Web 2.0 Educational Technologies used to Improve Student Achievement

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Abstract

The purpose of this study was to investigate the impact of Web 2.0 educational technologies in improving student achievement as measured by content comprehension and written expression. This study used a pre-test/post-test quasi-experimental design with assessment. The study included 12 students, each of whom had an Individualized Education Plan (IEP). The study hypothesized that there was no difference in content comprehension and written expression between students using Web 2.0 technology and those students who did not use Web 2.0 technology. The null hypothesis was supported. The results indicated that there was no significant difference between the groups. Future research is recommended to include using a larger sample size and selecting participants from various educational levels.

CHAPTER I

INTRODUCTION

Overview

"The emergence of Web 2.0 technologies has provided new opportunities for creating and sharing content and interacting with others. Also called 'social media', Web 2.0 encompasses tools that allow individual and collective publishing; sharing of images, audio and video and the creation and maintenance of online social networks. It is argued, "with these new tools have come new practices and attitudes." (Bennett, Bishop, Dalgarno, Waycott, & Kennedy, 2012, p. 524). The purpose of his study is to determine if the use of Web 2.0 technologies can be linked with student achievement in the areas of content comprehension and written expression.

The education of students has changed to reflect the changes in the world. Many students use all kinds of Web 2.0 technologies in their everyday lives. In education, there is an initiative to incorporate Web 2.0 technologies to create classroom opportunities that will reflect the world in which the student lives. "In recent years, teacher educators have witnessed the rapidly increasing impact of computing and web-based technology in its various forms on instructional methods in both the K-12 and the university classroom" (O'Brien, Aguinaga, Hines, & Hartshorne, 2011, p. 33). This study reflects this change in education and its possible impact on the way students learn content and expand their written expression.

Statement of Problem

Can Web 2.0 educational technologies be used to improve student achievement in content comprehension and written expression?

Hypothesis

The null hypothesis is that there will be no difference in content comprehension and written expression between students using Web 2.0 technology and those students who do not use Web 2.0 technology.

Operational Definitions

The independent variable for this study is the ***instructional approaches*** of using Web 2.0 educational technologies. The operational definition for the Web 2.0 technologies is the use of cell phones during class, podcasting, and a class wiki, which allows the students the ability to access classroom content and work collaboratively. The dependent variable is ***student achievement*** as measured by content comprehension and written expression on a United States history content.

CHAPTER II

REVIEW OF THE LITERATURE

Overview

This literature review will examine the issue of a 21st century education and the Web 2.0 tools needed in order to create a 21st century learner. Section one of this literature review will define the 21st century skills movement, a 21st century learner, Web 2.0 technologies, what Web 2.0 technologies look like, and the relevancy of Web 2.0 technologies on content, comprehension, and written expression. Section two of the literature review will examine positive and negative impacts of using Web 2.0 technology in the classroom. The third section will look at applications of Web 2.0 technology in the classroom.

Understanding Web 2.0

21st Century Skills Movement

"Globalization, economic necessity, and low civic engagement compound the urgency for students to develop the skills and knowledge they need for success. The interconnectedness of our global economy, ecosystem, and political networks require that students learn to communicate, collaborate, and problem solve with people worldwide" (Rosfsky-Saavedra, Anna, & Opfer, 2012, p. 8).

The skill set suggested by the authors identified above is essential for a student to master in order to obtain a job in the global workplace. The 21st century skill movement has seven critical skills that all students must master: critical thinking and problem solving, collaboration and leadership, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analyzing information, and curiosity and imagination. Rosfsky-Saavedra et al. (2012) stated, "The assessment and teaching of 21st-century Skills

Consortium (AT21CS), organizes skills, knowledge, and attitudes into four categories: ways of thinking, ways of working, tools for working, and living in the world" (p. 8). These four categories are the basis for what a 21st century learner must achieve in order to gain the necessary skills to be successful and develop the needed tools to succeed in a global workplace.

21st Century Learner

Good (2008) stated, "Understanding tensions about the shape and purpose of teacher education from a century or more in the past is helpful, but we can't approach the present without recognizing that teaching in the public schools of the United States is fundamentally a different job than it was even 30 or 40 years ago" (p.10).

The world has become a different place, and the classroom has to change in order to help keep up with the ever-changing world. When looking at the importance of 21st century skills, an educator must examine the needs, requirements, and trends, as well as how education is being taught in the classroom and school, in order to accommodate 21st century learners. According to Rosfsky-Saavedra et al. (2012), there are nine lessons that an educator needs to impart to a student to become a successful 21st century learner: make it relevant, teach through the disciplines, develop thinking skills, encourage learning transfer, teach students how to learn, address misunderstandings directly, treat teamwork like an outcome, exploit technology to support learning, and foster creativity. These nine lessons are needed in order to make sure that a student has the skill set that will make him/her a successful 21st century learner.

Web 2.0

"Web 2.0 technologies are becoming more popular in the everyday lives of students" (Bennett et al., 2012, p. 524). It is essential that educators take advantage of technology that

students use every day. In using Web 2.0 tools, an educator can develop an additional platform to the students.

Bennett et al. (2012) states, "The emergence of Web 2.0 technologies has provided new opportunities for creating and sharing content and interacting with others. Also called 'social media', Web 2.0 encompasses tools that allow individual and collective publishing; sharing of images, audio and video; and the creation and maintenance of online social networks" (p. 524).

Educators must take advantage of this new platform, which can allow students to look at traditional learning in a different way. It can make solving and thinking about content in a different perspective thereby allowing the 21st century learner the ability to make the knowledge his/her own. "The emergence of Web 2.0 technology provides an opportunity to develop online learning tools enabling students to not only participate in online activities more actively, but also to learn from their colleagues. The use of blogs and Wikis are examples of ways to utilize Web 2.0 technology in online learning environments" (Chen, Hwang, & Wang, 2012, p. 1094). Taking advantage of these opportunities to create a collaborative atmosphere is essential in using Web 2.0 tools to create a foundation for the 21st century learner.

Web 2.0 in Action

Bennett et al. (2012) cited (Dohn, 2009), "It has been assumed that students who are already using Web 2.0 technologies voluntarily in their everyday lives would be similarly motivated to use them in an academic context and would already possess the necessary technical skills" (p. 524) It is advantageous, as an educator, to use these Web 2.0 technologies in the classroom as designing lessons and learning around these areas will spark the students' interests. Web 2.0 applications in action in the classroom serve as vital tools that create a learning environment that will allow the student to access the 21st century tools to succeed in his/her

education. "The past few decades have seen a tremendous burst of creativity and innovation fueled by digital technologies. From Google to Facebook, from cloud computing to tablet devices, new technologies have had an immense impact on how we live, work and communicate" (Mishra, 2012, p. 13).

Using these Web 2.0 tools in the classroom can enrich and add depth to the student's learning. Educators must be willing to incorporate Web 2.0 tools into planning because it will give them the ability to reach the students in ways that will enable the students to apply and internalize the content in habits they can make their own. Mishra (2012) states, "If technology has advanced to the forefront of 21st. century learning discussions, then creativity has been its partner in crime" (p. 13). Linking creativity and the use of Web 2.0 applications as a tool for learning in the classroom and by the student is essential. "New technologies enable individuals to personalize the environment in which they learn by creating and managing a learning network and appropriating a range of tools connecting people and resources to meet their learning interests and needs…" (Tu, Sujo-Montes, Yen, Chan, & Blocher, 2012, p. 14). In an ideal situation, this is the way a classroom using Web 2.0 should and could be used to make effective 21st century learners.

Web 2.0: Relevance to Content Comprehension and Written Expression

There is a need and relevance of using Web 2.0 tools to impact a student's content comprehension and written expression. It must be used to meet the needs and requirements of the content and curriculum. Using Web 2.0 technologies can be used to assist in expanding the knowledge of the 21st century learner. The use of Web 2.0 technology does have a connection to content comprehension and written expression. Swan and Hofer (2011) cited several studies (Armstrong, Tucker, & Massad, 2009; Dale & Povey, 2009; Lee, McLoughlin, & Chan, 2008;

Vess, 2006), "In addition to instructor-created podcasts, a number of educators have begun to study the use of learner-generated podcasts as a means of assessing students' understanding…" (p. 75). Web 2.0 technology could be used to possibly expand students' knowledge of the content by allowing them to make different connections to the content. This can perhaps allow the students to access the material in ways that might be more useful to how they learn. The use of Web 2.0 technology could also have an impact on students' written expression. The expanding use of Web 2.0 tools, like Google Docs, can assist educators with the ability to provide feedback much more quickly, and this will allow student to improve their written expression skills (Betrus, 2012). This will also enable students to have the ability to use different tools to write and understand how the material/content might be presented. The use of Web 2.0 tools such as Twitter and blogs permit students the opportunity to express themselves in a different manner than ever before. This assists an educator with the ability to offer suggestions in improving written expression and allows the educator the ability to have access to a student's writing during the writing process.

The Positive and Negative Effects of Using Web 2.0

Positive Aspects

In the classroom, there are ways in which Web 2.0 technologies can enrich and improve the quality of the educational environment and learning in the classroom. According to Tu et al. (2012), "Web 2.0 technology empowers learners to create, share, and organize their personal learning environments in open network environments; and allows learners to engage in social networking and collaborating activities" (p. 13). This will then expand the learning environment and allow students to work more collaboratively, which is a skill that will be needed in the workplace. Tu et al. (2012), says that this online environment will allow the student the

ability to personalize their learning. This will allow the student to thrive, be creative, and learn the content in ways that are unique to that student. The use of Web 2.0-based instruction allows the teacher the ability to control the learning of the students and guide them in the discovering of knowledge (O'Brien et al, 2011). By allowing students to examine certain websites, this type of discovery learning allows them the ability to find the answers for themselves and also allows the educator the ability to control what material is being accessed by students. Construction of Web 2.0 applications can be used to enhance instruction and assist students in deepening their comprehension of the content. This is a positive aspect of using this technology in the classroom. A possible outcome would be giving the teachers the ability to reach students in new paths and allow the students to make connections with content in ways that will let them be successful.

Wheeler, Yeomans, & Wheeler (2008) state, "Interaction and collaboration are increasingly being mediated through the social medium of web-based environments. Social networking spaces such as FaceBook, MySpace and YouTube afford students unprecedented opportunities to share their ideas, celebrate their creativity, and receive immediate feedback from fellow networkers" (p. 988).

If Web 2.0 technologies are being used properly, they can help create an atmosphere that allows for more collaborative learning between students and educators. This will allow students the opportunity to take charge of their education and make connections to the content in ways that are unique to them.

Negative Aspects

There is also a negative side to using Web 2.0 technologies. A few disadvantages are that educators rely on it for every aspect of the class, it can create gender bias, and it can lead to instruction that is not always content-based.

According to Quillen (2012), "Of all the recent budget cuts made by the Eagle County, Colorado school district—the loss of 89 staff jobs through attrition and layoffs, a 1.5 percent across-the-board pay cut, and the introduction of three furlough days—none sparked as much anger or faced the same scrutiny as the decision to cut three foreign-language teaching positions and replace them with online instruction" (p.1).

In school districts all over the country, similar decisions are being made every day. The intent is to help the schools save money, but it is leading to learning that is taking an impersonal approach because the intimate connection is diminishing. Quillen (2012) states, "…replacing face-to face instructors with a digital option would not be as rich or as meaningful" (p.1). In this process, removing the student/teacher interaction is vital for the learning process.

Another issue that could possibly come about from using Web 2.0 technology is gender bias. This gender bias comes from the possible use of Web 2.0 technologies by male teachers versus female teachers. According to Top, Yukselturk, & Cakir (2011), "…male teachers' scores on their views about perceived behavioral control and self-efficacy were significantly higher than those of the female teachers" (p. E108). This gender difference could lead to male teachers using Web 2.0 applications more frequently than female teachers.

Top et al. (2011) cited two studies (Gilley, 2002, Tomte, 2008), "In this study, the differences among teachers were only in perceived behavioral control and self-efficacy about Web 2.0 applications. In other words, female teachers may now be using the web applications as

much as males; however, as some researchers pointed out, female teachers may still either be less confident or less interested" (p. E108). This argument does not mean that female teachers use Web 2.0 technology less; they just might not rely on it as much as male teachers.

There can also be a negative impact from the possible overuse of the technology. There are teachers who use Web 2.0 tools to create busy work for students or work that has no clear connection to the content. If Web 2.0 is not properly used, it could be damaging to students.

Damage to students can occur from using websites that are not reliable because students can upload information and documents that are not properly edited. There are clear social and pedagogical consequences of user-created content. Students need to know that they must check references before using websites to make sure the content information is accurate.

Web 2.0 Applications/Interventions

Cell phone

Many teachers today know that the cell phone has become an extension of the students in their classroom. Students in the classroom use their phones to text each other, update their Facebook/Twitter, and look up answers on classwork and tests (Sharma, 2012). This tool can be used to access Web 2.0 applications, and the majority of students have phones. This can save the school money because there is now no need to buy more computers as the students can have access to the web and Web 2.0 applications via their phones. The Sharma (2012) study examined the students' use of cell phones and had students take online quizzes using their cell phones. This tool can allow a teacher the ability to access information quickly, assessing feedback and altering the content appropriately. This intervention could be useful in improving content comprehension because it can be used to make sure that students have grasped the key content concepts, and teachers can use this as an evaluative tool that could assist in facilitating the learning process.

Podcasting

Podcasting is another intervention that can used to assist students in improving their content comprehension.

Swan et al. (2011) cited two case studies on podcasting, Putnam and Kingsley (2009) report on the efforts of a fifth grade science teacher to create supplemental podcasts to support student vocabulary acquisition. In a quasi-experimental, pre/posttest design (n = 58), they conclude that the students in the treatment group scored significantly higher than the students in the control group on the posttest. Additionally, 86% of the students in the treatment group indicated that the podcasts helped them to learn better, and 76% agreed that the podcasts helped to make learning vocabulary more interesting. Shaffhauser (2009) reflects on his efforts to use podcasting in a variety of ways in a high school science class. He began by creating recordings of his class lectures as a way to help students who are absent to access course material" (p.76).

Using podcasts can assist in developing essential skills that will allow students to build content vocabulary, refresh themselves regarding content presented in class, go back and listen a specific parts of the lecture in order to gain further comprehension, and make corrections in their notes. The ability to connect the content, pedagogy, and technology might be difficult for teachers, but it can be a useful Web 2.0 tool to aid students in content comprehension (Swan et al. 2011).

Wiki

"Interactive digital technologies are playing an increasingly important part in all sectors of education, and few educational providers are without an e-learning strategy." (Wheeler et al., 2008, p.987). Web2.0 tools have created a learning environment that can exist outside the classroom and allow for students to develop a collaborative atmosphere. A wiki can be a useful

Web 2.0 tool that can be used to assist in improved achievement in content comprehension and in written expression. The wiki can be used to measure content comprehension by allowing students to post online response to questions in class and as a way for students to have further discussions of classroom content.

According to Wheeler et al. (2008), "The word 'wiki' (from the Hawaiian *wiki)* wiki) is translated as 'to hurry', and wikis certainly enable rapid and easy authoring direct to the Web. Wiki pages can be used by all to publish new content directly to the Web, including text, images and hyperlinks; to edit existing content; and also, because the wiki is fluid and open to all, to 'roll back' if necessary to previous versions through a 'page history' utility" (p. 989). In developing a class wiki, students would have extra access to content, teachers' PowerPoints, and enrichment activities. Students would have the ability to blog about classroom content, upload creative writing on the content, and communicate with his/her classmates and the instructor. This could allow students to gain in their content comprehension and improve their written expression.

Summary

This review of the literature has examined the 21st century skills movement, a 21st century learner, Web 2.0 technologies, what Web 2.0 technologies look like, and the relevancy of Web 2.0 technologies to content comprehension and written expression. Educators cannot approach teaching as has been done in the past. Education is completely different from years ago; Web 2.0 can be used in the classroom to facilitate the 21st century learner. Use of Web 2.0 has both positive and negative aspects to the education of students in the 21st century. Research cited shows the possible link between using Web 2.0 tools and the creation of an effective 21st century learning environment.

CHAPTER III

METHODS

This study was conducted to determine the effect of Web 2.0 educational technologies on student achievement in content comprehension and written expression.

Design

The study utilized a quasi-experimental pre-post test design using scores from the Baltimore County Public School United States History assessment.

Participants

The students in this sample were a convenience sample from two self-contained United States History classes. There were six students in each of the classes. All of these students have an Individualized Education Plan (IEP). The students were predominantly African American; there was one Hispanic student and three White/Caucasian students.

Instrument

A teacher designed assessment instrument used for this quasi-experimental study. The test was administered as the pre-test on January 29, 2013, and the test was again administered as the post-test on March 1, 2013. The test followed a selected-response format with two essays and included forty-four selected-response content comprehension questions, one expository essay, and one persuasive essay. The selected-response questions were based on the content of the unit established by the Baltimore County Public School United States History curriculum.

The essays were scored using a five point scoring rubric. The expository essay had the students describe the circumstances that led up to the Great Depression. The persuasive essay had students discuss the success of Franklin D. Roosevelt's New Deal and its impact on bringing an end to the Great Depression.

Procedure

This quasi-experimental study was carried out over a twenty-three day period, which took place from Tuesday, January 29, 2013 through Friday, March 1, 2013. During the twenty-three day period, both groups met for forty-five minute periods until the unit of instruction concluded on Thursday February 28, 2013. The U.S. History students completed the pretest during the first day of the unit. There was a school holiday of one day; both groups received instruction from January 30, 2013 through February 28, 2013.

The instruction for this unit for the control group was delivered primarily in lecture format. The control group received current events, a drill activity, new instruction, classroom activity, and occasional homework. This group had two essays to write during the course of the unit.

The experimental group received current events, a drill activity, new instruction, classroom activity, occasional homework, and the use of various Web 2.0 tools, including the use of cell phones during class, podcasting, and a class wiki. Students in the classroom used their phones to text answers to answer poll questions during the lecture and as a way to look up additional content, as well as to access the class Edmodo page, which is a way for the class to digitally collaborate and access homework from home, download the class podcasts, and take online quizzes. Podcasting was another intervention that was used to assist students in improving their content comprehension. The podcasts assisted in developing the essential skills that allowed students to build content vocabulary, refresh themselves regarding content presented in class, go back and listen to specific parts of the lecture in order to gain further comprehension, and make corrections in their notes. The wiki was used to assist in improving achievement in content comprehension and written expression and then in measuring content comprehension and written

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expression, which allowed the students to post online responses to questions asked in class as a way for the class to have further discussions of classroom content.

At the conclusion of the instruction, both groups took the same end of-unit test.

CHAPTER IV

RESULTS

The purpose of this study was to determine if the integration of Web 2.0 technologies within the public school curriculum would improve student achievement in the areas of content comprehension and written expression.

An Independent *t* test was run on the pretest selected response scores, posttest selected response scores, and the posttest essay score to see if there was a significant difference between the groups. An analysis of the pretest essay score could not be conducted as both groups' mean score was zero. There was no significant difference in pretest selected response scores between the control and experimental group, $t(10) = 2.57$, $p > .05$. The two groups had similar performance on the pretest.

Results also showed that there was no significant difference in posttest selected response scores, $t(10) = 1.076$, $p > .05$, or posttest essay scores, $t(10) = .038$, $p > .05$, between the control and the experimental group. The null hypothesis that there would be no difference in academic achievement was supported (See Table 1). These results will be discussed in the following chapter.

Table 1

Mean and Standard Deviations of the Pretest and Posttest Measures By Group

Group	Pretest Selected Response Score	Posttest Selected Response Score	Pretest Essay Score	Posttest Essay Score
Treatment	11.17 (3.18)	31.83 (8.44)	0	3.83 (3.19)
Control	8.67 (5.27)	29.50 (12.09)	0	4.50 (2.88)

CHAPTER V

DISCUSSION

The null hypothesis that there would be no difference in content comprehension and written expression between students using Web 2.0 technology and those students who do not use Web 2.0 technology was supported.

There was no significant change in motivation of the experimental group from the pre-test results to the post-test results. Moreover, there was no difference between the experimental group and the control group for achievement when Web 2.0 technology was used. The null hypothesis was supported when the experimental group was taught through the use of Web 2.0 technology while the control group was taught by lecture and class notes. As Table 1 of Chapter IV indicates, students in the experimental group scored the same on their chapter test as the students in the control group.

Implications of Research

In this quasi-experimental study, there was no effect of Web 2.0 technology on the students' achievement, regardless of the teaching technique used by the instructor. The results showed that there was not a significant difference between the pre-test results and the post-test results for the experimental group or the control group. The null hypothesis was supported. The results of this study help to support previous research on the relationship between Web 2.0 and student achievement.

This study can be valuable from a teaching perspective and provides ideas that can be used to improve student achievement through the use of Web 2.0 technologies. This study shows that there is no direct correlation between student achievement and the increase in the use of Web 2.0 technologies. The importance of a student having the ability to use Web 2.0

technologies as a 21st century tool can prove to be valuable as the students leave school and prepare for jobs using Web 2.0 technologies. Teachers may not feel comfortable with the implementation of Web 2.0 technologies or how to integrate Web 2.0 technology within their instruction. As a result, they may be less willing to use Web 2.0 technologies. Based on results from this study, it is recommended that teachers look at trying to incorporate Web 2.0 technologies into classroom.

Threats to Validity

In this study, there were some threats to experimental validity. The first threat to internal validity was maturation. The threat of maturation referred to the intellectual change of the students in the study. The maturation change impacted the performance in this study. At the beginning of the unit, students in the study were not as familiar with the material but, as the study advanced, they gained knowledge. During the course of the study, maturation played in unexpected role in how some students preformed in the class and impacted their results on the post-test.

The testing threat to internal validity could have impacted the study. An internal threat of testing could have also impacted student performance due to the similarity of the pre-test and post-test. The pre-test measured factual information that may have been recalled by students on the post-test. It is possible that the pre-test could have improved student performance on the post-test because the student was familiar with the question.

Another threat to internal validity was the small sample that was used. The study used a sample of twelve participants. Another aspect of the threat to validity involved the convenience sample used during this research. All students participating were drawn from the same United

States History class. The small size of the sample was taken into account. If the study would have followed students taught in an honors, gifted and talented, advanced placement, or general education/inclusive setting, it is still possible that the small size of the sample would have impacted the results.

This study was a convenience sample; a truly random sample was not attainable. All the students in this study had an IEP. The two self-contained classrooms are composed of students who possess an IEP and require daily special education services. All of the students have IEP goals in reading, and learning the content may work best in a smaller classroom setting. It may require students with IEPs a greater effort to gain knowledge and comprehension of the topic, and using Web 2.0 technologies could have made it more difficult to gain the information that was needed.

The last threat to external validity was that randomization was not used in the sample. The sample in this study was determined by it being a convenience sample. This study was limited to a convenience sample of two classes of six students in each self-contained United States History. The narrowness of the sample limited the amount of information that could be deduced from the study. For example, it would have been helpful to have students without disabilities in this study. Participants' may also have affected the study's validity because they were taught in a self-contained setting.

Connections to the Literature

The use of Web 2.0 technology in the classroom has been an important trend in education in the past few years. There is a need to give 21st century students the ability to access their education with 21st century tools. One relevant study examines the opportunity that educators

have in implementing Web 2.0 technology in the classroom. Bennett et al. (2012) states, "The emergence of Web 2.0 technologies has provided new opportunities for creating and sharing content and interacting with others" (p. 524). This study examined successful use of Web 2.0 technologies in higher education. The results of this study showed that there is an opportunity to use successful Web 2.0 technologies in the classroom. "These findings highlight the potential learning benefits that can come from effective use of Web 2.0, particularly through student content creation and sharing" (p.533). The present study reflects that there is an untapped opportunity to incorporate Web 2.0 technology in the classroom. According to Bennett et al. (2012), Web 2.0 technology has its value but is still relatively new and needs more testing. This reflects the results of the present study because the use of Web 2.0 technology is still new and has yet to be fully supported in the curriculum and there is no direct correlation between the use of Web 2.0 technology and improved student achievement.

Many other studies have focused on other strategies for implementing of Web 2.0 technology in the classroom. These studies have used cell phones as an extension of the students in their classroom, as tools for looking up information, and as a quick assessment tool. Podcasting is a tool that can be used to assist students in improving their content comprehension by allowing the ability to listen for material they might have missed and to review how to do a specific problem. The use of wiki's can facilitate a collaborative learning environment by allowing the student the ability to work collaboratively with other students outside the classroom and allow for a continued discussion of topics outside the traditional classroom. The Sharma (2012) study examined how teachers can incorporate student cell phones to take online quizzes. The results in Sharma (2012) research are also reflected in this study as both studies showed there was no direct correlation between the use of Web 2.0 technology and student achievement.

According to the Swan et al. (2011) study, teachers might be challenged with their ability to connect the content, pedagogy, and technology and that there can be a use for Web 2.0 tools in aiding students in content comprehension. Swan et al.'s (2011) research found some studies showed positive results using podcasting, and while there were some who used podcasting producing no significant results, this research showed that there were possible uses of podcasting in classroom instruction. "All the teachers in the study successfully integrated their podcasting projects within the constraints of their classrooms and curricula, their ability to connect the content, pedagogy, and technology was mixed" (Swan et al., 2011, p. 84). Results in the Swan et al., (2011) research and this study showed similarities because there was a direct correlation between the use of podcasting and improved content comprehension.

Wheeler et al. (2008), stated that wikis "open source software may yet enable us to effect some transformational changes in education" (p. 995). The results in this research looked at the potential in content comprehension and in written expression in a collaborative atmosphere. In the Wheeler et al. (2008) research it was used to "develop their critical thinking skills" and, in using a wiki, it allowed the learner to develop these ideas in a space that allowed for collaboration. (p.993). Both studies looked at the potential collaborative possibilities of using a wiki in the classroom setting.

Implications for Future Research

Future studies should continue to evaluate the benefits of the use of Web 2.0 technologies in the 21st century classroom. Such future studies should focus on how teachers can implement Web 2.0 technology and academic Web 2.0 technology strategies within their teaching practices. With more knowledge of Web 2.0 technology applications in the classroom, teachers can continue to improve their Web 2.0 technology strategies and practices to benefit their students. In

addition, professional development initiatives should focus on how to effectively train teachers in integrating Web 2.0 technology into their teaching. Research citations reported in this study indicate that teachers with more training and more availability of Web 2.0 technology will be more likely to include Web 2.0 technology in their instruction. Finally, future studies should investigate how the use of Web 2.0 technology in academic instruction can prepare students for 21st century jobs.

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