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The Use of iPads in the Classroom: Increasing Word Study Skills in Elementary Students

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Abstract

The central theme of this research is the potential affect the iPad and its applications have on the development of word study skills while teaching within the student's Zone of Proximal Development (Vygotsky, 1978, 1981). Thirty-six second grade students participated in this study. The study consisted of three types of sessions: pretest, practice and post-test. After establishing a firm understanding of how the iPad and the Spelling Game application worked, students played the Spelling Game iPad application during the practice sessions. A paired-samples t-test was conducted to compare spelling scores in pretest and post-test conditions. There was a significant difference in the scores for the post-test, indicating a positive impact on word study development for students using the iPad. With continued research regarding the use of the iPad in a sociocultural environment, educators will gain new knowledge that will translate into improved student test scores.

Relevant Literature

Theoretical Framework

How do students learn best? While educators may agree on common content, the methodology to gain that knowledge is arguable (Pange & Dimitrios, 2001). Technology applications are mandatory components for best practices in today's school systems. Moreover, educators must adopt philosophies to incorporate technology devices for classroom instruction. Constructivism is a learning theory that suggests that students develop meaning of concepts based upon what they already know and the phenomena or ideas with which they are presented (Tracey & Morrow, 2012). Many constructivists would agree that traditional learning does not bridge the gap between what students already know and what they are expected to learn. Therefore, a methodology that incorporates technology applications and advances best practices in teaching and learning must be considered.

Constructivists believe that a sociocultural environment is ideal for students to learn. According to Vygotsky's theory (1978, 1981), both teachers and caregivers play important roles in the development of culture and language usage. Vygotsky's Zone of Proximal Development (ZPD) is one of the best known concepts in sociocultural learning. ZPD suggests that learning takes place when a more competent other, such as a caregiver or even a technology device such as the iPad, serves in a social role within the context of the culture to help students learn. Spelling word practice is the specific context for this research project.

Many students learn their spelling words through traditional methods. The words are assigned on Monday; students are expected to practice the words throughout the week Monday-Friday, mostly at home. Then they are given the spelling test on Friday. Such instruction is often based upon rote memory of the words through traditional methods of instruction. This traditional spelling instruction fails to provide the time and practice sufficient to master the spelling words (Mann, Bushell, & Morris, 2010). Mayfield, Glenn, & Vollmer (2008) suggest that teachers can spend more time with students who need extra help because of the reduction in time on group instruction on spelling words if students are given practice opportunities with technology applications. The use of a technology device better engages the student in the

learning process. The iPad offers the potential to support student develop of word study skills in a sociocultural environment without the direct attention of the classroom teachers.

Technology Application

The iPad was released in April, 2010, based on the same operating system as the popular iPhone (McClanahan, Williams, Kennedy, & Tate, 2012). Within weeks of becoming available, the iPad reportedly sold over 3 million units (Murray & Olcese, 2011). Some of the most popular features of the iPad include the small size, light weight and the touch screen as well as Wi-Fi data connection and affordable applications that can be easily downloaded. Much of the early success of the iPad could be attributed to the almost 250,000 applications that could be downloaded and run on the device (Murray & Olcese, 2011). By early June, 2010, there were almost 30,000 applications categorized by developers of iPhones, iPods and iPads, as "educational" (Murray & Olcese, 2011). Today there are more than a million applications.

The more advanced the global society becomes, the greater the need for advanced technology (Saine & Kara-Soteriou, 2010). Yet, researchers over the last three decades wonder why more educators do not use digital technologies such as iPods, iPads, and SMARTboards to deliver curriculum and instruction (Abadiano & Turner, 2007; Hew & Brush, 2007; Wepner, Bowes, & Serotkin, 2007). As the acquisition of the iPad becomes more affordable, arguments regarding adequately preparing students technologically become much more urgent. Technology applications of many types continue to advance. Therefore, acquiring technology devices just for technology sake requires educators to look at *how* technological devices can be used to advance teaching and learning. The iPad technology device appears to be a viable option for classroom content application that could be applied in a sociocultural setting.

While empirical research studies are just beginning to emerge regarding the use of iPad applications, studies have been conducted to conclude some evidence of iPad technology applications. However, Templeton (2004) asserts that most educators think only of the *spell-check* function on desktops or laptops in relation to technology and spelling. Moreover, Templeton asserts that students must have enough intuitive spelling knowledge to even recognize the correct spelling choice with a spell-check function (2004). Therefore, as research increases and educators' knowledge of technology application beyond simple spell-check functions increases, the use of an iPad as a methodology to improve word study development requires additional research.

The research reported here seeks to explore the possibilities of using the iPad as a best practice for improving word study skills among elementary school students. This research considers whether the iPad will engage students in the second grade to improve their overall spelling scores. Therefore, the central theme of this research is the potential affect the iPad and its applications might have on teaching and learning within a student's Zone of Proximal Development. When considering the question, "Is the iPad fit for School?" Barack (2010) asserts that it may be too early to tell if the iPad will become standard equipment in schools, but that there is great potential for it.

Method

Problem

Elementary school students, and more specifically for the purposes of this study, second graders need to learn to spell age/grade appropriate words for annual achievement. Although, second graders are provided the list of words in advance and prompted to study the words at

home with a caregiver, many students simply may not receive the appropriate practice generating successful spelling scores.

Participants

For this study, 36 seven- and eight-year-old students (from a total of 109 second-graders) were recruited from a summer learning program in the Florida panhandle. Of the 36 participants, 19 were girls and 17 of the students were boys.

Data Collection

Spelling words were selected from a word list in a second grade spelling textbook used in three types of sessions: pretest, practice and post-test. Research indicated that at least three 15-minute training sessions with spelling words is needed for a 100% score on the post-test (Mayfield et al., 2008). Therefore, each session lasted approximately 20 minutes and took place every day for one week, Monday-Friday, using one list of 25 second grade spelling words.

As a simple measure of spelling knowledge, using paper and pencil, the students were asked to write spelling words. The students were prompted to simply write the words the best they could without worrying about handwriting and cursive or print mediums. Grammatical errors such as capitalizing the first letter of a word were not counted as an error in the students' scores.

The pre-test took place on Monday. For the pre-test, the researcher dictated the words from the word bank for the student to spell on a paper-and-pencil test. Practice sessions took place each day for approximately 20 minutes on Tuesday, Wednesday, and Thursday, during which the researcher provided observational guidance. After a firm understanding of how the iPad and the Spelling Game application worked, students played the specific spelling game that was developed for the purposes of this research. The post-test session occurred on Friday, the day after the practice sessions.

After the spelling pretest and one week interaction with the iPad application, Spelling Game, students were given a post-test of the same 25 spelling words. Again, students were prompted not to be concerned about handwriting and cursive or print mediums. Students used paper and pencil to record the spelling of the words. Capitalization was not counted in students' error scores. However, it is important to note, that the occurrence of capital letters in the spelling words decreased in the post-test, even though it was not a consideration in the scores.

Data Analysis

Examples of some of the students' spelling errors on the pretest included the following: appel = apple; herow = hero; raff= raft; tost = toast.

A paired-samples t-test was conducted to compare spelling scores in pretest and post-test conditions (see Table 1). There was a very significant difference in the scores for the post-test (M= -6.2, SD= 5.10, t= -5.431, **p<.001).

Table 1: Correlations between Pretest and Post-test Spelling Scores (**p<.001)

	Mean	SD	Std Error	t	df
Pre	89.8	6.01			
Post	96.0	3.89			
Paired Samples	-6.2	5.10	1.14	-5.431	19

N=36

These results suggest that the iPad Spelling Game application resulted in a significant improvement in word study skills. Specifically, the results suggest that when second grade students play the Spelling Game for three days in a row for approximately 20 minutes each day, post-test spelling scores will improve. This finding is grounded in the literature and further supports current research (Mayfield et al., 2008).

Discussion and Conclusion

As a consequence of interaction with the iPad Spelling Game, post-test scores of second grade spelling words were significantly higher than pretest scores for 36 students enrolled in a Florida summer learning program. This evidence indicates the effectiveness of iPad applications for developing word study skills among elementary school students. This could provide evidence for the critics or skeptics of iPad applications as a viable option for classroom use. This research project adds another layer to current research regarding iPad applications. For example, Saine (2012) reported an average increase of 10% from pretest to post-test in 8th grade classrooms in a research project to implement iPods, iPads and SMARTboards for literacy instruction. In a study for iPad intervention with a fifth-grade student with Attention Deficit Hyperactivity Disorder (ADHD), comparisons of pre-and post-assessments showed a gain of one year's growth in reading in a six-week time frame (McClanahan, et al., 2012). While further investigation is needed with respect to all aspects of iPad applications for the classroom, these early studies, coupled with the results of this research study, have shown compelling evidence that the iPad is associated with higher achievement in test scores, particularly as related to development of literacy skills.

Certainly, the iPad device has the capability for collaboration applications that move beyond a simple workbook-style methodology. As educators continue the discussion of research-based best practices, and teachers continue to promote Vygotsky's social learning theory into best practice models, technology applications will become more and more collaborative in the future.

With continued research regarding the use of the iPad in a sociocultural environment, teachers will gain new knowledge that will translate into improved student test scores. The scaffolding that takes place when a student is supported through the construction of new knowledge by a more competent other to include but not be limited to the iPad, improvement can be expected.

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Beyond Traditional Discussion Boards: Innovative Multimedia Tools Influence Student Outcomes in an Online Learning Environment

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Abstract

The purpose of this study was to investigate the effect of the use of Voicethread and Educreations as multimedia online discussion tools on students' learning outcomes and self-efficacy. A two-group, pretest-posttest design was employed to assess whether there were significant differences in students' learning outcomes and self-efficacy after engaging in multimedia-based online discussion. Twenty-three graduate students enrolled in a teacher preparation program participated in this study. The results of a paired-samples t-test indicate that

there were significant differences in students' self-efficacy after they created their discussion posts compared to their scores before the discussion activities. Further, the results indicate that, although students in each group improved their learning outcomes, students in the Voicethread group scored higher than students in the Educreations group. Students' multimedia-based discussion post scores related positively and significantly to their frequency of using computers in online courses. The results suggest that when students engage in online discussion activities that involve the use of audio, video, drawing, or images, their self-efficacy and learning outcomes improve compared to no use of multimedia-based discussion posts. Furthermore, students' level of success in the use of the multimedia discussion tools depends, in part, on their knowledge of using a computer.

Introduction

The majority of higher education institutions are continuing to increase the number of courses they offer online (Parker, Moore, & Lenhart, 2011). Recent studies indicate that public higher education institutions across the United States show increases in creating online courses with 89% of public four-year colleges and universities offering various online degrees. Two-year colleges show the highest number of online courses with 91% of these institutions providing online courses (Parker, Moore, & Lenhart, 2011). With the increased number of online courses and, consequently student enrollment in online courses, students' interactions with learning materials, instructors, and other students become essential components for students' success with knowledge acquisition and application.

One of the tools used in online courses to improve students' interaction is the discussion board. Many studies have found that group discussion has a significant impact on student learning. For example, studies have found that students' engagement in online discussion activities improve students' comprehension, learning, motivation, retention, and attitudes (Applebee, Langer, Nystrand, & Gamoran, 2003; Chiu & Ming, 2003; Laurillard, 1999). The emergence of multimedia-based discussion tools, such as Voicethread and Educreations, add additional support for students' online learning and often improve the quality of interaction and communication. Therefore, multimedia-based discussion tools are utilized by many instructors because of the ease of use, flexibility, and employment capacity in an asynchronous online discussion boards, allowing students to reflect and respond with images, audio, video and drawings capabilities (PytlikZillig & Horn, 2011).

Theoretical Framework

According to social cognitive theory (Bandura, 1982) and self-efficacy theory (Bandura, 1986), one of the strongest predictors of individual perceptions and use of computing technology is self-efficacy. In social cognitive theory human behavior is significantly inspired and controlled by the perpetual exercise of self-influence that includes self-monitoring of one's behavior, its determinants, and its effects; judgment of one's behavior in relation to personal standards and environmental circumstances; and affective self-reaction (Bandura, 1986). Self-regulation also encompasses the self-efficacy mechanism. Bandura defines self-efficacy as "…people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p. 71). Bandura's theory of self-efficacy purports that it is an important element that directly influences not only task performance but also cognitive development. In essence, self-efficacy helps to determine how much effort people are likely to spend on a task and how long they would endure when encountering impediments.

The social cognitive perspective holds that successful self-regulated students possess higher levels of motivation (personal influences), apply more effective learning strategies (behavioral influences), and respond more appropriately to situational demands (environmental influences) (Pintrich & Schunk, 2002). Therefore, many instructors consider students' self-efficacy to be an essential indicator to evaluate student engagement in problem solving activities and to motivate student engagement in effective learning strategies. Student development of self-regulatory skills is also an important element in successful student-centered online learning environments. Research supports that asynchronous (discussion boards, blogs, messaging) and synchronous (chat, video conferencing, white boarding) communication tools can be used to facilitate effective educational interactions among students such as sharing information and working collaboratively to construct knowledge (Hartley & Bendixen, 2001).

Educational researchers and practitioners alike allege that the prospective of new technologies for learning is likely to be found not only in the technologies themselves but in the ways that these technologies are used as tools for learning (Means, Olson, & Ruskus, 1995; Owston, 1997; Valdez et al., 1999). Notwithstanding the current craze of assimilating new technologies into instructional design, researchers also found that few instructors actually knew the specific pedagogies that could lead to productive innovation and learning within this new Web 2.0 environment. Collis and Moonen (2008) explained that Web 2.0 is more than just tools and technology, it has provided new ways for individuals to connect, communicate, and collaborate. Tu et al. (2012) concur stating that the integration of Web 2.0 tools benefits students by offering them interactive and collaborative environments through which they can interact with instructors, peers, friends, and people worldwide.

As with many new Web 2.0 online learning systems, digital discussion boards employ multimedia-based dialogue and collaboration tools in various applications including tools supporting students' audio, video, comments, and drawing. Specifically, the use of multimedia online collaboration tools has been found to enrich students' online interactions and enable them to utilize multiple forms of representation and expression to demonstrate learning. According to cognitive theory of multimedia learning, the case of multimedia rests in the premise that students can better understand an explanation when it is presented in words and pictures than when it is presented in words alone (Mayer, 2001). Empirical research on the use of multimedia in learning demonstrates that students not only prefer multimedia over text, but they are also more likely to gain deeper conceptual understanding of the content from multimedia than from words alone (Baggett, 1984; Mayer, 2002, 2003; Mayer & Moreno, 2002). A major assumption underlying this empirical work is that humans can construct a mental representation of the semantic meaning from either auditory or visual information alone, but when instruction is presented in both formats, each source provides complementary information that is relevant to learning (Baggett, 1984).

Researchers and practitioners alike suggest that Web 2.0 tools should be integrated into collegiate courses because digital natives expect to learn with these new web tools and, as such, instructors should be preparing their students for a 21st century workplace (Alexander, 2006; Prensky, 2001; Roberts, 2005). Unfortunately, the ubiquity of these new web based technologies is insufficient reason to automatically expect higher education instructors to universally incorporate these tools in their courses. Rather, assessing the tools for their potential to improve education outcomes should be conducted before embracing them outright (Donnison, 2004).

Statement of the Problem

Although there is a perpetual push to incorporate new technology into the higher education classroom, some multimedia discussion tools do not provide students the same level of interaction and collaboration that, in turn, can influence the equality of student contribution through the limited method delivery options. For example, while tools such as Voicethread and Educreations allow students to comment and reflect using voice, camera, drawing, and text, other tools do not allow students the same level of representation. Therefore, the purpose of this study is to examine the effect of employing two different multimedia-based discussion tools on students' self-efficacy and learning outcome both before and after engaging in the study's discussion activities.

Research Questions

Based on the research outlined in the theoretical framework, the following questions were developed:

How do multimedia-based discussion tools affect students' self-efficacy in the context of an online environment? Findings can help instructors and instructional designers utilize the appropriate discussion tools to improve students' self-efficacy in an online learning environment.

How do multimedia-based discussion tools affect students' learning outcomes in the context of an online environment? Findings could provide important information for instructors and instructional designers to create more interactive online learning environments where students can use multimedia to enhance the methods of presenting/expressing their understanding.

Is there a relationship between students' frequency of computer usage and their multimedia discussion scores in an online course? Findings could provide information regarding the importance of preparing students for online courses and providing them with the proper training to improve their learning experience. Using multimedia in learning requires a basic understanding of the relevant technology, including familiarity with the use of computers and the Internet, as well as key aspects of multimedia design.

The Study

This study used the between-subjects design to investigate the effect of two different types of multimedia discussion board activities (Voicethread or Educreations) on students' learning outcomes and self-efficacy. The course used in this study focuses on the characteristics of individuals with exceptional learning needs as they apply to school, family, and society. The course also covers the uses of formal and informal assessment, to identify the accommodations and modifications needed by individuals with exceptional learning needs in order to be successful in inclusive classrooms. The focus of the module used in this study comprised of activities designed to help students learn about building partnerships through collaboration to support exceptional learners. The module activities pertained to (a) how students can improve the quality of the working relationships among professionals and between professionals and parents; (b) how these relationships can influence the effectiveness of students' instructional programs; (c) how students explored the various collaborative services in schools and how these entities work together effectively to foster an inclusive learning environment; and (d) what is the instructor's specific role in these collaborative relationships.

The study had one independent variable: creating a Voicethread or Educreations discussion post coupled with evaluating a peer's discussion post. The two dependent variables

were: (a) students' self-efficacy and (b) the learning outcomes. Students were divided into two-group based on the type of the discussion post (Voicethread or Educreations).

Participants: Participants for this study included 23 graduate student level, teacher candidates enrolled in an online course entitled "Instruction and Assessment for Diverse Learners." Students in this course were divided randomly into two groups (Voicethread or Educreations). There were 11 students in the Voicethread group (gender division) and 12 students in the Educreations group (1 male, 22 females). Students' area of specialization included: 9 students in an Early Childhood Education program with a Special Education emphasis, 1 student in a Foreign Language program, 1 student in a Social Studies Program, and 11 students in other areas of specializations. Students' ages were between 22-40 years old (five students between 22-25, ten students 26-30 and eight students 31- 40 years old). Eleven students indicated that they felt very comfortable using a computer, nine students felt somewhat comfortable, and three students were not very comfortable using a computer. Twenty students indicated that they used the Internet at least a few times a day, and three students indicated that they only used the Internet a few times a week. Students' learning styles included four students who preferred lectures/discussions, one student who preferred Video/Movies/Media, eight students who preferred hands-on activities, and nine students who preferred a mixed method option.

Instrumentation

All learning materials, the discussion board posts, and the surveys were posted online as part of the Blackboard course content. The instrumentations consisted of a 13-item demographic survey and a 2-item self-efficacy survey to assess students' self-efficacy before and after uploading their discussion post and responding to other students' multimedia discussion (e.g. Voicethread or Educreations). All learning measures were selected or developed by the course instructor and were used regularly with students attending the course "Instruction and Assessment for Diverse Learners."

Pre-test
Demographic survey: This survey was created to collect information about the participants' demographic information. The survey consisted of 13 questions about students' gender, age, years in college, learning style, area of specialization, computer usage, and Internet usage.

Self-efficacy survey: This survey was developed to assess the level of students' self-efficacy in building partnerships through collaboration before and after completing the discussion posts. The survey was based on a scale developed by Bandura (2001) and has been validated in other studies. Reliability of the scale with a population of college students was estimated with Cronbach coefficient α ranged 0.82 to 0.92 (Uzuntiryaki & Çapa, 2009). The survey consisted of two multiple-choice questions. Both questions asked students to rate their degrees of confidence by recording a number from 0 to 100. The first question asked students to indicate how certain they were that they could identify the characteristics for establishing effective collaborative practices amongst school/home/community partners. The second question asked students to rate how certain they were that they could identify the key elements that should be embedded within these collaborative relationships (co-teaching/shared problem solving, etc.)

Discussion board questions

Students were asked to create a 3-4 minute discussion post via either Voicethread or Educreations based on the discussion topic of collaboration developed from Chapter 3 of the course text. The instructor attached a rubric to assess the quality of the posts. For example, the instructor requested that each post must contain the following criterion: A. Content based elements: (1) Characteristics of effective collaboration practices (school/home/community partnerships) and (2) Key elements that should be embedded within these collaborative relationships (co-teaching/shared problem solving, etc.). B. Process based elements: (1) Discussion post that is thoroughly and thoughtfully planned, (2) Critical analysis of each of the key elements from the chapter, (3) Incorporation of at least 3-4 specific examples from the text written in own words and does not quote directly from the text, (4) Use of a lot of content vocabulary from the text that is correct in both tense and definition, and (5) Absence of errors in grammar/syntax and colloquialisms/slang words. Each correct post yielded 35 points if it met the post criterion.

Materials

The module used in the present study was part of the instructors' materials to introduce the topic "Building Partnerships through Collaboration" to graduate students enrolled in a teacher preparation program and included online learning materials and activities from the textbook. Materials were identical in both discussion groups except for the creation of either Educreations or Voicethread discussion posts. Voicethread is a web-based application that allows students to place collections of media like images, videos, documents, and presentations at the center of an asynchronous conversation. A Voicethread allows students to have conversations and to make comments using any mix of text, a microphone, a web cam, a telephone, or uploaded audio file. Educreations is a recordable interactive whiteboard that captures students' voice and handwriting to produce video posts that they can share online. Students can replay other students' lessons in a web browser or from within Educreations' app on i-Pads. Voicethread, similar to Educreations, runs inside a web browser and doesn't require software to download, install, or update.

Procedures

First, all students were randomly assigned to either Voicethread or Educreations via Blackboard Random Selection tool. Next, the course instructor emailed instructions for the assignment to the students to explain the purpose and procedure of the module. Finally, over the course of the week, students completed the module and submitted their work through Blackboard in this order: (1) demographic survey, (2) self-efficacy survey, (3) online discussion including creation of Voicethread or Educreations thread and reflection on a minimum of one student's contribution, and (4) self-efficacy survey.

Findings

Prior to the main analysis, data were screened for out-of-range responses and systematic patterns of missing values and found small number of cases and no apparent patterns or clusters emerging.

To answer the first question, "How do the use of multimedia-based discussion tools effect students' self-efficacy in the context of in online environment?," the investigators used Paired Samples Test to compare the means between students' scores in the Voicethread and

Educreations groups on the same continuous, dependent variable (self-efficacy after completing the discussion). Before running the test, the investigators conducted basic analysis and found that different assumptions for the dependent t-test are met (dependent variable measured at the interval, independent variable consist of two "related groups", no significant outliers in the differences between the two groups and the distribution of the differences in the dependent variable between the two groups is normally distributed). A paired-samples t-test was conducted to compare the effect of the use of Voicethread and Educreations on students' self-efficacy before and after the discussion activities. The results found that there was a significant difference in the scores for students' self-efficacy after the discussion activities (M=175.8, SD=18.9) compared to before the discussion activities (M=132.8, SD=38.3) conditions; t (17) = -4.04, $p = 0.001$. Table 1 summarizes the paired-samples t-test results.

Table 1: Paired Samples Test between Self-efficacy before/after the multimedia-based discussion posts

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	SD	Std. Error	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	SE before SE after	-42.222	44.399	10.465	-64.301	-20.143	-4.035	17	.001

Note: Significant at p < 0.05 level

To answer the second question, "How the use of multimedia-based discussion tools effect students' learning outcomes in the context of an online learning environment?," the investigators conducted a one-way analysis of variance (ANOVA) to compare the effect of the use of multimedia-based discussion tools on students' learning outcomes in Voicethread and Educreations conditions. Although the ANOVA analysis indicated that there was difference in students' learning outcomes and that the mean scores for the students in the Voicethread condition were higher than students in the Educreations condition, these differences did not statistically significantly differ from the students' mean scores in the Educreations condition (F (1.17) = 1.4, $p = .23$). Table 2 summarizes the ANOVA results.

Table 2: One-way Analysis of Variance (ANOVA) between students' test scores in Voicethread and Educreations posts

Discussion

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	49.862	1	49.862	1.395	.254
Within Groups	607.822	17	35.754		
Total	657.684	18			

Note: Significant at $p < 0.05$ level

To answer the third question, "Is there relationship between students' frequency of using computer and their multimedia discussion scores in online course?" a partial correlation was computed between students' multimedia discussion scores and their frequency of using computer, controlling for students' frequency of using Internet. The results indicate that

students' multimedia discussion scores do not correlate with their frequency of using computer in online course, r (.938) = .020, $p > .05$, when controlling for students' frequency of using Internet. Table 3 summarizes the correlations results.

Table 3: Correlations between discussion scores and internet use

Control Variables			Discussion	Computer Use
Internet use	Discussion	Correlation	1.000	.020
		Significance (2-Tailed)	.	.938
		Df	0	16

Note: Significant at $p < 0.05$ level

Results and Discussion:

The primary findings from this study indicate that the use of multimedia-based discussion activities have a positive effect on students' self-efficacy in online learning environment. Specifically, results suggest that when students engage in online discussion activities that involve the use of audio, video, drawing or images, students' self-efficacy increases as compared to other online learning activities. The results of the study support previous findings found in research of the use of multimedia discussion tools and provide empirical evidence that validates the social cognitive theory and the cognitive theory of multimedia learning. Certainly, students' self-efficacy improved when the learning activities include multimedia-based discussion activities rather than text-based activities (Shank & Shelia, 2014). A theme further endorsed by Bandura's theory of performance accomplishments (Bandura, 1982, 1997), which claims that authentic, performance-based experiences, lead to the development of personal efficacy.

According to cognitive research, in the process of trying to build connections between words and pictures, students are able to create a deeper understanding than from words or pictures alone (Mayer & Chandler, 2001) and, consequently, improve their self-efficacy. In this study, results showed that students' self-efficacy indeed benefited from their abilities to use more multimedia representations in order to synthesize and communicate their ideas and thoughts to their peers and engage in a more interactive discussion. This benefit was demonstrated by the statistically significant differences in the scores for students' self-efficacy after the discussion activities compared to before the discussion activity scores. A possible interpretation of this result is that after students engaged in the online multimedia-based discussion experience they also received multimedia feedback from their peers. West (2013) concurs stating that technologically rich activities can sustain and support high levels of student engagement and peer collaboration. Other studies established similar findings claiming that the integration of Web 2.0 tools such as Voicethread and Educreations help students acquire a variety of skills through an open, dynamic environment allowing all users to participate, interact, and collaborate with instructors and peers (Jonassen, 2008; Solomon & Schrum, 2007). Their research supports that using Web 2.0 tools facilitates collaboration and interaction, offering possibilities for immediate feedback, connections, and collective intelligence.

The findings from this study demonstrated that the students were able to observe visually and auditory how their peers presented their own posts; they could compare the ideas shared by their peers to ideas in their own analyses, all of which contributed to positive effects on the measure of students' understanding and self-efficacy. Evidence supports these findings

assenting that the technological needs unique to 21st century students are different than needs addressed in the past (Asselin & Doiron, 2008). The research purports that this new generation seamlessly integrates digital technologies into all aspect of their lives (Lenhart, Madden, & Hitlin, 2005) and needs to be able to develop proficiencies with new technological tools, which will allow them to create, critique, analyze and evaluate a variety multi-media texts (NCTE, 2008).

Regarding the effect of the use of multimedia-based discussion tools on students' learning outcomes, the results suggest that the use of Voicethread as discussion tool had an effect on students' learning outcomes compared to Educreations. Specifically, results suggest that when students use rich multimedia tools to engage with the learning content, students improve their learning outcomes. The findings and literature concur that as instructors spend more time working with new web tools, their confidence in using technology, as well as their willingness to implement technologies in their teaching, increases (Chen, 2008; King, 2002; Wells & Lewis, 2006). However, it should be noted that students' level of success in the use of the multimedia discussion tools still depends, in part, on their knowledge of using a computer (Albion, 2008).

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Reasons for Teaching and the Implications for Recruitment

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Abstract

Research articles were reviewed to determine the reasons why people choose to teach, and what these reasons imply for the recruitment of future teachers. The nine articles revealed six themes for the reasons why people enter teaching: a desire for social justice; a desire to work with young people; the influence of role models and mentors; the influence of informal teaching internships; preconceptions about teaching; and financial support. There were four implications for the recruitment of students into teacher preparation: the importance of providing field experiences, knowing students' prior experiences and addressing preconceptions, fostering networking, and appealing to students' desires to make a difference. These findings suggest important factors that teacher preparation programs should consider regarding the recruitment of future teachers.

In recent years, the prospect of an impending teacher shortage has spurred efforts by United States policy-makers to recruit more teachers. To illustrate the scope of this challenge, Aaronson and Meckel (2009) forecast that between 2.3 and 4.5 million new teachers will need to be hired between 2009 and 2020 in order to meet the demand for teachers. In 2009, the TEACH campaign (www.teach.org) was launched as a joint venture with the U.S. Department of Education, Microsoft, and State Farm. This campaign aims to recruit and retain one million young teacher candidates in order to fill the vacancies that will be left by high attrition rates and by the large proportion of the workforce expected to retire in the next 10 years (Aaronson & Meckel, 2009).

Additionally, the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Reauthorization Act of 2010 mandated a five-year strategic plan for STEM (Science, Technology, Engineering, and Mathematics) education. This plan, prepared by the Committee on STEM Education of the National Science and Technology Council, includes the recruitment of 100,000 new K–12 STEM teachers by 2020, which President Obama stated as one of his goals during his 2011 State of the Union Address. In order to fulfill these goals, it is necessary to conduct research investigating which factors influence potential teacher candidates to enter teaching. To help inform future research, the investigators of this review sought to create a summary of recent literature about factors influencing the decision to become teachers. Nine articles are included in this review from which the investigators found six major themes: a desire for social justice; a desire to work with

young people; the influence of role models and mentors; the influence of informal teaching internships; preconceptions about teaching; and financial support

Method for Research Article Selection

Article selection occurred over a six-month period in 2014. Investigators established five criteria as the primary lens for article selection. They sought studies that were research based, were published during or after 2000, emphasized pre-service teacher education, were peer-reviewed, examined reasons for entry into teacher training programs, and were conducted within the United States. Their secondary lens for article consideration included: marketing teacher licensure programs; a focus on preparing to teach in high-need, urban, and/or rural K-12 schools; and gender (men in teaching or women in STEM fields). Throughout the six-month process, each investigator brought forward articles for consideration during established meeting times. If the articles seemed potentially worthy of consideration, the other investigators read the articles. Once read, investigators discussed the merits of the articles and voted on whether or not to include them in the research review. Investigators considered a total of 27 articles, of which 9 were selected for inclusion in this research review. In this article, investigators present the six themes found across these nine articles that reveal reasons why people enter teaching, along with four implications for recruitment into the teaching profession.

Reasons for Teaching Social Justice

Four of the nine articles addressed issues of social justice (i.e., the desire to help others and to make a difference) as a driving factor for entry into teaching, making it the most prevalent of the six themes in the research reviewed. In a nationwide descriptive study, Curtis (2012) received responses to mailed surveys from 1,571 middle school and high school mathematics teachers. Surveys consisted of a list of different reasons for becoming a teacher, and respondents placed check marks by those reasons best describing why they became teachers. Out of all the respondents, 72.5% reported "to help others/to make a difference" as a factor in their decision to become a teacher (pg. 784).

Ganchorre and Tomanek (2012) also investigated pre-service teachers' desire to help others. They conducted a study investigating the motivations of 15 pre-service STEM teachers' decisions to teach in high need schools, rather than their decisions to teach in general. All 15 participants were Noyce Scholars from a Southwest university. Noyce is a National Science Foundation (NSF) funded program that provides scholarships to students committing to teach science, technology, engineering, or mathematics (STEM) in high need schools. Noyce also provides stipends to higher education freshmen and sophomore students/pre-service teachers to increase their awareness of licensure opportunities and teaching as a profession by engaging them in science education internships.

Ganchorre and Tomanek (2012) collected data from the 15 participants' applications to the Noyce program via a questionnaire given during the Noyce Scholars' first semester in the program, a semi-structured interview based on responses to that questionnaire, and focus group discussions. Participants were categorized into two groups: those identifying with experiences in low-income schools and those identifying with experiences in middle-to-high income schools. Analysis of the data revealed that both groups of participants felt a desire to help students, especially students in low-income school districts. Both groups of participants also articulated an awareness of educational challenges faced by students in high need schools. However, while participants with experiences in low-income schools gained this awareness through first-hand

experiences, participants with experiences in middle-to-high income schools gained this awareness by interacting extensively with others from different backgrounds than themselves.

Ponte (2012) also found that a desire to help others was a motivation for entering teaching for both pre-service and in-service educators in Hawaii. Ponte (2012) researched the factors that influenced male teachers' decisions to enter teaching in order to offer recommendations for recruiting teachers in ways that reduce the current gender imbalance of the teaching force. The researcher performed audio-recorded interviews, lasting about 30 minutes each, with 6 male teacher candidates and 5 current male teachers (11 participants in total). The researcher's analysis found that the majority of participants were motivated to enter teaching based on "ideals of altruism," i.e., the desire to contribute positively to their communities and "provide all students with useful learning experiences" (p. 46).

Olsen (2008) found that issues of social justice were a reason for entering teaching for female educators on the west coast of the United States. Olsen (2008) examined how teachers' reasons for entering the teaching profession reflect aspects of their teacher identities and influence their development. The researcher noted that the original intent of the study was not to investigate reasons for entry into teaching; but after completing the data analysis, six themes surfaced related to this topic: three related to gender and three related to perceived personal compatibility with the teaching profession. The researcher's study included six first-year English teachers who graduated from the same west coast teacher education program. The investigator conducted two semi-structured, one-hour interviews: one during the fall and one during the spring.

Additionally, the investigator collected artifacts, such as documents from their teaching and reports for their schools. Data analysis created profile identities, which led to the generation of themes that were further studied through the lens of teacher identity development. The analysis revealed that the participants' conceptions of social justice in the form of making a difference in the world varied, yet all participants expressed a desire to "make a difference in the world," (33). Olsen (2008) noted that making a difference made teaching an appealing career choice for these participants, and that these teachers' conceptions of social justice might be related to their own life histories. The next theme from the research, desire to work with young people, shares the idea that the work of teachers is inherently worthy with the social justice theme.

Desire to Work with Young People

Two of the nine research articles contributed to the theme of desire to work with young people. The desire to work with youth was one of the personal compatibility themes generated by Olsen's (2008) research. All six study participants addressed this theme in differing ways, such as the "natural honesty" of students and their "positive energy," but indicated it as one of their primary reasons for entering the teaching profession (p. 33). Research conducted by Curtis (2012) also supports this theme: 79.2% of the 1,571 math teachers checked "like working with young people" on the survey as a reason for becoming a teacher (p. 784). It is worth noting that this response was the most frequently marked response in Curtis' study. Additionally, Curtis followed up this survey by interviewing 32 randomly selected respondents who had indicated that they planned to leave the profession within five years for reasons other than retirement. Of the interviewees, only 12 (38%) indicated "likes to work with young people" as a factor that led them to become mathematics teachers (p. 785).

Role Models and Mentors

Three articles selected by the investigators provided evidence that the influence of role models and mentors is a significant factor in the decision to enter teaching. Showcasing one way that mentors and role models can influence the decision to enter teacher education, Abell, Boone, and Arbaugh (2006) found that university faculty advisors played a crucial role in connecting potential candidates for teacher education with information about a teacher education program.

This study examined the effectiveness of a variety of recruitment strategies for an alternative certification program at a midwestern state university. The researchers tracked the initial source of program information leading to prospective students' inquiries into their program, to applications to the program, and to acceptances into the program. From these data, the researchers reported that 10 of the 19 students (53%) accepted into the program for their first cohort initially heard of their program through an advisor or faculty member at the university more than any other recruitment effort. After expanding and intensifying recruitment efforts for the second cohort, the researchers found that advisors and faculty members from their university again provided initial program information to more accepted applicants than any other recruitment method, accounting for 17 out of 39 (46%) of the applicants accepted into the teaching licensure program.

Within Olsen's (2008) research, four of the six female study participants revealed having women in their family who worked as educators as influencing and supporting their desire to teach. These female family members provided opportunities for the participants to be around schools for most of their lives. One participant responded to "Did you ever think about being a teacher when you were a kid?" by answering yes and noting her mom's work with students in and outside of schools throughout her lifetime (p. 29). Her responses and responses from others revealed that early, positive relationships with teachers can serve as lasting motivators for entering the teaching profession.

Furthermore, in Curtis' (2012) study, 59% of survey respondents checked off "Influence of role model/teacher" as one of their reasons for entering the profession (p. 784). Among the interviewees, this phrase was the third most-cited reason for entering the profession. Seven of the 32 interviewees planning to leave teaching (22%) indicated that the "Influence of a teacher/role model" contributed to their initial decision to teach (pg. 785).

Informal Teaching Internships

The first three themes, including a sense of social justice, a desire to work with young people, and the influence of role models and mentors, all focus on the dispositions and experiences of potential teacher candidates themselves, which influence the decision to become a teacher. The fourth, fifth, and sixth themes, however, focus on efforts teacher educators can make to interest students in teaching careers: informal teaching internships, changing preconceptions about teaching, and financial support. Two research studies included in this review examined whether paid internship experiences serve as effective tools for recruiting students into teaching. Schuster (2013) investigated the experiences of two cohorts of a total of 15 first- and second-year-students engaging in science education in informal settings, such as children's museums and summer camps, at a midwestern university. The internships were funded by the NSF Noyce program. Each intern in this study received a stipend to participate in an eight-week experience that included a series of seminars on STEM teacher licensure. The participants completed a four-point Likert scale questionnaire and submitted written responses to open-ended questions at three junctures during their internships: the beginning, the end, and

three months later. Using measures of variance as a part of their descriptive research for this small sample, the researcher found that over time the participants showed significant decrease in "always wanting to teach" and a significant increase in "knowing what it takes to become a teacher" (p. 42). The researcher found that of the five students who "strongly agreed" or "agreed" that they would pursue licensure in college, three of them had once "strongly disagreed" or "disagreed" that they would do so (p. 43). Additionally, of the three students whose responses declined for this same question, two noted in their written responses that the internship "'increased' their interest in becoming a STEM teacher" (p. 43). The researcher concluded that the internship program had a positive effect on awareness and recruitment into teacher education at their institutions.

Worsham, Friedrichsen, Soucie, Barnett, and Akiba (2014) also considered if paid internships might encourage students to consider pursuing licensures at their midwestern university. The researchers examined three cohorts of a total of 34 science majors and undecided students who were first- and second-year students at their time of application. The internships were eight-to-ten weeks in length at a variety of sites offering science education programing. Interns taught at least 50% of the time at their sites and also completed a free one-credit online course. They were encouraged to complete a one-hour course that was a prerequisite for admittance into the teacher licensure program.

Thirty-two of the 36 students completed this additional course. The researchers triangulated data from application materials, exit survey responses, college directory information, and final reflective papers. The researchers created categories regarding the participants' commitment to careers in science teaching, comparing the commitment at the beginning of the experience to the end. Of the 28 students who began the experience as "exploring" teaching as a career, one (4%) was committed to teaching as a career at the end of the experience, eight (29%) were not committed, 17 (61%) were possibly committed to someday teach, and two (7%) were committed to the teaching, just not to science. These researchers concluded that the informal science teaching internships were ineffective for recruiting science students into teacher education.

Preconceptions about Teaching

One article selected by the investigators examined the effect of preconceptions on the decision to enter teaching, but because of the quality of the research and the encouraging findings, this article generated its own theme. Swanson (2011) conducted a three-part study that gathered data about the preconceptions of undergraduates about the teaching profession. The first part of the study involved an initial survey of 63 undergraduates enrolled in intermediate level foreign language courses at a western research university.

The survey used a five-point Likert scale to assess participants' motivations for taking a foreign language class beyond the university's general education requirements and to gain insights into their perceptions about becoming foreign language teachers. Respondents were undecided about whether or not they would consider teaching after receiving more information about their university's teacher education programs. The second part of the study consisted of a 55-80 minute interview with 14 of the initial survey participants.

Two common misconceptions found among interviewees were the amount of teacher pay and the severity of classroom management issues. Based on the data from the survey and interview, Swanson (2011) organized a recruitment dinner designed to promote conceptual change about the careers of foreign language teachers. Thirty-two undergraduates enrolled in

either second- and third-semester foreign language courses attended the dinner. Discussions revealed that many of the attendees also had misconceptions about teacher pay and classroom management issues. Following presentations by several speakers and a series of small group discussions, students appeared to experience conceptual change in these areas. After the event, attendees completed a survey using a five-point Likert scale. The survey data revealed that attendees agreed with moderation that they were seriously considering becoming foreign language teachers. Respondents reported not being discouraged from entering the profession by fears of classroom management issues and low pay. In the year following the event, 15 attendees decided to enroll in the foreign language teacher education program, quadrupling the number of pre-service foreign language teachers at this university.

Financial Support

Of the studies reviewed, one researched the influence of receiving a scholarship on the commitment to teach (Liou, Kirchhoff, & Lawrenz, 2010). This nationwide study was included because of the high quality of the research and the large number of teacher education programs utilizing scholarships and stipends to attract prospective teachers. Liou et al. (2010) investigated how Noyce scholarships influenced scholarship recipients' commitment to teach in high need schools. The researchers sent surveys by email to 1140 past and current Noyce scholars, from which 555 Noyce scholars responded. Focusing on a portion of the larger survey, the researchers investigated participants' responses to six four-point Likert scale items probing the influence of the Noyce scholarship to each item, such as "become a teacher," "complete certification," and "teach in a high need school" (p. 458). The researchers analyzed this data with descriptive statistics, hierarchical cluster analysis, and confirmatory factor analysis.

The hierarchical cluster analysis revealed that the survey items formed two main clusters, where one cluster "indicat[ed] that scholars perceived that the scholarship played a role in influencing their commitment to teach in high need schools" while the other cluster "indicate[d] that that the scholars perceived that the scholarship played a role in their commitment to complete their teacher education program" (p. 460). The researchers then used confirmatory factor analysis to provide additional support by proposing a model that two underlying factors explained the data while also testing a single-factor model. The confirmatory factor analysis supported the two-factor model, providing additional validation that "scholars perceived the influence of the program in two ways: as a means to complete their teacher education program and as a means to become teachers in high need schools" (p. 460).

Discussion

Reviewing nine research articles related to the reasons why teachers entered teaching revealed four implications for recruiting future teachers: the importance of providing field experiences (Ganchorre & Tomanek, 2012; Olsen, 2008; Schuster, 2013; Worsham et al., 2014), knowing students' prior experiences and addressing preconceptions (Olsen, 2008; Swanson, 2011), fostering networking (Abell et al., 2006; Ponte, 2012), and appealing to students' desires to make a difference (Ganchorre & Tomanek, 2012; Liou, et al., 2010, Ponte, 2012). Field experiences can attract students to teacher training programs for a number of reasons. Olsen (2008) noted that by either identifying students who have engaged in tutoring or engaging them in tutoring opportunities, teacher educators can help students understand how tutoring and teaching identities compare in order to possibly guide them into teaching. Three of the six (50%) participants in the study had this experience. Field experiences, such as tutoring, can also

increase students' awareness of the educational challenges faced by people of various backgrounds and appeal to the students' desires to help others, thus attracting them into the teaching profession (Ganchorre & Tomanek, 2012). Internships as field experiences have been shown to also promote awareness of licensure programs and engagement of students in licensure programs (Schuster, 2013). Schuster (2013) noted that of the 15 participants, five (33%) noted that they "strongly agreed" or "agreed" that they would pursue teaching and two of the five (40%) enrolled in the teacher education programs (p. 43). Despite the limitations of this study, such as lack of a control group and an inability to generalize due to the small number of participants, the researcher noted "the internships have had a positive impact on awareness and pursuit of STEM certification at [the researcher's university]. The greatest strength of the program is that it provides students with an opportunity to develop a more realistic understanding about becoming a secondary STEM teacher" (p. 45).

Although one of the research articles noted the benefits of field experiences for the recruitment of students into teacher licensure programs, another indicated the ineffectiveness of these types of experiences. Worsham et al. (2014) noted the disconnect their 28 undergraduate students who were exploring teaching as a profession felt between informal science teaching settings and public school classrooms. Only one of these students committed to changing their career paths after the experience. Although the researchers found that the experience was not effective in recruiting them to teaching, it was effective in teaching them more about science teaching.

The second implication for the recruitment of students into teacher licensure programs involves addressing students' preconceptions and knowing their prior experiences. Olsen (2008) encouraged a consideration of students' histories as they relate to teaching. These experiences can help identify students' with identities that are similar to teaching identities. In addition to knowing their histories, it is also important to know the preconceptions they possess related to teaching. If people perceive the overall benefits of the teaching profession to be low, they are less likely to choose this career path regardless of whether or not their perceptions correspond with reality. In order to address these preconceptions, Swanson (2011) used Posner's Conceptual Change Model (CCM) during a recruitment event designed for undergraduate foreign language students. The CCM addressed the misconceptions revealed in a survey and interviews conducted prior to the event. By intentionally addressing misconceptions, the researcher quadrupled the number of students in their certification pipeline. Other than CCM helping with positively influencing their students' perceptions of teaching, Swanson (2011) also advocated that teacher education departments become proactive in regards to recruitment. Due to the demands for more highly qualified teachers, licensure officers must actively seek students for their programs.

Part of actively seeking students for programs involves fostering networking opportunities for prospective teachers both on and off-campus. Abell et al. (2006) noted that, at times, these networking opportunities occur with what they called "intentional and unintentional gatekeepers" (p. 172). Intentional gatekeepers were those programmatic elements such as requirements and resources that facilitated students' successful completion of their licensure program. Unintentional gatekeepers were the people and resources that they did not anticipate as either hindering or encouraging student participation in the licensure program. Overall, Abell et al. noted that when recruiting students for their licensure program it is: (1) important to make sure all campus personnel who might come in contact with the potential students are very aware of the licensure program details; (2) specifically targeting the academic advisors and career

services personnel affiliated with subject areas of licensure; and (3) the importance of a strong Internet presence. Ponte (2012) also acknowledged the importance of connecting prospective teachers with teachers who can serve as good role models. Like academic advisors and career services personnel, these teachers can greatly influence students' knowledge of teaching as a potential career.

A last implication was the importance of licensure programs appealing to students' desires to serve and make a difference (Ganchorre & Tomanek, 2012; Liou et al., 2010; Ponte, 2012). In their investigation of how to attract students to teaching in high need schools, Liou et al. (2010) cautioned that they cannot definitively suggest that "some participants perceived the influence of the scholarship only as means to finish their certification program, without a commitment to teaching in high need schools," but that this undesirable outcome remains a possibility worthy of future research (466). In order to circumvent that possibility, Liou et al. concluded that teacher education programs should aim their recruitment efforts at candidates committed to teaching in high need schools before entering teacher education. In addition to this desire, Ganchorre and Tomanek (2012) also concluded that these students should have a working knowledge of high need communities and dispositions to work with them. Ponte (2012) referred to this commitment to serve as social justice, and emphasized that students with a desire to serve and make a difference must be able to view themselves as change agents. Recruitment efforts that allow programs to determine such knowledge, dispositions, and commitment include personal statements and interviews with questions specifically designed to reveal their commitment.

The findings regarding the reasons why teachers enter teaching revealed important factors teacher preparation programs should consider regarding the recruitment of future teachers. Future studies could examine these four implications for recruitment through actively using them to market and develop their programs.

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