Creating/Developing/Using a Wiki Study Guide: Effects on Student Achievement

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Abstract

Wikis are gaining popularity in classrooms because of their many benefits. Despite these benefits, there is a shortage of empirical data regarding their effectiveness in increasing knowledge. This study examined (a) the effectiveness of creating/developing/using a wiki to increase knowledge of Web 2.0 tools for 103 preservice teachers; (b) their perceptions of the use of a wiki to increase knowledge of Web 2.0 tools; (c) the frequency of use while participating in the reader, writer, and editor roles; and (d) their communication habits. The results revealed that there was a significant gain in achievement. Further, the preservice teachers reported that the wiki was effective for increasing their knowledge of Web 2.0 tools, and more than 75% used the wiki as an information source during and after the activity. The preservice teachers indicated that the creation of the wiki increased their knowledge as well as the presentations given by their peers, but the hands-on practice increased their knowledge the most. When examining preservice teachers' participation in the reader, writer, and editor roles, the results indicated that they read the information but were less regular in posting or modifying the wikis. Upon examination of the communication habits of the preservice teachers, the results indicated that they did not actively communicate with each other during the development stage of the study guide. They reported using email the least, comments within the wiki a little more, and face-to-face conversations the most. This study demonstrates that wikis can be used to increase knowledge. Additionally, the findings can serve as a guide to educators who want to use wikis as a teaching tool. (Keywords: achievement, collaboration, teacher education, Web 2.0, wikis)

Web 2.0 applications bring new and powerful opportunities to classrooms. This growing collection of free Web-based tools, accessible through a browser and Internet connection, allow individuals to read, write, and edit information on the Web in user-friendly spaces. Solomon and Schrum (2007) point out that the Web has changed from static HTML pages where visitors locate and copy information to a participatory, interactive space where they create, collaborate, and share information.

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There is continued interest in ways that technology can support collaboration and, thus, learning in schools. Software programs that provide opportunities for collaboration offer new and unique possibilities for teaching and learning (Grant, 2006; Reinhold, 2006). Wikis are such programs and, according to Johnson, Levine, and Smith (2007), are reportedly developing quickly as a preferred tool for instructional purposes in all levels of education. Wikis, first created by Ward Cunningham in 1995 but used sparingly in education in the past, are the topic of this study. Wikis allow individuals to create, edit, and link Web pages as well as add pictures, sounds, and movies to a Web site. In addition, wikis provide a means for asynchronous communication and collaboration among members of a wiki community.

Lamb (2004) suggests that wikis offer a way to use the Web in the ways that inventor Tim Berners-Lee intended it to be used in 1999. He explains that Berners-Lee wanted the Web to be an interactive space where every person could edit content. Until recently, interactivity was limited to clicking Web links to move about the pages. Lamb points out that, although wiki tools are not all the same, some central characteristics apply. These characteristics include:

- **Wikis are unique.** Wikis allow the sharing of original content that might not be found elsewhere and provide links to information on the Web that can be retrieved long after projects are completed.
- **Wikis are collaborative.** The collaborative nature of wikis promotes a synergy that comes from the contributions of many members rather than only one.
- **Wikis allow open editing.** Anyone can add any information at any time in wikis that are not private.
- **Wikis are simple.** The simplicity of using most wiki tools makes it viable for very young learners and those with little technology expertise.
- **Wikis are evolving.** Constant change or progress occurs in wiki communities.

Wikipedia (http://www.wikipedia.org), the best-known public wiki, is a multilingual collaborative online encyclopedia that emerged in 2001 and has "become a clearinghouse of information based on the work of thousands of amateur researchers" (Richardson, 2006, p. 3). At the time of this writing, more than 3.8 million articles reside in the English-language version of Wikipedia (Wikipedia, n.d.), with new articles emerging at the rate of more than 900 per day and edits per month in excess of 3.6 million (Wikimedia, 2012). Soloman and Schrum (2007) state that Wikipedia "includes more up-to-date entries than the Encyclopedia Britannica" (p. 58). Nonetheless, educators have voiced concerns that Wikipedia is based on an openly editable model, thus inviting posts or modifications that may be inaccurate. Although contributors consistently monitor and edit the content for accuracy, students must be taught to evaluate the correctness of the information they use. Richardson (2010) insists that teachers should teach Wikipedia to

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students because "they are already using it in their research, whether we like it or not" (p. 58) and because "Wikipedia is becoming a trusted and cited resource by major news outlets and scholars" (p. 58).

A variety of wiki software applications are available for use; however, it should be noted that the features and complexity of the tools vary significantly. Some applications are online services, whereas others are server based, and still others are offered in content managed systems, such as Blackboard or Moodle. Semantic wikis, including Semantic MediaWiki, in which Wikipedia is constructed, permit users to add semantic data to pages, which allows the information to be queried or searched. Soloman and Schrumn (2010) report that PBWorks (http://pbworks.com) and WikiSpaces (http://www.wikispaces.com) are the most popular wiki tools for educational settings. Both online services are easy to use and offer ad-free workspaces to educators. Construction takes place in "what you see is what you get" (WYSIWYG) editors, which allow users to publish to the Internet with no knowledge of HTML code. Because all associated files are stored on company servers, there is no need for technical support or server space. Furthermore, there are multiple pedagogical potentials for using wikis in the classroom.

Pedagogical Potentials

Wikis allow students to generate their own knowledge by creating, communicating, and collaborating. Students must develop the ability to think critically, problem solve, and seek out information. Richardson (2006) stresses, "Network construction, through writing and publishing, is a crucial new literacy for the 21st century" (p. 44). Wikis allow these literacy skills to develop.

As mentioned earlier, little technical skill is needed to use the features in many wiki tools (Ferris & Wilder, 2006; Lamb, 2004), which allow users to focus on collaboration and the exchange of information. Wheeler, Kelly, and Gale (2005) refer to such applications as transparent technology; in other words, the ease of the tool allows the user to see through the technology and concentrate on the learning task. Lin and Kelsey (2010) add that, because wikis document page history, "learners can work collaboratively without worrying about losing documents and correspondence history" (p. 171). Additionally, students can work from anywhere and are able to contribute 24/7, which means that they are not limited to class sessions or the school day (Soloman & Schrum, 2010).

Wikis are extremely versatile. Multiple authors (Collaborative Software Lab, 2000; Godwin-Jones, 2003; Grant, 2006; Lamb, 2004; Lamb & Johnson, 2007; McPherson, 2006; Richardson, 2006) agree that the most common pedagogical application of wikis is in supporting writing instruction. Additional authors note the usefulness of wikis in collaborative efforts (Lamb & Johnson, 2007; Matthew, Felvegi, & Callaway, 2009; O'Bannon, Bayieth &

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Beard, 2009; Richardson, 2010; Schroeder, 2009) in research and problem solving. Lamb and Johnson (2007) further suggest that wikis are also good tools for building electronic portfolios, portals, study guides, and dynamic journals and notebooks. They can also be used for virtual conferences and as resource aggregators. In each of these learning situations, students come together to construct their own information in collaborative spaces. Dearstyne (2007) suggests, "The posting and pooling of ideas generate sparks of creativity as others react, reflect, have their insights deepened or changed and in turn, contribute something new" (p. 30). And peer editing is used to ensure that the writing is clear and concise (Soloman & Schrum, 2010).

Wikis can influence the learning of course content. Matthew et al. (2009) conducted a case study with 37 preservice teachers in a field-based language arts methods course. The preservice teachers contributed course content to a wiki, covering 11 language arts concepts aligned with Texas Language Arts and National Council of Teachers of English (NCTE) standards. Following the completion of readings, classroom activities, and tutoring elementary students, the participants made contributions to the wiki. The results indicated that "the collaborative knowledge creation resulted in the preservice teachers deeply processing and learning the material" (p. 68).

Wikis can also increase retention of information. In an experimental study with secondary social studies students, Heafner and Friedman (2008) found that the construction of a wiki did not increase unit test results; however, there was an increase in engagement, motivation, and interest in learning social studies. Further, student attendance was higher during this unit and provided a "more collaborative and communicative learning environment where students initiated questions, answered peer questions, engaged the teacher in individual dialogue, and conversed with peers" (p. 296). Eight months later, interviews were conducted to determine long-term effects on retention. Interview data provided contrasting data from the initial measures of achievement when, as a part of the interview, students took a posttest. The students involved in the wiki development scored much higher, which suggests that students who created the wiki had greater content retention. They reported that for the treatment group, "student answers to the content-based interview questions were more accurate and much more detailed" than the students in the control group (p. 298).

Although recent studies are promising for the impact of the use of wikis for learning purposes, there are some challenges associated with wikis that should be considered by educators when planning student activities.

Pedagogical Challenges

Ferris and Wilder (2006) and Wheeler, Yeomans, and Wheeler (2008) warn that the accuracy and veracity of user-generated content in wikis cannot be guaranteed. Lamb (2004) adds that public wikis are subject to vandalism, which causes frustration. In spite of that, he stresses that information can

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remain stable in a community that shares a common purpose and has robust participation from members. Heafner and Friedman (2008) suggest that infringement of copyright law can be a challenge, given the copy/paste potential with wikis. However, instructors should closely monitor the content to prevent this from happening and can edit or revert to previous versions to eliminate copyright infringement.

A primary challenge is students' lack of awareness and comfort with collaborative writing. Grant (2006) employed a writing assignment in her class with students who were 13–15 years old. She found that her students had great difficulty writing in public spaces and editing the work of other students. She accounted for this difficulty by asserting that the social and cultural practices needed for collaborative work within the context of a wiki were not part of the students' repertoire of teaching methods. O'Bannon et al. (2009) found similar results in a study with 85 preservice teachers who used a wiki to create a collection of Web-based curriculum resources. The study examined consistency of their participation in the reader, writer, and editor roles and revealed that participants did not consistently edit the wiki during the semester. Reasons given for the lack of editing related to their discomfort with changing the work of others and with others editing their work. Discomfort with collaborative writing is also reported in a case study conducted by Lin and Kelsey (2010) with two cohorts of 18 graduate students over a 2-year period. These researchers found that students were "anxious and uncertain about editing others' writing initially, and required a paradigm shift in regard to working alone to working collaboratively to overcome their reservations" (p. 179).

McPherson (2006) suggests that teachers must guide students as they become comfortable with the technology and its use. He advises that students must understand, respect, and follow the rules for a collaborative project and proposes that discussions be held with students before they enter the community for collaboration. Topics for discussion include when and how to edit (e.g., spelling, grammar, formatting), appropriate and inappropriate writing, differences in constructive and destructive feedback, recovery of deleted or modified information, the inclusion of multimedia and hypermedia to create dynamic writing, and the levels of participation expected and assessed. Wiki community members must be willing to share their work freely without becoming offended when it is altered. Orech (2009) stresses the importance of establishing a collaborative environment in the classroom and warns that a wiki project should not be the first experience in which students have worked together. He adds that the project must be an authentic problem that can be solved collaboratively and that outcomes should benefit the learning of the entire class. In addition, students need an organizational structure for a wiki (Engstrom & Jewett, 2005; Evans, 2006). When the structure is provided, teachers become moderators (Wheeler et al., 2008).

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The attribution of individual work is difficult (Lamb, 2004). It is often hard to differentiate the active contributors who consistently add and edit content from those who participate occasionally or fail to participate at all. Boulos, Maramba, and Wheeler (2006) reported that social loafing is often observed, with the contribution rate varying among community members. Ways to manage this difficulty include requiring that students sign the work they create, asking instructors to establish sections and categories or topics, and assigning certain members to direct student participation. Additionally, student participation can be monitored in most wiki tools by reviewing page histories.

Theoretical Framework

Soloman and Schrum (2007) advise that we must understand how students learn to determine the methods that will help them analyze, synthesize, and communicate information. They suggest further that constructivism, project-based learning, and connectivism are approaches to learning that align with the use of Web 2.0 tools.

Constructivism is an approach whereby the learner creates or "constructs" new understanding based on current and past knowledge (Soloman & Schrum, 2007). In this learning approach, teachers become facilitators of knowledge and assist students as they seek new information and work with others to solve problems. Wikis are ideal tools for promoting the constructivist learning approach. Students, as members of a wiki community, can actively engage in learning as they construct new knowledge on authentic, real-world topics and collaborate with community members to share what they have learned.

Project-based learning, a constructive approach, promotes in-depth learning by placing students in situations where they use inquiry-based tactics to solve real-world problems (Soloman & Schrum, 2007). Students use critical thinking skills and work within teams to locate, analyze, and synthesize information to find answers to problems and share their findings. Project-based learning can be implemented through the use of wiki communities, and researchers have confirmed their value in project work. Byron (2005) reports that wikis allow students to meet in virtual spaces at their leisure to collaborate on projects and solve problems. Project planning and documentation are facilitated through the use of wikis (Schaffert, Bischof, Burger, Gruber, & Hilzensauer, 2006) as well as management tasks such as brainstorming ideas, coordinating tasks, and recording meeting records (Schaffert, Gruber, & Westenthaler, 2006). Lamb and Johnson (2007) conclude that wikis provide an excellent setting for project-based activities—a forum for teams of learners to share their understanding and arrive at consensus. Project activities, including the generation of lists, narrowing of topics, outlining of options, debating of issues, and even voting, can take place in a wiki community.

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Connectivism, a learning theory for the digital age proposed by Siemens (2004), involves technology and connections as key features of learning and assumes that older theories do not account for the changes brought on by the digital age (Soloman & Schrum, 2007). Siemens suggests that in the last two decades, technology has restructured how we live, communicate, and learn. Furthermore, he says that learning is based on experiences. Because it is not possible to experience everything and acquire the amount of learning needed to act, competence is gained from forming connections and sharing the experiences of others. Wikis allow the diversity of opinions, connections, decision-making, and choices in learning that Siemens supports.

Purpose of the Study

Considering the conclusion that wikis have the potential to provide structure and support for students as they create, collaborate, and learn from one another (Grant, 2006) and the concern of authors (Carr, Morrison, Cox, & Deacon, 2007; Lin & Kelsey, 2010; Matthew et al., 2009; Schroeder, 2009), who report a lack of empirical research on the educational impact of wikis in education, there is continued need for ongoing research on the use of wikis in classrooms. Our intention is to contribute information to the literature in this area.

The purpose of this study was to examine (a) the effectiveness of using a wiki to increase preservice teacher knowledge of Web 2.0 tools; (b) the perceptions of preservice teachers regarding the use of a wiki to increase knowledge of Web 2.0 tools; (c) the frequency of use by preservice teachers while participating in the reader, writer, and editor roles; and (d) the communication habits of the preservice teachers during this activity.

Methods

Context of the Study

The teacher preparation program at this university graduates roughly 400 new teachers each year. These graduates are products of 5-year programs of study that lead to initial licensure. The core technology course, a required course for this population, serves approximately 275 students each year.

Participants

Preservice teachers ($N = 113$) who were enrolled in the six sections of the core technology course during the spring 2011 semester were invited to participate in the study. Of these students, 103 (91%) agreed to participate and completed the study. Forty (39%) were seeking licensure in early childhood or elementary education; 50 (48%) were seeking licensure in middle or secondary education; and 13 (13%) were seeking K–12 licensure in special education, deaf education, music education, or art education. Ninety-five (92%) were Caucasian, five (5%) were African American, two (2%) were

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Asian, and one (1%) was Hispanic. Seventy-nine (77%) were female, and 24 (23%) were male. The mean age was 23.24.

Almost all (100, 97%) of the participants reported use of Wikipedia to access information; however, far less (20, 19.4%) had used a wiki other than Wikipedia to access information. Slightly more (22, 21.4%) reported that they had joined a wiki and posted or edited information.

Data Sources

Guided by the recommendations of Creswell (2009), this study used a mixed method approach to provide a comprehensive view of the data. Pre/post surveys (see Appendix C, pp. 310–311) and focus-group interviews (see Appendix D, p. 312) provided the data used in this study. The pretest was administered prior to the study of Web 2.0 tools and consisted of three sections. The first section contained 10 questions that asked participants to match the name of a Web 2.0 tool to its purpose. The second section presented 10 scenarios that might be found in a K–12 classroom. After reading each scenario, the preservice teacher was asked to identify the Web 2.0 tool that was appropriate to the task presented in the scenario. The last section collected demographic data. The posttest contained sections one and two of the pretest as well as questions asking the participants to identify their prior experience in a wiki community in addition to the depth of that experience. The next sections used a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree) and asked that participants specify their perceptions about the wiki tool (PBWorks) used in the activity; their participation in the roles of reader, writer, and editor; and the impact of the instructional strategies on their knowledge. The following section used a 4-point scale (1 = never to 4 = often) and asked participants to respond to three questions related to the method they used for communication during the semester. The last section solicited responses indicating whether or not they use the Web 2.0 wiki as a resource.

The second researcher conducted the focus-group interviews, which consisted of a series of six 30-minute sessions, over a period of 5 days in May 2011. We randomly selected a total of 30 participants who were representative of the sample (equal percentages of students in licensure areas selected for the focus-group interviews) to attend focus-group sessions with a third-party moderator. During each session, the moderator asked participants to reflect on and describe their experiences using a wiki to build content knowledge on the topic of Web 2.0 tools. We encouraged the focus-group members to share what went well and what went wrong. The moderator used a semistructured protocol of seven questions (see Appendix D, p. 312) with probes to stimulate discussion among the members, but owing to the open-ended, "no holds barred" format of the discussion, she did not necessarily ask all questions.

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Procedures

Instructional sequence. Students were directed to (a) read textbook selections and other readings, (b) watch a video on wiki basics, (c) complete K and W sections of the K-W-L-S (know, want to know, learned, still want to know) chart (Read, Write, Think, 2012), (d) watch instructor demonstration of software features, (e) participate in hands-on guided practice exercise, (f) examine Web sites that presented ways to integrate wikis into learning, (g) complete L and S sections of the K-W-L-S chart (Read, Write, Think, 2012), and (h) develop the project wiki (see Appendix A, p. 309).

Hands-on guided practice. Following the advice of Oreck (2009) that a wiki project should not be the first experience in which students have worked together, and to create the "transparency of the technology" that Wheeler et. al. (2005) speak of, the students participated in a wiki assignment prior to the project wiki. This assignment was an attempt to facilitate student comfort with the software and the process with hands-on practice. Each instructor created an All About Me wiki community in each class section. After students created and populated the wiki communities, basic instruction for the software took place. Instructors demonstrated how to create pages; how to insert, edit, and format text; how to insert pictures and links; how to set up user-friendly navigation schemes; and how to use the comments to communicate/collaborate with each other. Additionally, the instructors discussed wiki etiquette, as suggested by McPherson (2006). Next, each student created a respective page containing a personal photo and three paragraphs explaining their educational background, reasons for wanting to become a teacher, and pastimes and hobbies. Once the pages were created, they were projected on the whiteboard as each student introduced himself or herself to the class. Finally, students completed the L and S sections of the K-W-L-S chart (Read, Write, Think, 2012) to determine what they had learned and what they still wanted to know. Class discussion was held to answer questions. At the conclusion of this activity, the instructional team was confident that the students were comfortable with the tool and the process and instructed students to proceed with the creation/development of a study guide on Web 2.0 tools.

The study guide. Following instructor explanations of the assignment, the instructors paired up the students, who chose a tool for comprehensive research from a collection of Web 2.0 options selected by the instructional team based on function and stability. The collection consisted of Animoto (http://animoto.com), Delicious (http://www.delicious.com), Glogster (http://edu.glogster.com), Google Forms (https://docs.google.com), Picnik (http://www.picnik.com), Prezi, (http://prezi.com), Smilebox (http://smilebox.com), Twitter (http://twitter.com), VoiceThread (http://www.voicethread.com), and Wordle (http://www.wordle.net).

The activity continued as class members watched the instructor (serving as wiki administrator) create the Web 2.0 wiki community. Students then

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requested and were granted permission to join the community and observed as the instructor set editing permissions and security options. After verifying that all students were members of the wiki, the research/development period began as student pairs examined/practiced using their assigned tools and looked for resources to assist development. The instructors allocated a week for students to complete their contributions to the wiki. Some work was done outside of class.

As recommended by Engstrom and Jewett (2005) and Evans (2006), the instructors provided structure to assist learners during collaborative development: Each page of the study guide would contain an overview of the tool, step-by-step directions for using the tool, ways to use the tool in the classroom, an artifact created by using the tool, and related images and /or instructional videos (see Appendix B, p. 309). Upon completion of the wikis, student pairs taught classmates how to use the tools. The presentations were spread over the semester and closely aligned with course content. For example, the presentation on Animoto, a Web.2.0 tool for making short videos, was presented prior to the study/creation of digital stories.

Data Collection and Analysis

The first researcher distributed consent forms and information sheets regarding the study to the participants. Once consent was given, we used an online tool to collect the pretest/posttest survey responses. Following calculation of the survey results, we analyzed the data, calculated means, and administered appropriate statistical tests.

The second researcher conducted a series of six 30-minute focus groups of five students each over a period of 5 days in May 2011. She used a semistructured protocol of seven questions with probes to stimulate discussion among the members (see Appendix B, p. 309). We digitally recorded, transcribed, and subjected these sessions to processes of initial and focus coding using Atlas.ti software. In preparing and analyzing the focus group data, we used the approach outlined by Bogdan and Bicklen (2006) in their work Qualitative research for education: An introduction to theories and methods. They emphasize gaining a "sense of totality" (p. 185) for the data collected, followed by "taking long, undisturbed periods and carefully read[ing]" (p. 185) the data before starting the coding process. We then coded the data was and noted major themes from the interview data. We connected those themes with the data provided through the survey.

Results

As described previously, the purpose of this study was to examine the effectiveness of using a wiki to increase preservice teacher knowledge of Web 2.0 tools. Further, it examined the perceptions of preservice teachers regarding the use of a wiki to increase knowledge of Web 2.0 tools; the frequency of

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Table 1. Means, Standard Deviations, and *T*-Test Results

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*df*	*p*
Scenario	1.87	.11	7.38	.18	29.186	102	<.001
Definition	4.04	.19	8.47	.21	17.810	102	<.001

their participation in the reader, writer, and editor roles; and their communication habits. Participants were asked about their views of the tools used in the study.

Effect on Knowledge

The first research question examined whether or not the creation/development/use of the Web 2.0 wiki had an effect on knowledge. We calculated the means and standard deviations of the pretests and posttests, which are presented in Table 1. We administered paired samples *t*-tests, which indicated a significant increase in student scores.

The preservice teachers agreed that the wiki was effective in increasing their knowledge of Web 2.0 tools ($M = 3.42$, $SD = .569$) and that wikis are effective tools for increasing student knowledge of topics in the curriculum ($M = 3.30$, $SD = .569$). Further, 79 (76.7%) indicated that they used the Web 2.0 wiki as an information resource. When examining the instructional strategies that the preservice teachers perceived had increased their knowledge of Web 2.0 tools, the mean perceptions indicated that the creation of the wiki increased their knowledge ($M = 3.41$, $SD = .550$), and the presentations given by their peers increased their knowledge ($M = 3.50$, $SD = .558$), but the hands-on practice increased their knowledge ($M = 3.67$, $SD = .493$) the most. We completed a repeated-measure ANOVA to determine if there were significant differences in the strategies used, and it revealed significant differences ($p < .001$). To check for significant differences in the group means, we ran a pairwise comparison with Bonferroni adjustment. Hands-on practice was significantly higher than the other two strategies, with no differences between the wiki and presentations.

Participation in the Wiki

When examining preservice teachers' participation in the reader, writer, and editor roles, mean perceptions indicated that, although the preservice teachers regularly read ($M = 3.06$, $SD = .557$) the wiki, they were less regular in posting ($M = 2.95$, $SD = .821$) or modifying ($M = 2.75$, $SD = .871$) information in the wiki. We administered a repeated-measure ANOVA to determine if the levels of participation were significantly different, and it revealed p =.004. To find the degree to which the levels of participation were different, we ran a pairwise comparison with Bonferroni adjustment, which revealed no difference between the levels of reading and posting, but significantly lower participation in the modification of information.

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Communication in the Wiki

We examined the communication habits of members. Communication was possible within the wiki by using comments or outside the wiki using email exchanges or through face-to-face conversations. The data revealed that mean perceptions of the communication habits of the preservice teachers were low, indicating that they did not actively communicate with each other during the development stage of the study guide. They reported using email the least (M = 1.97, SD = .923). They used comments within the wiki a little more (M = 2.39, SD = .854) and face-to-face conversations the most (M = 2.97, SD = .798). We completed a repeated-measure ANOVA to determine whether there was a significant difference in the communication habits, and it showed significant differences (p <.001). To check for significant differences in the group means, we ran a pairwise comparison with Bonferroni adjustment. All modes significantly differed from one another. We concluded that the face-to-face method was the most used mode of communication and comments were the second-most-used mode.

Discussion

This study examined (a) the effectiveness of the creation/development/use of a wiki to increase knowledge of Web 2.0 tools; (b) perceptions of the use of a wiki to increase knowledge of Web 2.0 tools; (c) the frequency of use while participating in the reader, writer, and editor roles; and (d) their communication habits. These findings provide insight for educators as they create learning activities involving wikis and as they conduct research in the future.

Key Findings

The survey concluded that, although almost all preservice teachers had previously used Wikipedia to retrieve information, most had not used other wikis to access information, nor had they participated as members of a wiki community to post or edit information. This result supports findings by O'Bannon et al. (2009) and suggests that the use of wikis in educational settings remains in early adoption, regardless of the numerous ways that wikis can be used in learning.

The data indicated that PBWorks, a favorite in educational settings according to Soloman and Schrum (2010), was easy to use as described by Lamb (2004) and Ferris and Wilder (2006), allowed the transparency described by Wheeler et. al. (2005), and allowed them to focus on learning about Web 2.0 tools. Further, the participants indicated that using the tool for multiple assignments increased their comfort level. This finding supports suggestions by Oreck (2009) and indicates that educators who choose to use wikis should consider using the tool several times before moving into a significant project.

As with prior studies, the wiki development influenced the learning of course content (Matthew et al., 2009) and retention of information (Heafner &

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Friedman, 2008). Pretest/posttest scores for the preservice teachers increased significantly. Further, they perceived that the wiki was effective in increasing their knowledge and that wikis are effective tools for increasing student knowledge of topics in the curriculum. More than three-fourths of preservice teachers used the wiki as a study guide after the assignment was completed, which is a testimony to its educational value; however, given that students' knowledge is expected to increase after instruction and because the lack of a control group did not permit comparison, this finding is diminished.

Although the preservice teachers agreed that the multiple strategies used—specifically the creation/development of the wiki, the presentations their peers made, and the hands-on practice—increased their knowledge, the data showed a significant difference in the impact of the hands-on activities. Although there are significant differences, they are small, and the means are reasonably high; therefore, even though the preservice teachers felt that hands-on practice was the most beneficial, the wiki development and presentations were still highly useful and only slightly less useful in increasing their knowledge. Educators should consider using multiple strategies when facilitating this type of activity.

The preservice teachers' participation was higher in the role of reader than that of writer or editor, with the lowest participation in the role of editor. Modification of information was significantly lower than the other modes of participation. This finding supports previous research (Grant, 2006; Lin & Kelsey, 2010; O'Bannon et al., 2009) that indicates that students continue to feel discomfort with editing the work of others. It is important to note that the design of the project limited the students' ability to edit pages other than their own. Yet, because this issue continues to emerge in multiple studies, educators should anticipate the discomfort, create expectations for edits, give credit for feedback efforts, and closely monitor participation to keep students on target.

Although promoted by the instructional team, communication made possible through comments within the wiki or using email exchanges or face-to-face conversations was limited during this activity. Face-to-face conversations were used the most, which indicates that the preservice teachers were the most comfortable with traditional means of communication. This supports earlier research (Grant, 2006; O'Bannon et al., 2009) that notes discomfort with writing and communicating in online spaces.

Limitations of the Study

It is important to note that the results of the study may be influenced by its limitations. The participants in the study were students who were enrolled in the technology core course and, thus, comprised a sample of convenience versus a random sample. Because this research was limited to students in a higher education setting, the findings do not give attention to K–12 contexts. Further, the study was limited in duration to one semester. Studies of short

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duration may suffer from the novelty effect, the tendency for individuals to initially increase their performance when new technology is involved because of increased interest in the new technology.

Implications for Practice

The use of wikis is slowly gaining approval in educational settings for the many benefits that are mentioned here. Yet most students have little, if any, experience using these tools other than using Wikipedia for the access of information. Hence, they will feel discomfort with learning activities, especially those that include the modification of information. Clearly, wikis have features that can facilitate communication and collaboration, but studies give conflicting results about the success of activities. The design and implementation of activities is critical to the success of wiki collaboration. Further, instruction must be comprehensive and include such strategies as readings, instructor modeling/demonstration, sharing of classroom examples followed by discussion, and hands-on practice to support students as they transition into learning in this new environment. The authors recommend that educators carefully plan learning activities and help students ease into these activities, closely monitoring their progress. They should hold discussions with students and set policies for each activity to give students a clear understanding of not only the wiki tool, but also the desired outcomes. If students feel that wikis are an effective learning tool and are comfortable with the process involved in using them, they will benefit from the unique opportunities that wikis offer for increasing their knowledge of specific content.

Recommendations for Future Research

Although there is a plethora of articles about wikis and their use, a deficient number is dedicated to the impact of wikis on learning. A direction for future research is to add to the knowledge base of the value of wikis to affect learning. In the future, researchers should conduct studies that build on the findings in this study, perform experimental research, and examine how wikis can affect learning in various content areas, at varying levels of education, and with varying age levels.

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Appendix A

Activity Topics	Materials/Resources Used	Method
Read textbook selections and other readings prior to lesson	O'Bannon. B., & Puckett, K. (2010). Preparing to use technology, 2nd ed. 7 things you should know about wikis (http://net.educause.edu/ir/library/pdf/ELI7004.pdf)	Introduction to wikis
Watch video	Wikis in Plain English (http://www.commoncraft.com/video/wikis)	Introduction to wikis
Instructor introduces software	PBWorks (http://pbworks.com)	Demonstration
Start K-W-L-S (know, want to know, learned, and still want to know) chart by completing K & W	K-W-L-S chart from Read, Write, Think (http://www.readwritethink.org)	Extension of K-W-L-S charts (Ogle, 1986) **. Involves students in learning
Creation/development of All About Me wiki (see detailed explanation in text)	The instructor acting as administrator in the wiki community. In doing so, the students are able to watch the set-up followed by participation in the development.	Demonstration • Scaffolding • Hands-on practice
Students examine websites that present ways to integrate wikis into learning with class discussion to follow	50 Ways to Use Wikis by Smartteaching (http://www.smartteaching.org/blog/2008/08/50-ways-to-use-wikis-for-a-more-collaborative-and-interactive-classroom) Wiki Walk Through by Teachers Firs (http://www.teachersfirst.com/content/wiki)	Discovery Learning
Students complete K-W-L-S (know, want to know, learned, and still want to know) chart by completing L & S	K-W-L-S chart from Read, Write, Think (http://www.readwritethink.org)	Extension of K-W-L-S charts (Ogle, 1986); involves students in learning
Study Guide Creation/Development begins	PBWorks (http://pbworks.com/)	Problem-based inquiry learning; hands-on practice

** Ogle, D. (1986). K-W-L: A teaching model that develops active reading of expository text. *The Reading Teacher, 39*, 564–571.

Appendix B

Overview

http://smilebox.com/

Smilebox is a tool used to bring life to your personalized photos and videos. You can create invitations, greetings, slideshows, collages, photo albums, and scrapbooks. There are over 1,000 templates to choose from with categories including anytime, seasonal, birthday, wedding, baby, travel, and holiday. You can share these creations using Facebook, email, and blogs. To use this tool to make your own creations, you can download Smilebox to your MAC or PC, it's FREE!

Go to Smilebox video

Step by Step instructions

To begin, download the application.

1. A screen will pop up and you will click allow and then run.
2. Once Smilebox is downloaded, you can begin using it.

Using Smilebox

1. Choose a design or format. Ex. Choose the scrapbook format.
2. Then you will choose the other option. Ex. Choosing the Family and Kids design.
3. Once the design is chosen you pick a subsection under that design. Ex. Choosing its Elementary.
4. Click personalize.
5. Browse through your photos and add them to the picture bar.
6. To add pictures to your design, click and drag it to the design.
7. Each page can have a different design, this is controlled by you.
8. After you have personalized the page you can preview it.
9. When it is to your satisfaction you can save it or send it to yourself.
10. The site is free but if you want to print your creation or burn it to a dvd you must pay per year or month.

How to use in the classroom

Smilebox would have many benefits in the classroom including:

1. A creative digital storytelling device
2. Use to create a newsletter for the parents
3. Abundant amount of designs to make any simple writing assignment creative and interesting
4. Use to make a classroom newspaper
5. Use as an invitation to parents and children in your classroom.

By: K. Breeze and R. Cook

Back to homepage

*Example page taken from Web 2.*0 Wiki: Smilebox

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Appendix C

Pretest/Posttest

Part A. Match the Web 2.0 tool to its definitions by writing the number by the definition.

Animoto	Prezi
Delicious	Smilebox
Glogster	Twitter
Google Forms	Voicethread
Picnik	Wordle

- ☐ Create "word clouds"
- ☐ Create 30-second movies
- ☐ A more "green" method of the traditional presentation board/poster assignment
- ☐ Create online presentations that allow for dynamic "zooming"
- ☐ Bookmark Web addresses that can be accessed from any computer with-Internet access
- ☐ Create slideshows, invitations, collages, scrapbooks, and photo albums and share on Facebook, email, blog, print at home, or burn to DVD
- ☐ Comment on an image or video in a variety of ways
- ☐ Resize, rotate, and crop images.
- ☐ A microblog
- ☐ Create a survey

Part B. Read each scenario and choose the most appropriate Web 2.0 tool to solve the problem. (NOTE: The word bank was presented with each question.)

1. Mrs. Jones, a social studies teacher, wants her students to discover the most important ideas from Martin Luther King's "I Had a Dream" speech. She wants a Web 2.0 tool that she can use to display the 25 most frequently used words in the speech. What tool does she need?

☐ Animoto	☐ Delicious
☐ Glogster	☐ Google Forms
☐ Picnik	☐ Prezi
☐ Smilebox	☐ Twitter
☐ VoiceThread	☐ Wordle

2. Mr. Walters, a first grade teacher, took his class to the zoo on a field trip. Throughout the day he took pictures of the animals. Back at school, he wants to create a brief video of the trip and share it on his class blog. Which tool should he choose?

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3. Mrs. Graham, the French teacher at the local high school, wants to promote her annual summer trip to France at the school website. What single online tool can she use to make an advertising poster that can be easily embedded in a Web page and allows for the inclusion of trip documents, pictures of previous trips, videos of monuments, as well as link to the registration form?

4. Dr. Wishart has noticed that many of his students get restless when he presents information on PowerPoint. He wants to create a dynamic online presentation that will hold their attention, and he does not want to be tied to a sequence of slides. What tool would you recommend?

5. Mr. Beard, the H.S. science teacher, wants an online tool to track and organize the Web sites that he uses with his students. He wants them to be able to access these Web sites from a computer with Internet access. Which tool would you suggest that he use?

6. Ms. Jones, the art teacher at Somewhere Elementary, wants her students to invite their parents to the upcoming art show. She wants each student to create an invitation. What tool will be helpful in creating the invitation?

7. Ms. Cabot's fifth grade class took a field trip to Washington, D.C. The students took photos of the different monuments during the field trip. Upon return, Mrs. Cabot wants her students to add captions to the photos and create postcards. What tool would you recommend?

8. Mr. Collins is looking for a quick way to remind his Algebra I students and their parents of their homework assignments after school hours. He would also like them to have the option of receiving this information via a text message. One way that he could do this is to post it through this social networking service.

9. Ms. Marshall, a fourth grade teacher, has the yearly task of gathering important information, such as parent names, contact info, allergies, method of transportation, and so on, about her students. In the past, she has done this by sending a questionnaire home with the students, and then she has inserted the information into a spreadsheet. Is there a Web 2.0 tool that would assist her in gathering this information electronically?

10. Teachers are no longer limited to posting student work in the hallway for others to view. Post student work to this Web 2.0 tool and others cannot only view, but they can interact with the creator by leaving comments, questions, or kudos.

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Appendix D

Questions Used for Focus Groups

1. There are many ways we could have taught you about Web 2.0 tools in the course. We chose a wiki to store all of the content knowledge information. How did creating the wiki affect what you learned about Web 2.0 tools?
2. Which do you think you learned more from, the Web 2.0 Wiki or through the presentations of your classmates?
3. For you as a learner, what are the advantages of using a wiki to build content knowledge? Can you tell me a story that illustrates what you mean?
4. What are the disadvantages of using a wiki to build content knowledge? Can you tell me a story that illustrates what you mean? Is there anything we might do about those disadvantages or problems?
5. What is the most important outcome of this semester's wiki activity on Web 2.0 tools for you (e.g., something you learned or a way in which it changed your life or direction)? Can you summarize how or why that happened? Perhaps a story about something that happened to you would help us understand what you mean.
6. Is there anything else you would like to tell us about your experience with wikis?
7. Regarding reading, posting, and modifying content, what was your participation like in the Web 2.0 wiki? (PROBES: Did you modify pages other than the one for your tool? Was your participation consistent? Was it inconsistent? Why?)

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