**U.S. Preservice Math Teachers’ Perceptions toward Using a Web 2.0 Technology vs. Achievement in a College Euclidean Geometry Course**

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**Abstract**

This paper discusses the current state of mathematics education in the United States and describes the results of a study to determine if relationships exist between achievement in a college Euclidean Geometry class and student perceptions toward and their perceived efficacy of a blogging activity that was a component of the course. The empirical study which included a 12-week blogging activity was conducted at a university in the western United States. This study has revealed some important and notable results regarding the use of blogs in teaching-learning Geometry and other mathematics courses. It revealed that the use of a blog is both enjoyable, and perceived to be effective in a college Euclidean Geometry course. It also revealed that students’ mathematical content knowledge, problem solving, and understanding skills are not significant factors with regard to using a blog as a supportive teaching-learning tool in a Euclidean Geometry course. Web 2.0 is a set of communication and social technologies that allow users to develop user-centered web applications to participate, add, control, and share information interactively and interoperably (O’Reilly, 2005). The use of powerful Web 2.0 technologies such as blogs is suggested as a possible means of strengthening the mathematics achievement of students of all levels, regardless of their relative strength in mathematics problem solving, reasoning, and understanding skills.

***Keywords-*** Blog; Collaborative Model; Euclidean Geometry; Mathematics Education; Preservice Teachers; Web 2.0 Technology

**Introduction**

Technology has been a powerful tool in the United States’ mathematics classrooms for several decades. Technology is one of the six principles included in the National Council of Teachers of Mathematics (NCTM) Principles and Standards of School Mathematics. The NCTM (2000) Principles and Standards suggests that “Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning” (p. 24). It also advocates for the appropriate and integrated use of technology in every aspect of mathematics education from what is taught in mathematics, how mathematics is taught and learned, and how mathematics is assessed (Powers & Blubaugh, 2005).

However, current progress in science, technology, and mathematics education in the U.S. is not satisfactory as evaluated by educators and legislators (Hossain & Robinson, 2011; Leshner, 2009). Although many U.S. students excel in mathematics, as a whole, U.S. students’ performance on international mathematics tests consistently remains between the second and third quartile (Leshner, 2009). There are wide disparities in mathematics achievement among various ethnic groups. Too many U.S. students and parents think that mathematics is a difficult and uninteresting subject. The result is that mathematics education in the U.S. is failing to instill students with sufficient skills and knowledge necessary to meet the century’s challenging economy and leadership (Leshner, 2009).

Moreover, information technology has not reached its full potential in mathematics education programs across the United States (Gunter, 2001; Kurz & Middleton, 2006). Many prospective mathematics teachers’ views on the role of information technology in mathematics education are not satisfactory (Habre & Grunmeier, 2007). Habre and Grunmeier (2007) found that prospective mathematics teachers believe that they should use information technology to help teach students mathematics; and that mathematics and not information technology should remain the focus of instruction in mathematics classrooms. However, many of these pre-service teachers believe that in many mathematics classrooms information technology is used improperly in ways that focus more on the technology than on mathematical understanding or calculation (Habre & Grunmeier, 2007). For instance, in an experiment, if students are shown tessellations of a plane, using a web-based Java applet, many participants may skip the mathematical knowledge behind the tessellation, since a Java applet may not show the mathematical calculation behind it (Habre & Grunmeier, 2007).

Studies also show that information technology is integrated inappropriately in many teacher education programs (Mistretta, 2005; Watts-Taffe, Gwinn, Johnson, & Horn, 2003). The preparation of pre-service teachers, students who are intended to be teachers after their graduation, to use information and communication technology is one of the critical challenges teacher education programs face (Powers & Blubaugh, 2005). Another study found that many teacher education programs use the computer as a teacher-centered tool rather than as a student-centered tool (Wang, 2002). Many information technology courses that are part of teacher preparation programs emphasize pre-service teachers’ learning with technology rather than the integration of technology into their classroom teaching (Lederman & Neiss, 2000). Another study to measure pre-service teachers’ technology beliefs, skills, and barriers to the use of information technology reports that many teacher education programs prepare pre-service teachers with lower or outdated information and communication technology skills that do not provide pre-service teachers adequate knowledge to provide sufficient information technology-based instruction in their classrooms (Brush, Glazewski, & Hew, 2008). Without adequate knowledge, these teachers get little opportunity to integrate information technology into their actual classrooms (Brush et al., 2008).

Although Blogs, Podcasts, YouTube, wikis, Facebook, and similar interactive Web 2.0 tools are already used in the fields of information technology, engineering, business, language, journalism, and the medical sciences (Lemley & Burnham, 2009; Malhiwsky, 2010; Thomas & Li, 2008), effective use of these tools in teaching-learning mathematics is rare. Moreover, no such empirical studies are available that evaluated the effectiveness of Blogs and other standard Web 2.0 technologies for assessing U.S. students’ perceptions in using these technologies for teaching-learning mathematics. Thus, the researchers aimed to investigate the relationship between U.S. students’ perceptions toward the use of a Blog, a simple Web 2.0 technology, and their achievement in a typical college Euclidean Geometry class. The rationale of conducting this study in a college Euclidean Geometry class was that almost all of the students taken that class were U.S. preservice secondary mathematics teachers. So the researchers have had a good opportunity to gather and investigate the participants’ perceptions of using the Blogging activity both as students and teachers in the United States.

*Current state of Mathematics Education in the United States*

According to the report of the National Assessment of Educational Progress in 2007, 70% of U.S. eighth-grade students performed at or above the basic level in mathematics, and 31% performed at or above the proficient level (National Center for Educational Statistics, 2008). Even the eighth graders in the highest-performing states such as Massachusetts rank significantly lower than the average eighth graders in the highest-achieving countries such as South Korea, Singapore, and Taiwan (Kuenzi, 2008). Compared to other industrialized nations, mathematics achievement of U.S. students appears inconsistent with a nation considered to be the world leader in scientific innovation (Hossain & Robinson, 2011).

Trends in International Mathematics and Science Study (TIMSS) results show that U.S. students’ progress and performance in mathematics is not satisfactory. The TIMSS report showed that in 1995, U.S. fourth-grade and eighth-grade students achieved an average score of 518 and 492 points respectively (TIMSS, 1995a, 1995b). In 1999, only eighth graders were tested, the average mathematics scores of U.S. eighth-graders was 502 (TIMSS, 1999); in 2003, the average mathematics scores of U.S. fourth-graders and eighth-graders were 518 and 504 respectively (TIMSS, 2003); and in 2007, these scores were 529 and 508 points respectively (TIMSS, 2007). In each year for each grade level those scores were compared with an international average that was normed at 500 points with a standard deviation of 100 points. It is noted that TIMSS study is conducted with 4-yrar time spans. A closer look at the results of past TIMSS studies is shown in Table 1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 1  U.S. Students’ Mathematics Performance Recorded in TIMSS 1995 – 2007 | | | | | |
| Assessment  Year | Participating Countries | U.S. Fourth-graders Score | Average Score | | U.S. Eighth-graders Score |
| M | SD |
| 1995 | 41 | 518 | 500 | 100 | 492 |
| 1999\* | 38 | − | 500 | 100 | 502 |
| 2003 | 46 | 518 | 500 | 100 | 504 |
| 2007 | 48 | 529 | 500 | 100 | 508 |
| \*In TIMSS 1999 only eighth graders were tested. | | | | | |

A superficial look at this table might mislead the reader into believing that the U.S. is doing well in mathematics. However, this would be a mistake as the improvement from 1995 to 2007 was not measureable. Although, both U.S. fourth- and eighth-graders improved in mathematics in 2007 compared to 1995, no measurable change was found in the percentage of either U.S. fourth- or eighth-graders performing at or above the advanced international benchmark in mathematics between 1995 and 2007 (grade four: 9 vs. 10 percent; grade eight: 4 vs. 6 percent) (TIMSS, 2007). Compared with the average score of 500 points in each grade with a standard deviation of 100 points, the U.S. fourth-graders’ average mathematics achievement on these tests was slightly higher; however, eighth-graders’ average achievement was close to the average level. In 2007, compared to the mathematics achievement of fourth-graders among the 36 participating countries, the average mathematics score of U.S. fourth-graders was higher than 23 out of the 35 other countries, lower than in eight countries, and not measurably different from the average scores of students in the remaining four countries; the average mathematics score of U.S. eighth-graders was higher than 37 of the 47 other countries, lower than in five countries, and not measurably different from the average scores of students in the remaining five countries (TIMSS, 2007).

Moreover, according to the Program for International Student Assessment (PISA), which is a system of international assessments that focuses on 15-year-old students’ scholastic performance on mathematics, science, and reading among the 35 Organisation for Economic Co-operation and Development (OECD) member nations and some other non-member nations, in 2003, 2006, and 2009, U.S. 15-year-old students’ combined mathematics scores were below the overall average score of 500 with a standard deviation of 100 in each of the assessments. A closer look at U.S. 15-year-old students’ mathematics performance in the past PISA studies is shown in Table 2.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 2  U.S. 15-year-old Students’ Mathematics Performance in PISA 2003 – 2009 | | | | | | |
| Assessment  Year | U.S.  Score | Average Score | | | Participating Countries | U.S.  Position |
| M | SD | |
| 2003 | 483 | 500 | | 100 | 41 | 24th |
| 2006 | 474 | 500 | | 100 | 57 | 32nd |
| 2009 | 496 | 500 | | 100 | 67 | 24th |

In PISA 2003, 15-year-old U.S. students’ average mathematics score was 483 compared to the overall average score of 500 with a standard deviation of 100. The U.S. 15-year-old students ranked 24th in average mathematics score among the 41 participating countries (Lemke et al., 2004). In PISA 2006, 15-year-old U.S. students’ average mathematics score was 474 compared to the OECD average mathematics score of 498 and that was in 32nd position among 57 participating countries (Baldi et al., 2007). In PISA 2009, U.S. 15-year-old students’ average mathematics score was 487 compared to the OECD average score of 496 and that was in 24th position among 67 participating countries (Fleischman, Hopstock, Pelczar, & Shelley, 2010).

Although U.S. 15-year-old students’ average mathematics score in 2009 was higher than their average mathematics score in 2006, it was not measurably different from its average mathematics score in 2003. U.S. 15-year-old students’ average mathematics scores were lower than the OECD average scores in each of the assessment years from 2003 to 2009. Only 27% of U.S. 15-year-old students scored at or above proficiency level four in mathematics – that was lower than the 32% of 15-year-old students in the OECD countries on average that scored at or above level four (Fleischman et al., 2010).

**Objectives and Method**

The premise of this study was to discuss how mathematics education in the United States not only needs improvement but also often fails to take advantage of new technologies that could serve to enhance mathematics instruction and ultimately student learning. To initiate this line of investigation, this study sought to determine if relationships exist between student performance in mathematics and their perceptions of a blogging activity included as a regular component of the class. Specifically, the two research questions were:

(1) *Is there a relationship between the cumulative quiz scores attained by preservice mathematics teachers enrolled in a college Euclidean Geometry class and their attitudes toward the blogging activity in a college Euclidean Geometry class?*

(2) *Is there a relationship between the cumulative quiz scores attained by preservice mathematics teachers enrolled in a college Euclidean Geometry class and their perceptions of the effectiveness of the blog for the learning of Euclidean Geometry?*

To answer these research questions, a 12-week blogging activity was conducted as a standard component of a college Euclidean Geometry course offered for preservice secondary mathematics at the University of Nevada, Reno in the United States. The blog can be visited at: http://edsc353fall2011.wordpress.com/.

*Survey Instrument*

At the end of the 12-week activity, preservice mathematics teachers’ perceptions, attitudes toward the blogging activity and perceived effectiveness of using the blogging activity, were measured using an instrument (Appendix A) developed by the researchers. An electronic copy of the survey instrument can be seen at:

<http://edsc353fall2011.files.wordpress.com/2012/10/survey_instrument.pdf.>

Validity and reliability of the instrument were measured through appropriate procedures and were found to be authentic and consistent. Using Reliability Calculator developed by Siegle (2002), Cronbach's alpha was calculated as 0.9696 and split-half reliability was calculated as 0.9677. In both cases, the reliability coefficients were found to be consistent; and thus, the Cronbach's alpha was considered to be greater than 0.9, suggesting the reliability of this instrument was excellent.

*Nature of the Euclidean Geometry Course*

The Educational Science (EDSC) 353 - Teaching Secondary Geometry course in which the blogging activity was conducted was an undergraduate level course. The purpose of the course was to prepare secondary mathematics education majors for the teaching of Euclidean Geometry in the high school level. Junior to senior education major students usually take this class. It was intended to help prepare students to become high school mathematics teachers. No effort was made to determine how far along individual students were with regard to this goal, however, almost all students had already decided that they want to be high school mathematics teachers, while a couple might have taken this course to help them decide if they want to pursue the goal of becoming a high school mathematics teacher.

Other specific objectives of the course were to: (1) solve problems appropriate to a Euclidean Geometry course using multiple strategies; (2) rigorously prove theorems typically included in Euclidean Geometry; (3) explain the nature of proof and consider its role in a Euclidean Geometry course; (4) explain the role of technology in the teaching of Euclidean Geometry; (5) describe the different experiences that must occur to facilitate the learning of High School Geometry; (6) explain instructional strategies appropriate for teaching Euclidean Geometry; (7) communicate geometric concepts effectively, both orally and in writing; and (8) define and discuss the teacher's role in the Geometry classroom, including responsibility to the diversity of students and their various learning styles.

The first research question sought to determine if a relationship exists between participants’ median attitude scores regarding the blogging activity with their cumulative quiz total attained on the eight in-class quizzes. The second research question sought to determine if a relationship exists between participants’ median perceived effectiveness scores of the blogging activity. Participants’ attitude toward the blogging activity was measured by calculating the median response to 16 Likert-type scale items measured on a six-point scale, while participants’ perceived effectiveness of the blog for the learning of Euclidean Geometry was measured by calculating the median response on another 18 Likert-type scale items measured on a six-point scale. Due to the ordinal nature of the Likert-type scale data, a Spearman correlation *r* was used for these analyses

Prior to collecting data, permission was sought from the Institutional Review Board (IRB) of the university where the study was conducted. At the conclusion of the blogging activity, a survey was administered to collect data regarding preservice mathematics teachers’ perceptions of using a blog as a supportive teaching-learning tool in a college Euclidean Geometry course.

*Participants*

The study was conducted in a college Euclidean Geometry course offered at the University of Nevada, Reno in the United States in the fall 2011 semester. There were 28 students who enrolled in and completed the class, all of whom participated in the study and survey. Descriptive statistics on the demographic information of study participants showed that twelve (42.86%) of the participants were male, and 16 (57.14%) were female. The participants ranged in age from 20 to 61 years old with a mean, median, and range of 26.43, 22.0, and 41 years respectively, and a standard deviation of 10.15 years. The participants reported their approximate average total time spent on the Internet per week in hours for all purposes that had mean, median, and range were 22.43, 20.50, and 55 hours respectively, with a standard deviation of 10.823 hours.

Participants were asked to respond to 16 specific questions (#s 8 to 23, see in Appendix-A) designed to measure their attitudes toward the blogging activity in a college Euclidean Geometry course. These questions included a 6-point Likert-type scale allowing participants to indicate whether they Very Strongly Agree (VSA), Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD), or Very Strongly Disagree (VSD) to each item. These sixteen 6-point Likert-type scale items were combined to attain a median attitude score toward the blogging activity in the college Euclidean Geometry course for each participant. The possible attitude score for each item was 1 to 6 with a higher number representing a more positive attitude toward the blogging activity for the learning of college Euclidean Geometry. For positively worded items, 1 indicated Very Strongly Disagree (VSD) and 6 indicated Very Strongly Agree (VSA). There were 6 negatively worded Likert-type scale items (items numbers 9, 11, 13, 16, 19, and 23) in this section. The same Likert scale options were given for the six negatively worded Likert-type scale items; however, those items were coded in reverse order. The median score on the 16-question attitude survey was determined for each participant.

The participants also responded to 18 specific questions (#s 24 to 41, see in Appendix-A) pertaining to the perceived effectiveness of the blog for the learning of Euclidean Geometry. These questions included a 6-point Likert-type scale allowing participants to indicate whether they Very Strongly Agree (VSA), Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD), or Very Strongly Disagree (VSD) to each item. These eighteen 6-point Likert-type scale items were combined to attain a median perceived effectiveness score of using the blog for the learning of Euclidean Geometry for each participant. Each item had a possible range of 1 to 6; where 1 indicated Very Strongly Disagree (VSD) and 6 indicated Very Strongly Agree (VSA). All items in this section were worded positively. The possible range for the perceived effectiveness score for each item was 1 to 6 with a higher number representing a more positive perceived effectiveness of the blog for the learning of Euclidean Geometry. The median score on the 18-question perceived effectiveness survey was determined for each participant.

| Table 3  Descriptive Statistics of Median Attitude and Median Perceived Effectiveness Scores | | |
| --- | --- | --- |
|  | Median Attitude Scores | Median Perceived Effectiveness |
| Valid N | 28 | 28 |
| Mean | 4.1786 | 4.1250 |
| Median | 4.0000 | 4.0000 |
| Mode | 4.00 | 4.00 |
| Std. Deviation | .95466 | .92921 |

An overview of participants’ attitudes and perceived effectiveness scores are shown in the Table BA and Table BB in the Appendix B, respectively. Table 3 shows an overall measure of the median attitude and median perceived effectiveness scores. Descriptive statistics of the median attitude scores yielded a mean, median, and mode of 4.18, 4.0, and 4.0, respectively, with a standard deviation of 0.95. 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, descriptive statistics of the median perceived effectiveness scores yielded a mean, median, and mode of 4.13, 4.0, and 4.0, respectively, 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.

**Results**

The first research question was: *Is there a relationship between the cumulative quiz scores attained by pre-service mathematics teachers enrolled in a college Euclidean Geometry class and their attitudes toward the blogging activity in a college Euclidean Geometry class?* The data (Table 4) for this research question were analyzed by calculating a non-parametric Spearman correlation *r* on cumulative quiz scores and median perception (attitudes and perceived effectiveness) scores.

|  |  |  |
| --- | --- | --- |
| Table 4  Cumulative Quiz Scores vs. Median Attitude and Perceived Effectiveness Scores | | |
| Cumulative  Quiz Scores | Median  Attitude Scores | Median Perceived Effectiveness Scores |
| 74.5 | 6.0 | 4.0 |
| 77.5 | 6.0 | 4.0 |
| 73.0 | 4.0 | 5.0 |
| 80.0 | 4.0 | 4.0 |
| 76.0 | 3.0 | 3.0 |
| 66.5 | 4.0 | 4.0 |
| 70.0 | 5.0 | 5.0 |
| 49.0 | 5.0 | 6.0 |
| 64.0 | 4.0 | 4.0 |
| 33.0 | 5.0 | 4.0 |
| 58.5 | 4.0 | 4.0 |
| 78.0 | 3.0 | 3.0 |
| 72.5 | 4.0 | 5.0 |
| 70.5 | 4.0 | 4.0 |
| 69.5 | 3.0 | 4.0 |
| 65.0 | 3.0 | 3.0 |
| 58.5 | 4.5 | 5.0 |
| 64.5 | 6.0 | 6.0 |
| 65.5 | 4.0 | 3.5 |
| 73.5 | 5.0 | 5.0 |
| 67.5 | 4.0 | 5.0 |
| 73.0 | 5.0 | 5.0 |
| 77.0 | 3.5 | 3.5 |
| 60.5 | 4.0 | 4.0 |
| 68.5 | 4.0 | 3.0 |
| 72.5 | 4.0 | 3.5 |
| 70.5 | 2.0 | 2.0 |
| 72.0 | 4.0 | 4.0 |
| N = 28 | N = 28 |  |

The Spearman correlation test result (Table 5) indicated a non-significant correlation (N = 28, *r*s = −0.145, *p* >.05) that failed to reject the null hypothesis that there is no relationship between the cumulative quiz scores attained by pre-service mathematics teachers enrolled in a college Euclidean Geometry class and their attitudes toward the blogging activity in a college Euclidean Geometry class. This means that the study did not find a significant correlation between attitudes toward the blog and total quiz score measured by eight in-class quizzes.

| Table 5  Spearman Correlation Test Results on Median Attitude Scores | | | |
| --- | --- | --- | --- |
| Spearman's rho |  | Cumulative Quiz Score | rs |
| Cumulative Quiz Score | Correlation Coefficient | 1.000 | -.145 |
| Sig. (2-tailed) | . | .461 |
| N | 28 | 28 |
| Median Attitudes | Correlation Coefficient | -.145 | 1.000 |
| Sig. (2-tailed) | .461 | . |
| N | 28 | 28 |

The second research question was: *Is there a relationship between the cumulative quiz scores attained by pre-service mathematics teachers enrolled in a college Euclidean Geometry class and their perceptions of the effectiveness of the blog for the learning of Euclidean Geometry?* The data (Table 4) for this research question were analyzed by calculating a non-parametric Spearman correlation r on cumulative quiz scores and median perceived effectiveness scores.

The Spearman correlation test result (Table 6) indicated a non-significant correlation (N = 28, *r*s = −0.232, *p* >.05) that failed to reject the null hypothesis that there is no relationship between the cumulative quiz scores attained by pre-service mathematics teachers enrolled in a college Euclidean Geometry class and their perceptions of the effectiveness of the blog for the learning of Euclidean Geometry. This means that the study did not find a significant correlation between perceived effectiveness of the blog and total quiz score measured by eight in-class quizzes.

| Table 6  Spearman Correlation Test Results on Median Perceived Effectiveness Scores | | | | |
| --- | --- | --- | --- | --- |
| Spearman's rho |  | Cumulative Quiz Score | rs | |
| Cumulative Quiz Score | Correlation Coefficient | 1.000 | -.232 |
| Sig. (2-tailed) | . | .235 |
| N | 28 | 28 |
| Median Effectiveness | Correlation Coefficient | -.232 | 1.000 |
| Sig. (2-tailed) | .235 | . |
| N | 28 | 28 |

**Discussion and Implications**

Analysis of the first research question: *Is there a relationship between the cumulative quiz scores attained by pre-service mathematics teachers enrolled in a college Euclidean Geometry class and their attitudes toward the blogging activity in a college Euclidean Geometry class?*, 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. Similarly, analysis of the second research question: *Is there a relationship between the cumulative quiz scores attained by pre-service mathematics teachers enrolled in a college Euclidean Geometry class 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 toward the blogging activity. These finding coincide 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.

Although in many instances, non-significant results aren’t particularly useful with regard to informing practice, in this study, combining the non-significant results with the descriptive statistics is quite revealing. The descriptive statistics gathered in this study indicate that participants considered the blogging activity to be enjoyable and perceived it to be effective with regard to the teaching and learning of Geometry. Combining these strong descriptive findings with the non-significant results to the two research questions suggest that all participants, regardless of their relative performance on the quizzes, enjoyed and perceived benefits from participating in the blogging activity. Thus, we can conclude that relative strength in mathematical problem-solving, reasoning, and understanding skills should not be considered as a determining factor with regard to the benefits of using a blogging activity as a supportive teaching-learning tool in Euclidian Geometry as well as other typical mathematics courses.

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.

Another implication of these results might be that, since undergraduate college students and pre-service mathematics teachers responded positively to this activity and perceived it to be effective then there is a good chance that middle school and high 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 could provide instruction to pre-service teachers regarding the implementation of blogging activities and encourage these future teachers to use them in the future. Additionally, curriculum developers and policy makers could 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.

## Conclusions

This empirical study has revealed some important and notable results regarding the use of blogs in teaching-learning Geometry and other mathematics courses. As most of the participants in this study were pre-service 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 did not indicate any significant correlation between the participants’ achievement in the college Euclidean Geometry course and their median attitude scores toward the blogging activity. Similarly, the study did not indicate a significant correlation between the participants’ ’ achievement in the college Euclidean Geometry course and their median perceived effectiveness scores toward the blogging activity.

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-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 concerned about whether the participants have a strong or weak background in mathematics. Through active collaboration and increased engagement both strong and weak students will enjoy and potentially benefit from the use of a blog as a supportive learning tool.

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APPENDICES

## Appendix A: Survey Instrument

Please fill out this questionnaire based on your perceptions of the blogging activity in the course, 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 total time do you spend per week 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 | SD | VSD |
| 9. | The blogging activity made me irritable | VSA | SA | A | D | SD | VSD |
| 10. | After participating in this blogging activity I hope to see blogging activities in other mathematics courses 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 | SD | 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 | SD | VSD |
| 20. | Blogging activities should be incorporated into other courses 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 | SD | VSD |
| 25. | The blogging activity encouraged me to share my ideas with other students in the course | 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 course | 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 course | 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 |

*Thank you for your participation.*

Appendix B:*An Overview of Participants’ Perception Scores Obtained by the Survey*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Table BA: *An Overview of Participants’ Attitude Scores toward the Blogging Activity* | | | | | | | | | | | | | | | | | | |
| Participants | |  | Items in the Survey Instrument Pertaining to the Measurement of Attitude | | | | | | | | | | | | | | | | Median |
| No. | Gender | Time | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 1 | M | >=21 | 5 | 6 | 6 | 6 | 5 | 6 | 6 | 5 | 6 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| 2 | M | >=21 | 3 | 5 | 4 | 6 | 5 | 6 | 6 | 6 | 5 | 6 | 6 | 5 | 6 | 6 | 6 | 6 | 6 |
| 3 | F | <21 | 4 | 3 | 5 | 6 | 5 | 4 | 4 | 4 | 5 | 3 | 4 | 4 | 4 | 4 | 4 | 6 | 4 |
| 4 | F | <21 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | F | <21 | 4 | 3 | 2 | 3 | 3 | 4 | 3 | 2 | 2 | 2 | 4 | 4 | 3 | 4 | 4 | 4 | 3 |
| 6 | F | <21 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 7 | M | <21 | 6 | 6 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 |
| 8 | M | >=21 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 5 |
| 9 | M | >=21 | 5 | 4 | 4 | 4 | 4 | 5 | 3 | 3 | 4 | 3 | 5 | 5 | 5 | 4 | 5 | 4 | 4 |
| 10 | M | <21 | 1 | 6 | 1 | 5 | 6 | 5 | 5 | 6 | 6 | 4 | 1 | 6 | 4 | 1 | 6 | 1 | 5 |
| 11 | M | <21 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 5 | 4 | 4 | 4 | 3 | 4 | 5 | 3 | 4 |
| 12 | F | <21 | 3 | 3 | 2 | 3 | 3 | 5 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 13 | F | >=21 | 3 | 4 | 3 | 5 | 3 | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 4 | 5 | 4 | 3 | 4 |
| 14 | M | <21 | 6 | 4 | 3 | 4 | 5 | 3 | 4 | 4 | 3 | 5 | 3 | 4 | 5 | 4 | 5 | 3 | 4 |
| 15 | F | >=21 | 2 | 2 | 2 | 1 | 3 | 2 | 5 | 1 | 3 | 3 | 4 | 6 | 3 | 4 | 4 | 5 | 3 |
| 16 | F | <21 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 2 | 3 |
| 17 | M | >=21 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 6 | 5 | 4 | 4 | 5 | 4 | 6 | 5 | 4.5 |
| 18 | F | >=21 | 6 | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 19 | M | <21 | 3 | 5 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 3 | 4 | 5 | 3 | 4 |
| 20 | F | >=21 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 5 | 6 | 5 | 6 | 4 | 4 | 6 | 6 | 6 | 5 |
| 21 | F | >=21 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 |
| 22 | F | >=21 | 4 | 4 | 4 | 6 | 4 | 5 | 6 | 4 | 5 | 5 | 6 | 4 | 5 | 5 | 6 | 6 | 5 |
| 23 | M | <21 | 3 | 4 | 4 | 5 | 3 | 4 | 2 | 2 | 4 | 2 | 3 | 4 | 3 | 2 | 5 | 5 | 3.5 |
| 24 | F | <21 | 4 | 3 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 25 | F | <21 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 26 | F | >=21 | 3 | 5 | 3 | 5 | 4 | 4 | 4 | 3 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 |
| 27 | M | >=21 | 2 | 1 | 5 | 1 | 2 | 1 | 2 | 4 | 6 | 4 | 2 | 5 | 6 | 2 | 6 | 1 | 2 |
| 28 | F | >=21 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Table BB: *An Overview of Perceived Effectiveness Scores of the Blogging Activity* | | | | | | | | | | | | | | | | | | | | |
| Participants | | | Items in the Survey Instrument Pertaining to the Measurement of Perceived Effectiveness | | | | | | | | | | | | | | | | | | Median |
| No. | Gender | Time | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| 1 | M | >=21 | 5 | 6 | 4 | 3 | 3 | 4 | 5 | 5 | 3 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 5 | 3 | 4 |
| 2 | M | >=21 | 6 | 6 | 4 | 3 | 4 | 6 | 5 | 5 | 3 | 4 | 4 | 5 | 6 | 3 | 4 | 4 | 6 | 4 | 4 |
| 3 | F | <21 | 4 | 5 | 5 | 3 | 4 | 6 | 6 | 4 | 3 | 5 | 5 | 5 | 4 | 6 | 6 | 5 | 4 | 3 | 5 |
| 4 | F | <21 | 4 | 4 | 4 | 3 | 4 | 4 | 5 | 5 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | F | <21 | 4 | 3 | 4 | 1 | 2 | 3 | 4 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 4 | 4 | 3 |
| 6 | F | <21 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 4 | 2 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 |
| 7 | M | <21 | 5 | 6 | 4 | 3 | 4 | 6 | 6 | 5 | 2 | 5 | 5 | 4 | 4 | 5 | 6 | 5 | 6 | 4 | 5 |
| 8 | M | >=21 | 6 | 6 | 6 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 5 | 6 |
| 9 | M | >=21 | 5 | 5 | 4 | 3 | 3 | 4 | 4 | 5 | 3 | 4 | 2 | 5 | 4 | 3 | 4 | 5 | 5 | 5 | 4 |
| 10 | M | <21 | 3 | 6 | 3 | 3 | 3 | 6 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 6 | 3 | 6 | 3 | 4 |
| 11 | M | <21 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 4 | 4 |
| 12 | F | <21 | 3 | 4 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 |
| 13 | F | >=21 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 4 | 4 | 6 | 6 | 5 | 6 | 5 | 5 | 5 | 6 | 5 | 5 |
| 14 | M | <21 | 5 | 5 | 4 | 2 | 3 | 5 | 6 | 4 | 2 | 3 | 4 | 4 | 3 | 2 | 5 | 3 | 5 | 2 | 4 |
| 15 | F | >=21 | 4 | 4 | 5 | 1 | 4 | 5 | 5 | 4 | 3 | 2 | 4 | 4 | 4 | 1 | 2 | 4 | 4 | 5 | 4 |
| 16 | F | <21 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 17 | M | >=21 | 5 | 5 | 5 | 3 | 4 | 6 | 4 | 4 | 3 | 4 | 4 | 6 | 5 | 5 | 5 | 5 | 5 | 6 | 5 |
| 18 | F | >=21 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 4 | 5 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 6 | 6 |
| 19 | M | <21 | 4 | 4 | 4 | 2 | 3 | 4 | 4 | 5 | 3 | 3 | 4 | 3 | 3 | 2 | 2 | 3 | 4 | 4 | 3.5 |
| 20 | F | >=21 | 6 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 5 | 6 | 5 | 5 |
| 21 | F | >=21 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 4 | 5 | 6 | 6 | 5 | 5 | 5 | 5 | 6 | 5 |
| 22 | F | >=21 | 4 | 4 | 5 | 3 | 4 | 6 | 5 | 6 | 4 | 6 | 5 | 5 | 6 | 5 | 6 | 5 | 6 | 6 | 5 |
| 23 | M | <21 | 6 | 3 | 3 | 4 | 3 | 4 | 2 | 4 | 3 | 3 | 3 | 4 | 4 | 2 | 5 | 3 | 4 | 5 | 3.5 |
| 24 | F | <21 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 6 | 4 |
| 25 | F | <21 | 3 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 3 |
| 26 | F | >=21 | 4 | 4 | 3 | 1 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 6 | 3.5 |
| 27 | M | >=21 | 4 | 4 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 4 | 2 | 2 | 4 | 5 | 1 | 1 | 2 | 1 | 2 |
| 28 | F | >=21 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |