Web 2.0 Matters: An Analysis of Implementing Web 2.0 in the Classroom

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Abstract

Web 2.0 tools are collaborative Internet applications that allow for facilitation of communications between individuals and organizations. Examples of Web 2.0 tools include blogs, wikis, Second Life, and social networking. This manuscript reviews classroom implementation of Web 2.0 tools at three Northeastern US universities. The importance of Web 2.0 instruction is examined via literature review and pre and post class testing of the students involved in the courses. It was found that knowledge of Web 2.0 skills is generally regarded as being very important. Students who took the course and were educated on Web 2.0 skills increased both their knowledge and comfort level after the course. A detailed analysis of student perceptions both prior to taking the course and after instruction are reviewed.

Keywords: Web 2.0, information systems pedagogy, wikis, collaborative learning, social software, social networking, constructivism, and education

INTRODUCTION

Web 2.0 is a term which describes "new" collaborative Internet applications. The primary difference from the original World Wide Web, or Web 1.0, and Web 2.0 is greater user participation in developing and managing content, which changes the nature and value of the information. According to McLean, Richards, & Wardman (2007), key elements of Web 2.0 include:

- Really Simple Syndication (RSS) to rapidly disseminate awareness of new information
- blogs to describe new trends wikis to share knowledge; and podcasts to make information available "on the move".

Web 2.0 enables and facilitates the active participation of each user. Web 2.0 applications and services allow publishing and storing of textual information, by individuals (blogs) and collectively (wikis), of audio recordings (podcasts), of video material (vidcasts or vodcasts), and of pictures, etc. (Ullrich, Borau, Luo, Tan, Shen, & Shen, 2008). Web 2.0 tools are becoming increasingly important to both individuals and businesses throughout society. As an example, the medical community needs to be aware of these technologies and their increasing role in providing health information "any time, any place". Many contemporary health professionals in Australia use the Internet to participate in continuing professional development (CPD) activities, for email communication, and to search for clinical information (McLean, Richards, & Wardman, 2007).

This study reviews the integration of Web 2.0 tools into information systems (IS) courses at three Northeastern US colleges. To start, a brief literature review is included outlining support for the importance of teaching Web 2.0 tools to tomorrow's information technology professional. Next, a discussion of the various Web 2.0 classroom experiences in presented. This is followed by detailed analysis of how these implementations were successful and how they were perceived and interpreted by the students. Overall, this study presents a unique view into one of the most current and important topics in IS today.

LITERATURE REVIEW

There has been a lot of hype around the notion of Web 2.0 in recent years, but in reality the technologies haven't been around for all that long (it just seems that way). The term was officially coined in 2004 by Dale Dougherty, a vice-president of O'Reilly Media during an internal team discussion while planning for a future Web conference (Anderson, 2007). In 2007, Sir Tim Berners-Lee, the inventor of the Web, stated that Web 2.0 was a "piece of jargon" that no one even know the meaning of (Anderson, 2007). His vision for the original Web, or Web 1.0, was that of a collaborative workspace, a read-write Web, where everyone would be able to share their work and others would be able to edit it in a "single, global information space." With Web 2.0, his vision has come to fruition.

Web 2.0 should not be confused with Internet2. According to a Pew Internet study (Madden & Fox, 2006), Web 2.0 is *not* a new and improved Internet network and it does *not* have a separate backbone. Web 2.0 is a term which describes new collaborative Internet applications. The primary difference between Web 1.0 and Web 2.0 is that the latter fosters collaboration and greater participation in content (McLean, Richards & Wardman, 2007). In addition, Web 2.0 technologies utilize "collective intelligence, providing network-enabled interactive services, giving users control over their own data" (Madden & Fox, 2006). Web 2.0 technologies (or services) include blogs, wikis, podcasts, vodcasts, RSS/Atom feeds, social networking, and social bookmarking. These technologies facilitate a more socially connected Web.

Apart from all of the Web 2.0 hype, according to a Pew Internet study, asynchronous email exchanges still dominate daily Internet activities. Fifty-three percent of adult Internet users sent or received email each day, which has gone virtually unchanged between the years 2000-2005 (Madden & Fox, 2006). However, what is the average age of the "adults" in the Pew study?

If the average age of the "adult" in the Pew study is, for example, 40 years old, those adults are regularly using Web 1.0 technologies such as email. However, *young* adults show different Internet behaviors. Another Pew Internet study found that 56 percent of the young people in the US were using computers for "creative activities." Those activities included using Web 2.0 technologies such as social networking sites, MySpace and Facebook; they were blogging, using wikis, mixing and constructing multimedia using mashups, etc. One out of five said they shared other people's images or audio. Another Pew study found that 55% of online teens have created a personal profile online and 55% have used social networking sites (Attwell, n.d.). In addition, online learning has proliferated and continues to grow. Almost 3.2 million students took at least one online course during the fall of 2005 as compared to 2.3 million students the year before (Augar, Raitman, & Zhou's study as cited in Parker & Chao, 2007).

According to Saulnier (2007), today's undergraduate students learn very differently from the way many current academicians have.

Millennials tend to be more pragmatic; i.e., the subject matter must be "useful" to them. Although there are exceptions, most of them are not in college to explore intellectual ideas; they are focused on learning skills to help them achieve whatever short term goals that they perceive will make them employable and competitive in the marketplace. In addition, today's Millennials are proficient at multitasking and also with the use of technology; however, many are not self-assured with course texts, written instructions and assignments.

Today's student learning occurs in an active format; they are quick to "change channels" when their active learning expectations are not being met (Saulnier, 2007). According to Chin (2008), students are savvy Internet users, perhaps to the point of overuse or addiction; however, much of the dilemma lies with teachers who are less interested in learning Web 2.0 techniques to incorporate across the curriculum. Web 2.0's architecture of participation offers students ways of learning in an environment that is much more in line with our normal ways of learning and better enable them to integrate the explicit and tacit dimensions of knowledge (O'Reilly, 2005).

When educators fail to engage students with these types of activities, schools and other educational institutions run the risk of becoming irrelevant to the culture of discourse for young people and to the way in which young people interact and exchange ideas (Attwell, n.d.). According to Wyld (2008), the blogosphere is a younger, more diverse environment than the Internet and society in general.

Despite the immediate appeal of applications such as Facebook and Second Life it is necessary for educators to take time to carefully reflect upon the nature of these Web 2.0 applications as online learning environments; they need to question the learning affordances they offer in practice (Selwyn, 2007). The most convincing challenge to our present system of education and instruction and the major driver of change may be the changing ways learners, traditional and non-traditional alike, are using computers for learning (Attwell, n.d.).

The new literacy, the one beyond text and knowledge, is one of information navigation. (Attwell). Seely and Brown suggest new forms of learning are based on trying things and action, rather than on more abstract knowledge. "Learning becomes as much social as cognitive, as much concrete as abstract, and becomes intertwined with judgment and exploration" (Attwell, n.d.).

WEB 2.0 IN TODAY'S BUSINESS WORLD

The global market for Mobile Web 2.0, including social networking, user-generated content, mobile search and mobile instant messaging, will increase from $5.5 billion currently to $22.4 billion in 2013, according to Juniper Research (Pearce, 2008). This will come mainly from social networking and user-generated content, which is predicted to grow from $1.8 billion this year to $11.2 billion in 2013. However, growth in mobile search and mobile IM will be more measured (Pearce, 2008). According to the Economist Intelligence Unit (2007), almost 80% of corporations believe Web 2.0 has the potential to increase revenues. Marketers also view social networking sites (SNS) as an attractive, growing proposition for marketing. Media analysts predict that advertising on SNS sites will surpass $2b annually by 2010 (Vasquez's study as cited in Wyld, 2008).

Given these staggering statistics, it is clear that students must be prepared to use Web 2.0 tools in the workplace. It is no longer a question of "if" they will use these tools; it is a question of "when" they be called upon to use them. According to Parker & Chao (2007), today's students will not only manage business innovations of the future, but in many cases will drive them.

Some authors believe that we may be seeing the birth of an entire new management style, ''management by blogging'', as a way of promoting better relationships between management and their various stakeholders, including employees and customers. A Senior Vice-President for Hewlett-Packard observed that, ''a lot of the traditional 'Management 101' you might have read ten years ago doesn't apply anymore." (Larson's study as cited in Wyld, 2008). McDonald's Senior Director of GlobalWeb Communications observed that blogging is viewed as an integral part of the company's management strategy (Wyld, 2008). According to Parker & Chao (2007), collaborative creativity promises to be a key business skill in upcoming years. As we move forward,

blogs will increasingly become a focal point for managerial activity (Wyld, 2008).

According to Atwell (n.d.), the development and implementation of digital technologies has lead to enormous pressure on education and instruction systems for new skills and knowledge; this includes, specifically, the changing ways in which individuals are using Web 2.0 technologies to create and share knowledge. However, WorkLight, the Web 2.0 security specialist, found that almost half of business managers do not understand the benefits of Web 2.0 technology (Anonymous, 2008).

A recent study showed that business health could be seriously damaged by not using Web 2.0 technologies. "Unless industry wakes up to Web 2.0 it will remain a consumer-only tool at a significant cost to business" (Keep Taking the Web 2.0, 2007). Lack of understanding is something, however, that can be solved with a little education and/or instruction (Anonymous, 2008).

Some decision makers in higher education make an assumption that the majority of the students are coming out of high school with most of the technology skills that are needed in order to be successful college students. However, most IS professors are keenly aware that is far from reality. There are already high expectations from employers that today's college graduate possess moderate to advanced technical skills, whether they've taken any technology courses or not in their degree programs. In addition to excellent oral and written communication skills, and proficiency in desktop applications, as the "net generation moves into the workforce, they're going to expect social networking, blogging, forums, etc." (Harvey's study as cited in Wyld, 2008). Web 2.0 is alive and well in the business community. There are approximately 60 million blogs in existence today; a new blog is created every second and there are 1.3 million new blog posts each day. The blogosphere continues to double in size every six months and is 60 times larger in size than it was just three years ago (Sifry's study as cited in Wyld, 2008).

Rather than being limited to today's skills, students must learn the skills of the future. Educators need to teach students the importance of wikis and other social software tools to business. They need to place emphasis on the skill set and make it clear that Web 2.0 tools are not just another trend (Evans' study as cited in Parker & Chao, 2007). By incorporating wikis into the classroom, educators can better prepare students to make innovative uses of collaborative software tools (Parker & Chao, 2007) which will help to make them competitive in the marketplace upon graduation. "This phenomenon is the socialization of the Web, and it's in the basis of a real sharing economy" (Fumero, 2006).

METHODOLOGY

The importance of Web 2.0 technologies led to their inclusion into undergraduate information systems classes at two Northeastern colleges. The students at these universities were surveyed about Web 2.0 tools upon starting the course and again upon completion. At the first university, data from 21 juniors and seniors in an e-Business class was gathered. The pre-requisite to this course was the introductory information systems course. Students are required to bring their laptops to class. At the second university, data from eight freshman students in the introductory information systems course was collected. No technology background was required for the introductory course however, the school requires students own their laptops and to bring them to class. The overall sample size from each university was too low for inter-collegiate comparison in this study.

Web 2.0 tools were used in one section of an upper level undergraduate e-Business class at the first university. Specifically, the students incorporated the use of wikis, blogs, instant messaging, RSS, widgets, gadgets, You Tube and Second Life. Many facets of social networking, Web communities and collaboration were discussed throughout the semester. Each chapter had several case studies embedded within the chapter, often highlighting "real-world" business that used Web 2.0 technologies.

Blogs--In various Management and Information Systems classes, the professor has used journaling as a way of student self-reflecting and/or summarizing the assigned chapter. Paper journals were used twenty years ago, then the classes migrated to Web 1.0 technologies, for example, using Blackboard to summarize and discuss the chap-

ters. In this class, blogging was used for personal journaling, chapter reflections and summaries. The professor wanted the students to discover on their own how to find a blogging site to use for their assignments, after which they were to discuss the reasons for their selection with their classmates. At the end of each week, the students were to blog on their reactions to the assigned chapter and classroom discussions. Their reflections could include a topical area that they found particularly interesting or particularly difficult to understand, etc. They were also encouraged to include anything else they wanted to write about, for example, the New England Patriots, college sports, new website discoveries. As the semester went on, about fifty percent of the class looked forward to entering in their blog, the other half found it to be "pointless, busy work." Some were disappointed that their blogs were not visited or commented upon. To do over, the professor will have all students use the same blogging site, e.g. Blogger.com, so that the professor and students can have an easier, more convenient way to access the blogs. In future semesters, a mechanism will be put into place where the students will have an opportunity to comment on each other's work. Initially, the instructor purposely did not want it to be a structured exercise; she wanted students to discover how to find a blog and set it up on their own. In addition to mandating the same blogging tool, it is important to stress the importance and benefits of blogging in business and to their careers. This might be an opportunity to have the student find and tag articles on the proliferation of blogs and wikis in today's business environment.

Wiki –A wiki exercise was assigned at the end of the semester. The professor set up a space for the class at WikiSpaces http://www.wikispaces.com. WikiSpaces also has an educational wiki space called *EduWikis* that provides resources for educators wanting to incorporate wikis into their teaching, http://educationalwikis.wikispaces.com/. Before you set up your wiki space for the first time, WikiSpaces invites the first time user to experiment by first "playing in the sandbox." The purpose of this assignment was to have the students create questions and answers, both multiple choice and essay, which would be used for their third and last exam of the semester. An opening page welcomed the student to the wiki space. The welcome included a brief explanation of what a wiki was, how to use the wiki and the specifics of the assignment.

Before beginning the wiki lesson, the class discussed wikis; what they were, who uses them and for what purpose. Once again, the impact on business was also discussed. The professor made it clear to them that they should first construct their questions in Word then copy and paste them into the wiki environment given that only one student at a time could have the wiki open for editing in real time. Students became frustrated when they didn't follow directions and perceived that others were "writing over" their contributions. The professor used this as an opportunity to stress that a wiki is a collaborative environment where participants are encouraged to edit each other's work.

Given that the students were to be individually assessed for their contribution, the author recommends that students use their real names (at least first name, last initial) when they register in the wiki space. It becomes difficult to identify students and ultimately credit them for work when the instructor does not know who, for example, "SummerChik" is.

YouTube was incorporated into the class discussions and "lecture" environment as much as possible. Often times in class, while studying a company, we would spontaneously launch out into YouTube to view a commercial produced for a company, etc. For example, when discussing ubiquitous computing, a student suggested looking at an iPhone ad on You Tube; another suggested viewing "McDonald's Rap" when discussing viral marketing. The students have a great time viewing the videos while "getting" the concepts of ubiquity, viral marketing, etc.

Second Life—The textbook chapter on *ethical, social and political issues in e-commerce* began with a case study on Second Life entitled, *Second Life Gets a Life: Discovering Law and Ethics in Virtual Worlds* (Laudon & Travers, 2008). After a lively discussion, the students launched out to the Second Life Web site, most for the first time. The assignment was to get to know Second Life, to understand its virtual world from a technological, social networking and business perspective. The students had a great time building their own avatars. They began the

assignment in class and finished it outside of class on their own. During the next class, we talked about their experiences while in the virtual world (this was really quite an entertaining conversation). While the majority of the students expressed that they perceived Second Life to be "sketchy", it was incumbent upon the professor to teach them about the new business opportunities provided by virtual worlds such as Second Life. We also discussed a current Newsweek article posted by the professor entitled, *Our Imaginary, Hotter Selves* (Begley, 2008) on the psychological impact of avatars. Many instructors are now using virtual classrooms within Second Life.

Social networking sites (SNS)—The students responded enthusiastically any time we incorporated SNS into the discussion. SNS include Facebook and MySpace, for example. Included in this category were online communities such as iVillage. All of the students already had either a Facebook or MySpace account, or both. We used social networking sites to learn about online communities and social network marketing. The students and professor launched out to their Facebook sites, viewed and discussed the ads, and privacy and security considerations. This exercise enabled the professor to discuss how companies are making money on social networking sites and to review with the students how to set their personal privacy settings. In addition, it took the students outside of the security of their own SNS into other social network sites. While iVillage may not be interesting to a 20 year old male, knowing how others utilize the social network to market to various other target markets in business is, indeed, very important to his future. The key to learning is to take the student out of her or his comfort zone and stress the value of the knowledge to business and to their future as business professionals.

RSS, widgets, gadgets—Students use Google perhaps several times a day to search for a variety of things. When the discussion lead to RSS feeds, gadgets and widgets, a very easy hands-on lesson was to go out to iGoogle, http://www.google.com/ig, and have the students create their own personal "home" page using gadgets, widgets and RSS feeds. Students could add as many gadgets as they wanted, some with real time RSS feeds. They might include the local weather, calendar, Gas Buddy for up-to-date fuel prices, and links to the top stories from their favorite publications, including the New York Times, The Boston Globe, and The Onion. iGoogle also lets the user set personalized themes and tabs. This is a very quick and easy exercise to teach the students about several different Web 2.0 technologies.

Instant Messaging—This particular course was a traditional "land" course; however, we held one online class using AIM. The purpose was to have the students experience a synchronous text-based class discussion. The students prepared for this class the same way they prepared for others; they had to read the chapter and come prepared to discuss the assigned questions. The students were taught IM meeting protocol in advance. During the next in-person meeting, the students were to discuss and assess the online meeting. After some voiced their satisfaction and others their dissatisfaction, the professor had them dissect the meeting. What could we have done to improve the meeting for the next time? The most important discussion was how they would transfer this type of meeting into the "real world". They were asked why more businesses were utilizing IM meetings? The students tend to respond much more favorably to these activities when "real world" situations are related back to the use of the particular technology at hand.

E-collaboration. The instructor attempted to set up a Groove session, to demonstrate how to use e-collaboration tools on the Web. Today's business and IT students are typically accustomed to working in groups. This tool could have benefited them in their studies right out of the gates. In addition, it is a tool that they could have continued to utilize after graduation in their professional work groups. Groove provides a free 30-day trial for those who do not already have Office 2007 (and not all students did). Some of the students had trouble receiving the invitation to join the class Groove group. After several iterations, the professor abandoned the assignment given that the 30-day clock was ticking for many of the students who had successfully joined the group earlier. When using Web 2.0 technologies, the idea is ease of use. If it becomes burdensome to you, then typically the same applies to the students. The author recommends a test run

with a small group of students before attempting to incorporate Groove into the entire class.

During the process of writing this article, some of the details of the recently completed academic year had escaped the author. Many of these activities were impromptu, many planned. Studies have shown that students will respond to the incorporation of Web 2.0 technologies into the curriculum if they do not perceive it as "busy" or "extra" work. The beauty of these technologies is that they are easy to use; they do not require special programming skills.

The author contacted some former students on a Friday night via Facebook and IM soliciting their input. Approximately 80% of the students who received instant messages responded to the inquiry. They helped the author to fill in the blanks in places where her memory had escaped her. This epitomizes the benefits of social networking. None answered the author's email request; all who were available responded via IM.

During one of the conversations, a student said, "Web 2.0 tools have helped my interview process so much." He added that "everyone loves that I write wikis and blogs." He stated that he feels that he has a competitive edge over the applicants who do not have Web 2.0 knowledge. Specifically, this student understands how and why businesses use blogs and wikis. He has gone on to create a Web site that will generate interest for his band using Web 2.0 social networking tools. He is also using Google AdSense and Google Analytics to track site activity.

At the second university, another faculty member used many of the Web 2.0 tools in the undergraduate and graduate online introductory IS course. At the undergraduate level, students were required to write numerous blogs. The first blog was completed during the first week of class and required students to post general personal information and their interests in a blog and then respond to two other students. Since it was a freshman level course, this enabled the students to get to know one another on a personal level and discover things they may have in common.

Both the graduate and undergraduate students were required to read a special report from business week on how executives are using social networks in the workplace. The article can be found at, http://www.businessweek.com/technology/content/sep2006/tc20060911_414136.htm. The students were then asked to discuss the pros and cons of social networking and are asked to discuss what information about them is available in Facebook or on the Web? How are they portraying themselves? Is it professional? Would they feel comfortable having other students, faculty or potential employers view this information? They are then asked if they think they should be careful of what information is posted. Throughout the semester students were also required to read, review and discuss articles on information technology from the Wall Street Journal.

Wikis were used in both the undergraduate and graduate courses. For the graduate online course, a wiki was used to create a test bank for the midterm and final. One of the main reasons for the wiki was the textbook's lack of a robust test bank. Blackboard was the platform that was used for the wiki. Each chapter was a separate wiki and students were required to post two unique multiple choice questions per chapter. Instructions were given for the proper formatting of questions. Grading was based on the quality of the question and the possible multiple choice answers. The questions were then compiled and half of the midterm and final exam questions were taken from the textbook's test bank and the remaining half from the class' wiki questions. For the undergraduate course, wikis were used as a platform where students could collaborate and work on group homework assignments.

In the undergraduate introductory IS class the students were required to create a podcast. The students downloaded the software program Audacity. Audacity is free, open source software for recording and editing sounds and is very easy to use. The students created a podcast for a fictitious bike company. The podcast was then posted as part of a Web site the students created for the course.

Finally, blogs were used as a primary interactive classroom tool for an information technology legal and regulatory course at a third university. Legal topics would be initially raised by the instructor at the beginning of class and students would conduct Internet research on the topic and/or specific cases,

laws, or rulings based on the topic. The results of the search were posted in a series of blogs. These blogs were reviewed in class by each student and served as a basis for active and fruitful discussion. The class received extremely high reviews for class format reinforcing that Web 2.0 tools are an effective and useful tool for facilitating education of today's information technology student.

HYPOTHESES

In conjunction with our instruction, students were asked a series of questions relating to their education, knowledge, and perceived importance of Web 2.0 skills. As a result a series of hypotheses were developed.

Hypothesis one: There will a significant increase in knowledge of and comfort level for all Web 2.0 tools after specific directed instruction.

Hypothesis two: After instruction, knowledge and skills in use of Web 2.0 tools will be believed to be

a) useful classroom assignments and

b) useful after graduation and in the workplace.

Hypothesis three: Perceptions of usefulness of Web 2.0 tools after graduation and in the workplace will be directly and significantly related to usefulness of classroom assignments and show no significant difference in usefulness.

Hypothesis four: Knowledge of and comfort level with the Web 2.0 tool, Second Life will be positively associated with projected usefulness after graduation and in the workplace.

Hypothesis five: Knowledge of and comfort level with the Web 2.0 tool, Blogs will be positively associated with projected usefulness after graduation and in the workplace.

Hypothesis six: Knowledge of and comfort level with the Web 2.0 tool, Wikis will be positively associated with projected usefulness after graduation and in the workplace.

Hypothesis seven: Knowledge of and comfort level with the Web 2.0 tool, Social Networking will be positively associated with projected usefulness after graduation and in the workplace.

Hypothesis eight: There will be a significant difference by gender for both knowledge of and comfort levels of Web 2.0 tools before the class instruction.

Hypothesis nine: There will be a significant difference by gender for both knowledge of and comfort levels of Web 2.0 tools after the class instruction.

RESULTS

Hypothesis one: There will a significant increase in knowledge of and comfort level for all Web 2.0 tools after specific directed instruction. In order to measure the effect of pre and post testing, a paired samples t test for dependent means was performed (Table 1 and Appendix 1). This was to determine whether there was there was a significant improvement in both knowledge of and comfort level with each Web 2.0 tool before and after the class.

Table 1 Paired Samples Statistics

Pair		Mean	Std. Dev.	Std.Err Mean
1.	KBblog	2.7586	1.05746	.19637
	kABlog	4.2069	.61987	.11511
2.	kBWiki	1.9310	1.09971	.20421
	KAWiki	4.0690	.79871	.14832
3.	KBSec.life	1.6897	1.00369	.18638
	kASec.life	3.3448	1.23276	.22892
4.	kBSoc.Net	4.3793	.72771	.13513
	kASoc.Net	4.6897	.54139	.10053
5.	cBblog	2.4828	1.15328	.21416
	CAblog	3.9310	.84223	.15640
6.	cBWiki	2.2069	1.04810	.19463
	CAWiki	3.7241	.75103	.13946
7.	CBSec.life	1.7241	1.09859	.20400
	CASec.life	2.9655	1.23874	.23003
8.	CbSoc.net	3.9310	.92316	.17143
	CASoc.Net	4.4828	.87099	.16174

N=29

As can be seen in Table 1, for all areas, including blogs, wikis, SecondLife, and Social Networking, knowledge was increased after the class.

Likewise, for all the Web 2.0 tools, comfort level was increased after the class. These increases were shown to be statistically significant in all cases at $p < .05$. The null hypotheses of no significant difference was rejected in all cases in favor of the research hypotheses that there was a significant increase in knowledge of and comfort level for all Web 2.0 tools after specific directed instruction. For all the tables, please note that in variables First letter: K is Knowldege, C is comfort, Second letter: B is Before, A is after. And all increases are significant at $p < .05$ based on a paired sample t test

Hypothesis two: After instruction, knowledge and skills in use of Web 2.0 tools will be believed to be

a) useful classroom assignments and

b) useful after graduation and in the workplace.

To test this hypothesis, a one-sample t-test was used whether the respondents believed that Web 2.0 tools usefulness was significantly different from a neutral rating of 3.0. In table 2, results show that the usefulness of all tools except SecondLife after graduation were above 3.0.

Table 2. One- Sample Statistics

	Mean	Std. Dev.	Std. Err. Mean
UseBlog	3.7857	.99469	.18798
UseWiki	4.1429	.84828	.16031
UseSeclife	3.0357	1.34666	.25449
UseSocNet	4.3571	.91142	.17224
Gradblog	4.3571	.67847	.12822
GradWiki	4.1786	.90487	.17100
GradSecLife	2.8929	1.37003	.25891
GradSocNet	4.4643	.63725	.12043

N= 28

In Appendix 2, a t-test for a significant difference, blogs, wikis, and social networking all were shown to be significantly different from neutral. Second Life was not seen as different from neutral both in general and after graduation. Hypothesis two was primarily supported. After instruction, knowledge and skills in use of all Web 2.0 tools except Second Life will be believed to be

a) useful classroom assignments and

b) useful after graduation and in the workplace.

Test of usefulness in classroom and after graduation show all to be over neutral. In rank order they were Social Networking, Wikis, Blogs, then second life.

Hypothesis three: Perceptions of Usefulness of Web 2.0 tools after graduation and in the workplace will be directly and significantly related to usefulness of classroom assignments and show no significant difference in usefulness. In order to test this, a t-test sample of dependent means was performed. The results in table 3 show that for all Web 2.0 tools except blogs, the usefulness measure was very close between classroom and real world. Appendix 3 confirms no significant difference between usefulness of Wikis, SecondLife and Social Networking, between classroom assignments and opinions of usefulness after graduation and in the workplace. Blogs were estimated to have significantly more usefulness after graduation and in the workplace than the classroom assignments.

Table 3. Paired Samples Statistics

Pair		Mean	Std. Dev	Std. Err Mean
1.	UseBlog	3.7857	.99469	.18798
	Gradblog	4.3571	.67847	.12822
2.	UseWiki	4.1429	.84828	.16031
	GradWiki	4.1786	.90487	.17100
3.	UseSeclife	3.0357	1.34666	.25449
	GradSeclife	2.8929	1.37003	.25891
4.	UseSocNet	4.3571	.91142	.17224
	GradSocNet	4.4643	.63725	.12043

N=28

In comparing classroom usefulness to usefulness after graduation only blogs showed a

significant change and increase. Hypothesis three was generally supported.

Hypothesis four: Knowledge of and comfort level with the Web 2.0 tool, Second Life will be positively associated with projected usefulness after graduation and in the workplace.

A multiple regression analysis was undertaken to test this hypothesis. Appendix 4 shows that neither "knowledge of Second Life" nor "comfort level with Second Life" significantly affected projected usefulness after graduation and in the workplace at $p < .05$. Hypothesis four was rejected.

Knowledge and comfort in second life do not correlate with increased usefulness of the Web 2.0 tool after graduation at $p < .05$

Hypothesis five: Knowledge of and comfort level with the Web 2.0 tool, Blogs will be positively associated with projected usefulness after graduation and in the workplace.

A multiple regression analysis was undertaken to test this hypothesis. Appendix 5 shows that neither "knowledge of Blogs" nor "comfort level with Blogs" significantly affected projected usefulness after graduation and in the workplace at $p < .05$. Hypothesis five was rejected.

Knowledge and comfort of blogs do not correlate with increased usefulness of the Web 2.0 tool after graduation at $p < .05$.

Hypothesis six: Knowledge of and comfort level with the Web 2.0 tool, Wikis will be positively associated with projected usefulness after graduation and in the workplace. Another multiple regression analysis was undertaken to test this hypothesis. Appendix 6 shows that neither "knowledge of Wikis" nor "comfort level with Wikis" significantly affected projected usefulness after graduation and in the workplace at $p < .05$. Hypothesis six was rejected.

Knowledge and comfort of wikis correlate with increased usefulness of the Web 2.0 tool after graduation at $p < .05$. Though at $p < .10$ comfort with wikis did correlate with usefulness of blogs after graduation

Hypothesis seven: Knowledge of and comfort level with the Web 2.0 tool, Social Networking will be positively associated with projected usefulness after graduation and in the workplace. A multiple regression analysis was undertaken to test this hypothesis. Table ten shows that knowledge of social networking correlated with increase usefulness of the Web 2.0 tool after graduation at $p < .05$ but comfort with social networking did not. Hypothesis seven was only partially supported.

It is suggested that many computer and communications tools differ by gender. As a result the final two hypotheses are proposed.

Hypothesis eight: There will be a significant difference by gender for both knowledge of and comfort levels of Web 2.0 tools before the class instruction.

Hypothesis nine: There will be a significant difference by gender for both knowledge of and comfort levels of Web 2.0 tools after the class instruction. An independent samples t test was performed on the data and little differences in Web 2.0 results were found. Only two were significant by gender. Both Knowledge of Blogs after the class and usefulness of Wikis in class were significantly higher for males than females. All other differences for blogs, wikis, social networking, and second life were found not to be statically significant. Both Hypothesis eight and nine were rejected.

There was not a significant difference by gender for both knowledge of and comfort levels of Web 2.0 tools before the class instruction. There was not a significant difference by gender for both knowledge of and comfort levels of Web 2.0 tools after the class instruction.

CONCLUSION

The literature review suggests the importance of Web 2.0 tools. Blogs, wikis, social networking and other collaborative tools are changing the way we communicate in society. Knowledge of these skills is critical for today's information technology student as they enter the workforce. In addition they are a significant evolution in information exchange for all ages and groups in society. This study has shown that there was a significant increase in knowledge and comfort levels for all Web 2.0 tools after our specific instruction. Students can effectively be taught use of Web 2.0 skills with our instruction. Blogs, wikis, and social networking skills were judged to be useful both in classroom and in the workplace. In addition,

blogs were thought to be significantly more useful in the workplace. Generally, it was found that there seems to be an intrinsic belief in the usefulness of Web 2.0 tools after graduation. Mere knowledge and comfort level did not influence usefulness. Finally, gender seemed to play little role in knowledge or comfort levels of Web 2.0 tools before or after instruction. Only knowledge of blogs after the class and usefulness of wikis in class showed a significant higher result for males than females. This suggests that Web 2.0 instruction and education may be more or less gender neutral.

Overall, then it can be said that yes, Web 2.0 matters. The skills are judged important both in class and in the workplace. Common gender neutral instruction can be effective in advancing the use of these important collaborative tools. The methods presented are suggested to be incorporated in all information systems curricula.

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Appendix 1. Paired Samples Test

Pair		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
1	KBblog - kABlog	-1.44828	1.12078	.20812	-1.87460	-1.02195	-6.959	28	.000
2	kBWiki - KAWiki	-2.13793	1.12517	.20894	-2.56592	-1.70994	-10.232	28	.000
3	KBsecondlife – kAsecondlife	-1.65517	1.28940	.23944	-2.14564	-1.16471	-6.913	28	.000
4	kBSocialNet – kASocialNet	-.31034	.66027	.12261	-.56150	-.05919	-2.531	28	.017
5	cBblog - CAblog	-1.44828	1.15221	.21396	-1.88655	-1.01000	-6.769	28	.000
6	cBWiki - CAWiki	-1.51724	.98636	.18316	-1.89243	-1.14205	-8.284	28	.000
7	CBsecondlife – Casecondlife	-1.24138	1.09071	.20254	-1.65626	-.82649	-6.129	28	.000
8	CbSocialnet – CASocialNet	-.55172	1.08845	.20212	-.96575	-.13770	-2.730	28	.011

Appendix 2. One-Sample Test

	Test Value = 3					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
UseBlog	4.180	27	.000	.78571	.4000	1.1714
UseWiki	7.129	27	.000	1.14286	.8139	1.4718
Usesecondlife	.140	27	.889	.03571	-.4865	.5579
UseSocialNet	7.879	27	.000	1.35714	1.0037	1.7106
Gradblog	10.585	27	.000	1.35714	1.0941	1.6202
GradWiki	6.892	27	.000	1.17857	.8277	1.5294
Gradsecondlife	-.414	27	.682	-.10714	-.6384	.4241
GradSocialnet	12.159	27	.000	1.46429	1.2172	1.7114

Appendix 3 Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	UseBlog – Gradblog	-.57143	.87891	.16610	-.91224	-.23062	-3.440	27	.002
Pair 2	UseWiki – GradWiki	-.03571	.74447	.14069	-.32439	.25296	-.254	27	.802
Pair 3	Usesecondlife – Gradsecondlife	.14286	1.29713	.24513	-.36012	.64583	.583	27	.565
Pair 4	UseSocialNet – GradSocialnet	-.10714	.62889	.11885	-.35100	.13672	-.902	27	.375

Appendix 4. Coefficients[a]

Model	Unstandardized Coeff.		Standar-dized Coeff.	t	Sig.
	B	Std. Err	Beta		
(Constant)	2.044	.900		2.271	.032
kASecLife	.257	.259	.219	.994	.330
CASecLife	-.010	.251	-.009	-.042	.967

a. Dependent Variable: Gradsecondlife

Appendix 5. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.121	.949		4.342	.000
	CAblog	.163	.167	.206	.974	.340
	kABlog	-.096	.228	-.089	-.421	.677

a. Dependent Variable: Gradblog

Appendix 6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.500	.995		2.511	.019
	KAWiki	-.031	.222	-.028	-.138	.891
	CAWiki	.486	.236	.409	2.054	.051

a. Dependent Variable: GradWiki

Appendix 7. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.265	1.035		2.188	.038
	kASocialNet	.548	.246	.459	2.228	.035
	CASocialNet	-.085	.149	-.118	-.571	.573

a. Dependent Variable: GradSocialnet