use in their classrooms (Edmodo.com, 2011).

Unlike WordPress, Edmodo was launched with the aim of targeting mainly teaching and learning ausiences. However, each of these networks has some advantages and disadvantages/problems with regard to educational uses. Edmodo’s interface is similar to that of Facebook (Carta, 2011). It provides teachers and students with a safe and easy way to connect and collaborate, and to exchange content, materials, and ideas with their peers (Johnson, 2011). On the other hand, WordPress is known for its open accessibility and use in developing multipurpose blogs. Most WordPress blogs are public and visible to anyone; however, only the participating teachers and students have access to Edmodo blogs. Non-participating teachers and students cannot view an Edmodo blog. Thus, teachers have a limited chance of following other teachers and students who are using blogs in Edmodo.

**A BLOGGING ACTIVITY IN A COLLEGE EUCLIDEAN GEOMETRY COURSE**

This study was conducted during the fall semester of 2011 in a college Euclidean Geometry course taught in the college of education of a university in the western United States. All of the students enrolled in this course and a preservice teacher auditing the course as part of an independent study were asked to participate. Most of the students in this course were secondary mathematics education majors; however, a few were majoring in other areas. There were 29 students in the class. The students were given a choice to join or not to join in the blogging activity; with an alternate assignment provided by the instructor to those students who did not wish to participate in the blogging activity.

Initially, all 29 of the students agreed to participate. One student, who attended only two class sessions and did not continue the course, did not participate in this study. Finally, all 28 remaining students continued in the blogging activity and participated in the study. There were more than 6,500 visits to the blog during the twelve weeks of the activity.

The blogging activity was designed to run for twelve weeks and was a regular component of this course. The students were divided into six groups with five students in five of the groups and three in the remaining group. Each week the researcher uploaded a new problem set. The six groups were randomly assigned to a pair of weeks, 1st and 7th, 2nd and 8th, 3rd and 9th, 4th and 10th, 5th and 11th, or 6th and 12th. During the weeks to which they were assigned, group members were responsible for solving problems and leading the discussion board activity on the blog. The schedule was purposely set so that each group was assigned one week during the first half of the activity and another week in the second half. Each student created a pseudonym to maintain confidentiality throughout the activity.

Each group member was responsible for submitting a complete solution to one of the eight problems posted during the weeks assigned to their group. During the assigned week, at least one group member was responsible for initiating a new discussion thread and the other group members were expected to contribute to the thread. Additionally, throughout the semester each class member was required to post at least five substantive comments to solutions posted by other students; and to actively participate in the online discussion. Substantive comments included verifying a solution posted by someone else, fixing an incorrect or partially incorrect solution, or providing an alternative solution. In the online discussion board, a student could raise a discussion topic such as a contemporary issue related to the topics taught in the class or comment on threads that had been started by other class members.

The blogging activity was designed to provide participants with an opportunity to explore and share their knowledge of various geometric problems and their applications in real life situations. Every weekend the researcher posted eight problems on the blog and sent an email to all of the participants with a reminder that the problems were uploaded on the blog and were ready to be solved. It should be noted that there were a maximum of five participants in a group; however, eight problems were posted each week. Thus, extra problems were posted each week so that even the last participant in a group had some options to choose from when selecting and solving a problem.

The researcher periodically updated the grade sheet related to the blogging activity; posted it on the blog using pseudonyms; and sent a reminder to participants who were behind in their assigned tasks. All participants completed their assigned tasks for this activity in a timely manner and achieved the full number of points allocated for this activity. During the 12-week activity, there were 174 responses with 66 threads on the discussion board.

After the 12 week activity had concluded each of the participants was asked to complete a survey (see Appendix A) that gathered information regarding preservice mathematics teachers’ perceptions of using a blog as a supportive teaching and learning tool in a college Euclidean Geometry course. In particular, each participant was asked about his or her attitude toward the blog and his or her perception of its effectiveness.

**FINDINGS**

This study examined preservice secondary mathematics teachers’ perceptions of a blogging activity used as a supportive teaching and learning tool in a college Euclidean Geometry course. Self-reported attitudes toward the blogging activity and the perceived effectiveness of the blogging activity were measured and analyzed quantitatively using SPSS-PASW for Windows. Attitudes and perceived effectiveness scores were compared across gender and self-reported time on the Internet to determine if differences existed across these categories. Additionally, this study determined if a relationship exists between either participants’ attitudes toward the blog or perceived effectiveness of the blog to their total quiz scores measured by eight in-class quizzes. The qualitative component of this study analyzed the advantages and disadvantages of the blogging activity as reported by the students and determined the trends that emerged in the students’ contributions to the unguided discussion section of the blog. The qualitative data were analyzed using MAXQDA. Quantitative and qualitative analyses are presented separately.

**PARTICIPANTS’ PERCEPTIONS TOWARD THE BLOGGING ACTIVITY**

The median score on the 16-question attitude survey was determined for each participant. Descriptive statistics of these median attitude scores yielded a mean, median, and mode of 4.18, 4.0, and 4.0 with a standard deviation of 0.95 on a scale of 1 to 6. This indicates that the typical response of participants corresponds to slightly more than agreement that they held a positive attitude toward the blogging activity in the College Euclidean Geometry course. Similarly, the median score on the 18-question effectiveness survey was determined for each participant. Descriptive statistics of the median perceived effectiveness scores yielded a mean, median, and mode of 4.13, 4.0, and 4.0 on a scale of 1 to 6, with a standard deviation of 0.93, indicating that the typical response of participants corresponds to slightly more than agreement that the blogging activity was an effective means of teaching and learning Euclidean Geometry.

**PERCEPTIONS BASED ON GENDER**

Research Question 1a compared male and female participants’ median attitude scores toward the blogging activity. Results for Research Question 1a: Are there significant differences by gender with regard to preservice mathematics teachers’ attitudes toward the blogging activity in a college Euclidean Geometry course?, indicated no significant difference (N = 28, U = 68.0, p >.05) in the median attitude scores of the participants toward the blogging activity in terms of their gender.

Research Question 1b compared male and female participants’ median perceived effectiveness scores of the blogging activity. Analysis of Research Question 1b: Are there significant differences by gender with regard to preservice mathematics teachers’ perceived effectiveness of the blog for the learning of Euclidean Geometry?, indicated no significant difference (N = 28, U = 94.50, p >.05) in the median perceived effectiveness scores toward the blogging activity in terms of the gender of the participants.

These results do not support some other studies that found that men and women use the Internet very differently, with women sending and receiving emails in a richer and more engaging way and that women appear to have overtaken men in online shopping, while more **men perform online financial transactions and pursue and consume information online more aggressively than women** (Bimber, 2000; Fallows, 2005; Grove, 2010). However, the gender-based perception results, both attitudes toward and perceived effectiveness of the blogging activity, of this study does support another doctoral dissertation that found “gender did not have a significant relationship with Web 2.0 usage” (Cash, 2010, p. 81).

The result of the present study may be due to the fact that it was conducted in a single course with a small number of participants; Moreover, the median attitude and median perceived effectiveness scores in this study implied that both male and female participants experienced consistent perceptions that the blogging activity was appropriate and effective in the Euclidean Geometry course.

**PERCEPTIONS BASED ON TIME SPENT ON THE INTERNET**

Research Question 2a compared participants’ median attitude scores toward the blogging activity with their self-reported total time spent on the Internet per week. Results for Research Question 2a: Do preservice teachers who report spending more time on the Internet differ significantly from those who report spending less time on the Internet with regard to their attitudes toward the blogging activity in a college Euclidean Geometry course?, indicated no significant difference (N = 28, U = 61.50, p >.05) in the median attitude scores of the participants toward the blogging activity in terms of their self-reported total time spent on the Internet per week.

Research Question 2b compared participants’ median perceived effectiveness scores of the blogging activity with their self-reported total time spent on the Internet per week. Analysis of Research Question 2b: Do preservice teachers who report spending more time on the Internet differ significantly from those who report spending less time on the Internet with regard to their perceived effectiveness of the blog for the learning of Euclidean Geometry?, found a significant difference (N = 28, U = 53.00, p <.05) in the median perceived effectiveness scores of the participants in terms of their self-reported total time spent on the Internet per week. This significant result indicates that participants who spent more time on the Internet perceived the blogging activity to be more effective than participants who spent less time on the Internet.

According to The Nielson Company’s (2010) prediction that there might be a strong positive correlation between time spent on the Internet and time spent on social network sites, one possible explanation is that participants who spend more time on the Internet were more familiar with blogs and/or other social network sites than those who spend less time on the Internet. Thus the participants who spent more time on the Internet were more likely to perceive the use of a blogging activity for the learning of Euclidean Geometry to be more effective than those who spend less time on the Internet.

Another possible explanation is that participants who spend more time on social network sites might perceive the blog to be more effective than those who spend less time on the Internet and thus less time on social network sites. This prediction is consistent with the finding of a recent study on students’ perceptions of collaboration, self-regulated learning, and information seeking in the context of Internet-based learning and traditional learning, conducted by Lee and Tsai (2011) who found “students who spent a moderate amount of time online for learning actually perceived higher capability and more experience of collaboration than the group who spent less time” (p. 909). In another contemporary study Chu and Tsai (2009) found that “more time spent on Internet practice may increase adult learners’ Internet self-efficacy, which may strengthen their preferences for Internet-based learning environments” (p. 1).

**PERCEPTIONS BASED ON CUMULATIVE QUIZ SCORES**

Research Question 3a correlated participants’ attitudes toward the blog to their total quiz scores measured by eight in-class quizzes. Analysis of Research Question 3a: Is there a relationship between the cumulative quiz scores attained by preservice mathematics teachers enrolled in a college Euclidean Geometry course and their attitudes toward the blogging activity in a college Euclidean Geometry course?, did not indicate a significant correlation (N = 28, rs = -0.145, p >.05) between the participants cumulative quiz scores and their median attitude scores toward the blogging activity.

Research Question 3b correlated participants’ perceived effectiveness of the blog to their total quiz scores measured by eight in-class quizzes. Analysis of Research Question 3b: Is there a relationship between the cumulative quiz scores attained by preservice mathematics teachers enrolled in a college Euclidean Geometry course and their perceptions of the effectiveness of the blog for the learning of Euclidean Geometry?, did not indicate a significant correlation (N = 28, rs = -0.232, p >.05) between the participants cumulative quiz scores and their median perceived effectiveness scores of the blogging activity.

These findings imply that all participants, regardless of their relative strength in mathematics problem solving, reasoning, and understanding skills, as measured by the in-class quizzes, tended to have positive attitudes toward the blogging activity and considered it to be effective in the teaching and learning of Euclidean Geometry. This finding coincides with Cash’s (2010) doctoral dissertation research that found that Web 2.0 usage level did not have a significant relationship with high school students’ letter grade (performance) in mathematics, science, and social studies.

**ADVANTAGES AND DISADVANTAGES/PROBLEMS OF THE BLOGGING ACTIVITY**

Research Question 4: What do preservice secondary mathematics teachers perceive as the advantages and disadvantages of using a blog as a supportive tool in a Euclidean Geometry course?, was qualitatively analyzed to determine the advantages and disadvantages of the blogging activity, as reported by the participants. This analysis revealed that the preservice mathematics teachers reported numerous advantages and a few minor problems of the blogging activity as a supportive tool in the Euclidean Geometry course. The themes identified as advantages include: 24/7 accessible; source of alternate solutions; collaborative; convenoent; enjoyable; encouraging; engaging; getting feedback; safe and secured; and, technology savvy. Figure 1 (see below) delineates these themes and related subthemes as drawn by the MAXMaps feature of MAXQDA. Themes related to disadvantages or problems include: No disadvantage; difficult for new bloggers; difficult in using Geometric notations; enforcing; monotonous; and, personal dislike.

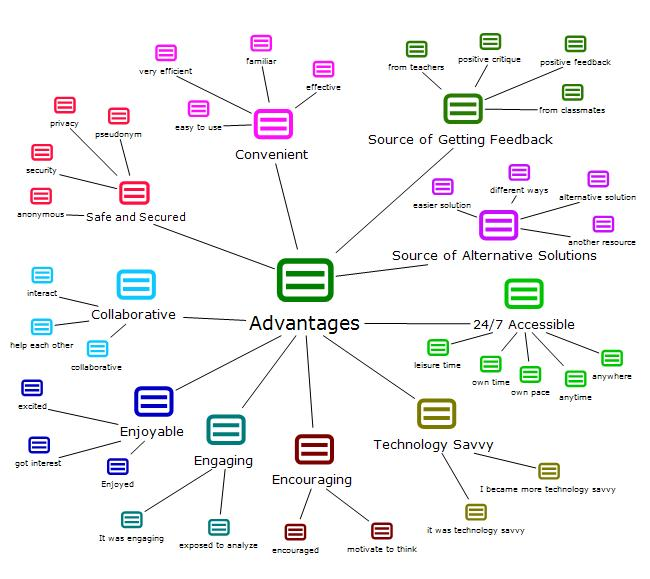


Figure 1. Major Advantages of the Blogging Activity

**TRENDS OF THE BLOG DISCUSSION**

Research Question 5: What trends emerge in the analysis of preservice secondary mathematics teachers’ contributions to an online discussion board on a blog used in a college Euclidean Geometry course?, qualitatively analyzed the trends that emerged in an unguided online discussion board on a blog. This analysis revealed that the preservice mathematics teachers raised approximately twenty major themes throughout the online discussion. These themes include: participants’ personal interest in Geometry; difficulties in teaching-learning Geometry; real-life applications of Geometry; teaching-learning strategies in Geometry; hands-on activities; drill and kill methods; use of a formula sheet; creating lesson plans; the importance and difficulty of word problems; career plans; math teachers’ pay and benefits; self-motivation of becoming a math teacher; how to maintain professionalism; overloaded homework; test creation strategies; grading policy; use of advanced technology such as a smart board and overhead projector use in Geometry classrooms; math jokes and fallacies; and, mathematics websites. Figure 2 (see below) depicts the major trends that emerged in the online discussion board of the blogging activity as drawn by the MAXMaps feature of MAXQDA.

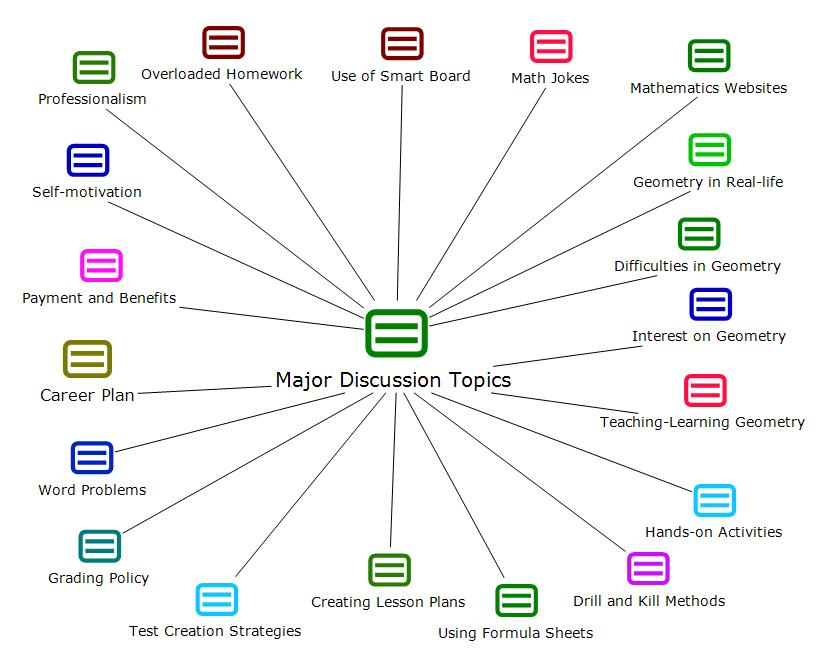


Figure 2. Major Trends that Emerged in the Discussion Board of the Blog

Although, the participants’ discussion did not focus in any specific direction, interestingly, most of the topics were related to the improvement of teaching and learning as well as professional development, topics that are often not discussed in the classroom. This result is analogous to Hendron’s (2008) argument as he stated that blogs can provide students with the social collaborative edge that they can never experience on paper and in traditional classrooms.

**IMPLICATIONS FOR PRACTICE**

The results of this study have possible implications not only to researchers in the field of mathematics education, but also for mathematics students, teachers, teacher educators, curriculum developers, instruction designers, and policy makers regarding the use of a blog and other Web 2.0 applications as supportive or comprehensive tools for teaching, learning, and planning purposes. The remaining part of this section presents some possible implications of this study.

First, this study found that participants generally reported positive attitudes toward a blog and perceived the blog to be effective without any significant differences based on their gender. One implication of these results might be that, professors and teachers who may have wrongly believed that males are being given an unfair advantage when computers and information technology are incorporated into a class should reconsider this thought. This study suggests that implementing a blogging activity may not provide any advantage to either males or females as some educators may believe to be the case. Therefore, professors and teachers should feel confident about implementing this type of activity without having to be overly concerned about unfairly advantaging male or female students.

Second, another implication of these results might be that, since undergraduate college students and preservice mathematics teachers responded positively to this activity and perceived it to be effective then there is a good chance that high school and middle school students and/or in-service mathematics teachers might, also, find it positive and effective. Thus, middle or high school teachers should consider implementing activities similar to those used in this study in their own classrooms. Further teacher educators should provide instruction to preservice teachers regarding the implementation of blogging activities and encourage these preservice teachers to use them in the future. Additionally, curriculum developers and policy makers should use their influence to encourage the inclusion of blogs and or/other Web 2.0 technologies in the middle school, high school, and teacher education mathematics curricula.

Third, this study found that although participants generally reported positive attitudes toward the blog regardless of the amount of time they spend on the Internet, those who spend more time on the Internet perceived the blogging activities to be more effective than those who spend less time on the Internet. Based on these results, professors and teachers who want to use this type of activity in their classroom need to be careful about some points before starting. Of course, it is critical to determine whether or not all of the students in the course actually have access to the Internet, since this lack of access may be the reason why some students spend little or no time online. Clearly these students would be disadvantaged by such an activity unless the teacher or professor made Internet access more accessible to them. Additionally, if students spend less than 21 hours per week online, they may need additional support regarding their Internet skills. Providing special training and support for these students may lead them to see these activities as being as effective as those who spend more than 21 hours on the Internet do.

Fourth, this study did not find a significant correlation between the participants’ cumulative quiz scores, and either their median attitude scores, or their median perceived effectiveness scores, toward the blogging activity. One implication of these results might be that mathematical content knowledge and problem-solving skills are not determining factors regarding whether or not a blogging activity should be included in a particular course. This result suggests that teachers should implement blogging activities in their low level courses as well as their upper level courses. Unfortunately, we have probably all heard stories of upper level courses being provided with interesting activities while lower level courses are often relegated to completing boring worksheets under the guise that these students couldn’t handle the more interesting activities. This study directly refutes this idea and provides a strong justification for implementing blogging activities with courses of all levels.

Fifth, the participants in this study found a number of advantages of using the blogging activity in the college Euclidean Geometry course. One such advantage was the collaborative nature of this type of activity. Not surprisingly, collaboration is considered to be an important aspect of learning mathematics, as stated in the NCTM (2000) Principles and Standards, “Technology also provides a focus as students discuss with one another and with their teacher” (p. 25). Through collaboration, preservice mathematics teachers gain “a better appreciation of mathematics content and pedagogical strategies that lie beyond the grades they will likely teach” (Edwards, 2006)(p. 1). Thus, as this study suggests, blogs could be a vehicle to improve the teaching and learning of mathematics because in such an activity students get more opportunities to communicate and collaborate with the teacher and their peers. This might also apply to mathematics teachers engaged in professional development activities. This idea is supported by the findings of Tinzmann, Jones, Fennimore, Bakker, Fine, and Pierce (1990):

Collaborative teachers encourage students' use of their own knowledge, ensure that students share their knowledge and their learning strategies, treat each other respectfully, and focus on high levels of understanding. They help students listen to diverse opinions, support knowledge claims with evidence, engage in critical and creative thinking, and participate in open and meaningful dialogue. (p. 1)

Sixth, the blog was found to be a source of alternative solutions and positive feedback from other students in the course, which have been identified as effective components in the teaching and learning of mathematics. The importance of encouraging alternative solutions is emphasized by the NCTM (2000) Principles and Standards as:

Different strategies are necessary as students experience a wider variety of problems. Students must become aware of these strategies as the need for them arises, and as they are modeled during classroom activities, the teacher should encourage students to take note of them. (p. 54)

The importance of encouraging alternative solutions, also, is witnessed by Stipek, Givvin, Salmon, & MacGyvers (2001) who state that “teachers should emphasize process and encourage students to seek alternative solutions rather than to find a single correct solution” (p. 216); and by Cohen and Ball (1990) who contend that “teachers should encourage students to offer alternative solutions to problems and invite them to collaborate in figuring out what makes sense and why” (p. 3).

Regarding positive feedback, Lou and MacGregor (2004) found that, in a collaborative learning environment, “receiving positive feedback from other groups was rewarding and encouraging” (p. 435). Lou and MacGregor (2004) also found that:

Providing feedback to each other across groups helps students to develop critical thinking skills, self-regulating skills, as well as the skills in evaluating the work of others – a professional skill important for educators. Through evaluating each other’s work, the students become more aware of possible areas of weakness in their projects. It enhances the transfer between conceptual understanding and applying newly learned concepts in their own projects and in evaluating other projects. (p. 437)

Seventh, the 24/7 accessibility of the blog might provide students with easy and convenient communication with the teacher and their classmates while they are at home, on the school bus, in the family car, or at a shopping mall. Perhaps, the convenient, enjoyable, encouraging, engaging features of the blog might be a way to motivate students to spend more time learning mathematics. Notably, these features of blogs and/or other Web 2.0 technologies might help change the lackluster attitudes toward learning mathematics held by many students who are more willing to spend their time on social networking sites than on practicing mathematics.

Eighth, both the researcher, as the instructor of the blogging activity, and the participants discovered some minor difficulties in using the blog in the Euclidean Geometry course, such as being unable to use some mathematical symbols, equations, and construction tools on the blog. The free version of the blog used in this study did not allow the instructor to install and use any third party plugins for these purposes. Software developers should consider making the use of mathematical symbols easier on their free blog websites. Doing so will make their products more convenient to use and would most likely lead to an increase in the number of mathematics teachers and/or students who would opt to purchase upgraded versions of the product. Another potential solution for software developers would be to create low cost plug-ins that allow for easy use of mathematical and scientific symbols and equations that could be used in tandem with their free blogs. Policy makers could encourage software developers in this regard by investing in software development programs with the promise of purchasing successful and innovative software programs after they have been developed.

Ninth, this study found that preservice mathematics teachers found the blog to be a good forum to openly discuss numerous Geometry related topics. These include issues regarding their personal interest and experience in Geometry and mathematics; use of Geometry and mathematics for real-life purposes; teaching-learning strategies; use and importance of formula sheets, hands-on activities, drill and kill methods, lesson plans, smart board use, and word problems. They also discussed their career plans, interest in becoming a math teacher, and effective ways to maintain professionalism. Thus, it seems that blogs could be used for various purposes. For instance, a mathematics teacher could develop and maintain a blog for his/her course and invite the students to discuss various topics about the course. This kind of virtual platform could enrich their mathematical knowledge and understanding by allowing for the discussion of various mathematical topics: posting of related problems and quizzes; allowing class members to submit online solutions to problems posted by others; and sharing thoughts about creating mathematics problems.

Finally, and most notably, the findings of this study might provide a great opportunity for students and classroom teachers who have not previously experienced blogging to share their voices and perspectives on an open and public forum. This opportunity will allow individuals who do not get a chance to publish their perspectives in typical print media to have an outlet for sharing their ideas. Further, this study suggests that using blogs could provide an effective opportunity for students who are involved in the process of learning and understanding mathematics. The relative low cost of using blogs can provide a strong alternative for those teachers and students who cannot afford costly mathematical software or Web-based applications. As more students participate in online discussion on various mathematics topics and take the opportunity to publish their voice on the open forum, the depth and breadth of their mathematics study should expand.

**CONCLUSIONS**

This study has revealed some important results regarding the use of blogs in the teaching and learning of Geometry and other mathematics courses. As most of the participants in this study were preservice mathematics teachers, their perceptions were related to both teaching and learning perspectives. Quantitative measures of participants’ attitudes toward and perceived effectiveness revealed that the use of a blog is both enjoyable, and perceived to be effective, in a college Euclidean Geometry course. The study also revealed that gender did not have a significant relationship with preservice secondary mathematics teachers’ attitudes toward or perceived effectiveness of using a blog as a supportive teaching and learning tool in a college Euclidean Geometry course. Thus, both male and female students and teachers appear to enjoy using and benefit from participating in such a blog.

Moreover, the study revealed that spending more time on the Internet did not have any significant effect on the participants’ attitudes toward using a blog as a supportive teaching and learning tool in a college Euclidean Geometry course. Although, the study revealed that participants who spent more time on the Internet found the use of a blog more effective as a supportive teaching and learning tool in a Euclidean Geometry course than those who spent less time on the Internet. This suggests that mathematics teachers who want to use such a blogging activity in their courses should be aware of the need to provide additional support and possibly even increased accessibility to the Internet to some of their students.

The study, also, revealed that students’ mathematical content knowledge, problem solving, and understanding skills are not a significant factor with regard to using a blog as a supportive teaching and learning tool in a Euclidean Geometry course. This means that mathematics teachers who want to use a blogging activity in their courses should not be worried about whether the participants have a strong or weak background in mathematics. Through active collaboration and increased engagement both strong and weak students could benefit from the use of a blog as a supportive learning tool.

Furthermore, the study revealed that the effective use of a blog has numerous advantages as a supportive teaching and learning tool in a Euclidean Geometry course with only a few minor problems and no mentionable disadvantages. Additionally, it is likely that many of these problems will be overcome as software engineers continue to improve the quality of free or low cost blogging websites.

Finally, the study revealed that participants considered the blog to be an open and public forum where they can discuss topics of interest to them and present their personal views and experiences without hesitation. This has the potential to allow mathematics students and teachers to build and join in many virtual platforms on blogs where they can share their voices and perspectives in a public forum. People from various corners of the world who love mathematics could be invited to participate in such an open discussion forum on the blog for learning and practicing mathematics.

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**KEY TERMS AND DEFINITIONS**

**Web 2.0 Technology:** a new development of Internet services available on the World Wide Web that allows Internet users to collaborate and share web information actively (O'Reilly, 2005).

**Blog:** an interactive Web 2.0 tool that allows users to read and/or contribute to an online discussion.

**Collaborative Learning:** a teaching strategy in which learners work together for their mutual benefit.

**Preservice Teachers:** undergraduate or graduate college students who are enrolled in a program designed to prepare them to be teachers.

**Problem Solving:** activities that allow learners to explore and struggle with an unfamiliar problem or situation.

**Perceptions:** self-reported information gathered from an individual regarding their beliefs regarding a particular construct.

**Euclidean Geometry:** a branch of mathematics that studies the nature of the world in which we live.

**APPENDIX A - SURVEY INSTRUMENT**

Please fill out this questionnaire based on your perceptions of the blogging activity in the class, EDSC 353: Teaching Secondary Geometry, in the fall semester of 2011.

**I. Demographic Information**

1. Please indicate your gender: 􀂆 Male 􀂆 Female

2. Please state your age: \_\_\_\_\_\_\_\_\_\_\_ years.

**II. Experience in using Internet and Web 2.0 Application**

3. Do you use a Smartphone or Internet connected cell handheld device to get access to the Internet?

􀂆 Yes 􀂆 No 􀂆 I do not use a cell phone

4. How much average time do you spend per day on the Internet for all purposes? \_\_\_\_\_\_\_\_\_\_ hours

5. How do you rate your skills in using the Internet in terms of sending or receiving emails, browsing webpages, searching information, reading news on the Internet, etc.?

􀂆 Excellent 􀂆 Good 􀂆 Fair

6. How do you rate your interest/engagement in Web 2.0 applications such as: blog, facebook, podcast, twitter, wikis, etc.?

􀂆 Very Much 􀂆 Average 􀂆 Very Little

7. Before participating in this activity how much experience in blogging did you have?

􀂆 Very Much 􀂆 Average 􀂆 Very Little

**III. Attitudes toward the Blogging Activity**

In this section, please express your response in **only one** of the following options:

*VSA* = Very Strongly Agree *SA* = Strongly Agree

*A* = Agree *D* = Disagree

*SD* = Strongly Disagree V*SD* = Very Strongly Disagree

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Question** | **Response** | | | | | |
| 8. | Participating in this blogging activity peaked my interest to learn how to conduct such an activity | VSA | SA | A | D | VSD | VSD |
| 9. | The blogging activity made me irritable | VSA | SA | A | D | VSD | VSD |
| 10. | After participating in this blogging activity I hope to see blogging activities in other mathematics classes I take in future | VSA | SA | A | D | SD | VSD |
| 11. | I did not like participating in the blogging activity | VSA | SA | A | D | SD | VSD |
| 12. | I enjoyed spending time online for this blogging activity | VSA | SA | A | D | SD | VSD |
| 13. | The blogging activity was not worth the time and effort it involved | VSA | SA | A | D | SD | VSD |
| 14. | I enjoyed reading solutions that my classmates posted on the blog | VSA | SA | A | D | VSD | VSD |
| 15. | I enjoyed posting topics or issueson the discussion board of the blog | VSA | SA | A | D | SD | VSD |
| 16. | I felt uncomfortable participating in the blogging activity | VSA | SA | A | D | SD | VSD |
| 17. | I enjoyed commenting on my classmates’ contributions to the blog | VSA | SA | A | D | SD | VSD |
| 18. | The blogging activity was interesting | VSA | SA | A | D | SD | VSD |
| 19. | The blogging activity did not fulfill my initial expectations about it | VSA | SA | A | D | VSD | VSD |
| 20. | Blogging activities should be incorporated into other classes in the teacher education program | VSA | SA | A | D | SD | VSD |
| 21. | I enjoyed posting solutions to the blog | VSA | SA | A | D | SD | VSD |
| 22. | I felt comfortable with the blogging activity | VSA | SA | A | D | SD | VSD |
| 23. | The blogging activity was boring | VSA | SA | A | D | SD | VSD |

**IV. Effectiveness of the Blogging Activity for Learning Euclidean Geometry**

In this section, please express your response in **only one** of the following options:

*VSA* = Very Strongly Agree *SA* = Strongly Agree

*A* = Agree *D* = Disagree

*SD* = Strongly Disagree V*SD* = Very Strongly Disagree

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Question** | **Response** | | | | | |
| 24. | The blog provided me with an interactive tool for online learning | VSA | SA | A | D | VSD | VSD |
| 25. | The blogging activity encouraged me to share my ideas with other students in the class | VSA | SA | A | D | SD | VSD |
| 26. | The blogging activity helped me understand difficult problems in easier ways | VSA | SA | A | D | SD | VSD |
| 27. | The online discussion on the blog was more effective for learning Euclidean Geometry than in class discussion | VSA | SA | A | D | SD | VSD |
| 28. | The blogging activity helped me get better scores on the quizzes | VSA | SA | A | D | SD | VSD |
| 29. | My contributions to the blog increased the learning experience of other students in the class | VSA | SA | A | D | SD | VSD |
| 30. | Writing a substantive comment to someone’s solution on the blog encouraged me to think of an alternative solution to a problem | VSA | SA | A | D | SD | VSD |
| 31. | The blogging activity helped me figure out how a specific problem could be solved in different ways | VSA | SA | A | D | SD | VSD |
| 32. | Solving a problem on the blog was more effective for learning Euclidean Geometry than solving a problem face-to-face in class | VSA | SA | A | D | SD | VSD |
| 33. | The blogging activity encouraged me to try other Web 2.0 technologies for teaching and learning Euclidean Geometry | VSA | SA | A | D | SD | VSD |
| 34. | The contributions of my classmates to the blog helped me learn something new about Euclidean Geometry | VSA | SA | A | D | SD | VSD |
| 35. | The blogging activity helped me better understand some concepts of Euclidean Geometry | VSA | SA | A | D | SD | VSD |
| 36. | My contributions to the blog helped other students in the class learn something new about Euclidean Geometry | VSA | SA | A | D | SD | VSD |
| 37. | The blogging activity helped me better utilize my leisure time for learning purposes | VSA | SA | A | D | SD | VSD |
| 38. | The blogging activity encouraged me to collaborate with other students in the class | VSA | SA | A | D | SD | VSD |
| 39. | The blogging activity provided me with some lifelong understanding of Euclidean Geometry | VSA | SA | A | D | SD | VSD |
| 40. | The blogging activity created a collaborative learning environment in the Euclidean Geometry class | VSA | SA | A | D | SD | VSD |
| 41. | The blogging activity was more effective for learning Euclidean Geometry than writing reflection papers on class readings | VSA | SA | A | D | SD | VSD |

**V. Open-ended Questions**

In the following questions, please provide your response regarding your experience in this blogging activity.

42. What were the advantages of this blogging activity?

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43. What were the disadvantages of this blogging activity?

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44. Do you recommend the blog and other Web 2.0 technologies to be incorporated in other mathematics classes in the teacher education program and secondary school curricula? Why or why not?

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45. Please briefly describe your personal experience of the blogging activity that is not asked in this survey?

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*Thank you for your participation.*