In-Service Teachers' Self-Efficacy, Professional Development, and Web 2.0 Tools for Integration

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Abstract

Background: The implementation and integration of computer technologies in K-12 education has seen nearly constant growth since the early 1980s (Culp, Honey, Mandinach & Bailey, 2003), in part because this trend has become synonymous with skills that students will need as participants in a competitive global economy (Culp et al., 2003). It has been argued that the integration of Web 2.0 tools into K-12 education will help students acquire such skills, as the web-based platforms offered by Web 2.0 provide an open, dynamic environment allowing all end-users to participate, interact, and collaborate with instructors, peers, friends, and unknown people worldwide (Buffington, 2008; Jonassen, Howland, Marra & Crismond, 2008; Solomon & Schrum, 2007). This paper investigated the relationship between in-service teachers' self-efficacy and the integration of Web 2.0 tools (e.g., blogs, wikis, podcasts, social networking sites, image/photo sharing sites, & course management systems) at K-12 public schools in the United States.

Goals: This study identified the factors predicting the utilization of these Web 2.0 tools in classroom instruction. It provides insight into the barriers of technology integration for future implementation.

Research Method: A nationwide stratified sample frame was utilized to collect quantitative data through a web survey. A multiple regression analysis was employed to isolate the factors influencing the integration of Web 2.0 tools in K-12 classrooms.

Results: A total of 559 in-service teachers responded to this research invitation. The results revealed public in-service teachers reported a low level of self-efficacy in using Web 2.0 tools, as well as a low frequency of Web 2.0 tools integration in their classrooms. Three out of five predictors included: teachers' self-efficacy, professional development, and school administrative support significantly predict the use of Web 2.0 tools.

Keywords: self-efficacy, professional development, Web 2.0

在職教師自我效能、專業發展、Web2.0工具的運用

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摘要

*研究背景：*自1980年代開始，電腦科技使用於K-12教育已持續成長至今(Culp, Honey, Mandinach & Bailey, 2003)，因為使用電腦科技已成為學生未來投入激烈競爭的全球經濟體系之必要技能的趨勢（Culp et al., 2003）。有人主張將Web 2.0工具納入K-12教育有助於學生掌握這種技能，Web 2.0網路平台提供開放及動態的環境，讓所有終端使用者能與教師、同儕、朋友、和全球各地不認識的人一起參與、互動、合作學習（Buffington, 2008; Jonassen, Howland, Marra & Crismond, 2008; Solomon & Schrum, 2007）。本研究調查美國K-12公立學校的在職教師之自我效能與Web 2.0工具於課堂上教學使用之關係（相關的Web 2.0工具包含：部落格、wiki、podcasts、社群網站、圖片分享網站、課程管理系統）。

*研究目的：*預測影響使用Web 2.0工具於課堂教學中的變項，提供深度解析，以利未來使用該工具於教學中所可能遇到的實施障礙解答。

*研究方法：*透過網路問卷的方式，蒐集量的研究資料，樣本來自全國性的分層隨機取樣。使用多元迴歸分析辨識K-12教學上使用Web 2.0 工具的影響因素。

*研究結果：*總共有 559 位在職教師回應本研究計畫之邀請。結果表明，公立在職教師通報使用 Web 2.0 工具於課堂教學上呈現低自我效能，使用 Web 2.0 工具於課堂教學之頻率亦偏低。教師自我效能、專業發展和學校行政支援等三項因素，為預測 Web 2.0 工具於課堂上之教學使用的主要預測變項。

關鍵詞：自我效能、專業發展、Web 2.0

Introduction

The use of Web 2.0 tools offers learners the opportunity to interact with information of high quality and depth (Lemke, Coughlin, Garcia, Reifsneider & Baas, 2009).Web 2.0 tools facilitate collaboration and interaction, offer possibilities for immediate feedback, foment social connections and communities, and harness collective intelligence with no associated costs (Buffington, 2008; Jonassen, et al., 2008; Liu, 2008; Solomon, & Schrum, 2007). Current research indicates that using Web 2.0 tools benefits teaching and learning in educational settings (Buffington, 2008; Jonassen et al., 2008; Lemke et al. 2009; Solomon & Schrum, 2007). With Internet connectivity, users can freely tailor these tools to meet their personal needs and interests. Schools that integrate Web 2.0 tools in teaching may "attract students to school work, meet individual learning needs, develop students' critical thinking skills, provide an alternative learning environment, expand learning outside schools, and prepare students for lifelong learning" (Lemke et al., 2009, p. 7).

Today, American students are not only familiar with digital tools and devices (e.g., the Internet, iPod, online games), they also often participate in the Web 2.0 environment in their personal life (Lemke et al., 2009; Project Tomorrow, 2009b; 2010). Meanwhile, in order to enhance their learning, students want schools to provide more computer technology tools as well as a concomitant reduction of limitations on school-based Internet access (Project Tomorrow, 2008; 2009a; 2010). It is worth noting that prior research (Bakia, Yang & Mitchell, 2008; Lemke et al., 2009; Project Tomorrow, 2009a; 2009b; 2010) indicates a large gap between teachers and students regarding the adopting of computer technologies for personal use and school tasks. This gap must be bridged before computer technologies can be integrated successfully into classrooms.

Review of Literature

Theoretical Framework: Self-Efficacy

This research study has chosen self-efficacy as the theoretical framework for predicting the integration of Web 2.0 tools in K-12 schools. Self-efficacy has been used successfully by prior studies as a highly reliable measurement for predicting the integration or implementation of technology in education (Curts, Tanguma & Peña, 2008; Lumpe & Chambers, 2001; Morales, Knezek & Christensen, 2008; Niederhauser & Perkmen, 2008).

Bandura (1997) asserts that "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true" (p. 2). Regardless of the accuracy of the judgment, Bandura (1982) argues that an individual's behavioral choices are dominated by the judgment of efficacy beliefs. In other words, assuming an individual person possesses the proper skills, knowledge, and incentives, and efficacy perceptions influence that person's decision regarding the time and effort s/he will invest in coping with stressful or difficult situations (Bandura, 1982; 1994; Pajares, 2002).

Consequently, due to the fact that what people do and believe may not always be consistent, people's behaviors are usually guided by their perceptions of self-efficacy instead of their actual capabilities (Pajares, 2002). Moreover, while people with high self-efficacy may accomplish tasks far beyond their capabilities, people with low efficacy might underestimate their ability to cope with difficult tasks and fail to finish the work (Bandura, 1982).

The four principle sources of self-efficacy, including performance accomplishment, vicarious experience, verbal persuasion, and physiological states, have been summarized by Bandura (1982; 1994; 1997). Performance accomplishment, one of the most prominent sources of self-efficacy, includes prior performance and mastery experience, which together provide authentic experiences

leading to the development of personal efficacy (Bandura, 1977; 1982; 1984; 1997; Pajares, 2002). Tschannen-Moran and Hoy (2007) found that mastery experiences are the most effective sources of teacher's self-efficacy beliefs. This research examines performance accomplishment with regard to the use of Web 2.0 tools.

Professional Development

The efficiency of professional development influences the adoption and integration of technology in classroom practice (Lawless & Pellegrino, 2007; Rickard, Blin & Appel, 2006;). Prior research conducted by King (2002) indicated that professional development not only improved pedagogy but also practice in using educational technologies.

Professional development also depends to an extent on access to the technologies in question. According to a National Center for Education Statistics survey (2000), almost all (99%) public school teachers had access to computers and the Internet at school and more than half (66%) indicated that they used computers or the Internet for classroom instruction. Evidence suggested that the more teachers participate in professional development, the more they implement technologies into their instruction and the more confident they are in the use of technology (Chen, 2008; King, 2002; Project Tomorrow, 2009a; Wells & Lewis, 2006).

Teachers' Self-Efficacy

A considerable number of studies have documented that professional development enhances teachers' beliefs of self-efficacy regarding the integration and implementation of technology for practical instruction (Albion, 2001; Chen, 2008, Curts, et al., 2008; Faseyitan, et al., 1996; Lumpe & Chambers, 2001; Milbrath & Kinzie, 2000; Niederhauser & Perkmen, 2008; Overbaugh & Lu, 2008; Wang, Ertmer & Newby, 2004; Watson, 2006). Factors influencing teachers' self-efficacy in integrating technology include comfort using computers (Albion, 2001), time to integrate curriculum, instruction, access to Internet at home (Curts et al., 2008), teacher training (Watson, 2006), vicarious experience (Wang et al., 2004) and confidence in performing computer tasks (Ropp, 1999).

Watson (2006) indicated that teachers' self-efficacy was significantly improved and sustained over time after the training program. A study conducted by Overbaugh and Lu (2008) investigated the impact of professional development among 377 in-service K-12 teachers and agreed with prior research as to the positive relationship of self-efficacy with the integration of technology in classroom instructions (Chen, 2008; Faseyitan et al., 1996; Lumpe & Chambers, 2001; Milbrath & Kinzie, 2000; Watson, 2006).

School Administrative Support

The ubiquitous nature of the Internet offers rich opportunities for students and teachers alike when approaching Web 2.0 tools for school use. According to Wells and Lewis (2006), all U.S. public schools had access to the Internet by the year 2000, and evidence confirms that this ubiquitous access to computers has yielded progress in student use of technology in classrooms (Bakia, et al., 2008). Penuel (2006) reported that students now have more opportunity to practice computer technologies and resulting improvements can be seen not only in students' technology literacy and skill but also in stronger writing skills. Still, according to the Project Tomorrow's (2008) online survey, almost half (45%) of middle school students complained about being frustrated and dissatisfied with the adoption of filters and firewalls for Internet security and irritated at technology usage rules at their schools. Online security seems to be an area of disagreement between students and schools.

Research studies indicate that the utilization of Web

2.0 for disseminating various subject contents at numerous grade levels has not yet been widely implemented in real classrooms (Lemke et al., 2009; Liu, 2008). In order to implement Web 2.0 tools in the school setting, school systems must undergo restructuring according to the six categories identified by Lemke et al. (2009), including "instructional approach; focus on student-centered learning; systemic change to effective use of Web 2.0; time and resources for professional development; accommodations for 24/7 learning; and greater access to technology and the Internet" (p. 41).

Method

Participants

A total of 559 in-service K-12 public school teachers responded to the research invitation e-mail message from the researchers. These stratified random samples were recruited from 3 subgroups within 12 states. The first group was based on a regional classification (Northeast, South, Midwest, and West) that is based on the census regions and divisions of the United States (U.S. Census Bureau, 2009). The second group was randomly selected from school districts by using the Statistical Package for Social Science (SPSS) program version 17 software. The final sample lists were randomly selected from schools among the second group. The response rate from the Web survey was 17%. A total of 461 participants filled out the Web survey, while 98 participants indicated their lack of interest in participating in the study.

A total of 379 valid data were used to report the demographic information within 137 (36.1%) male participants and 242 (63.9%) female participants; between the age of 22 to 73 years old (M= 42.64, SD= 11.35); within teaching experience between 0 to 50 years (M= 13.32, SD= 9.47), and using technology in teaching ranged from 0 to 38 years (M= 8.04, SD= 6.67).

Procedures

The data was collected over a three-week period starting in late January 2010. Target participants were recruited by sending out an individual invitation e-mail letter that included the purpose of the study, the URL link of the web survey, and the request that they participate in this research study. Two reminders were sent to remind participants who did not fill out the Web survey online to participate in this study.

Instruments

Validity and reliability.

Face validity and sampling-content validity, are commonly used in measuring the validity of instruments (Light, Singer & Wilett, 1990). Three college faculty professors are experts in the field of computer technology and education research from a Research I university in Midwestern United States. They reviewed and revised all the items of the two instruments which were used for this research study. Their review help to overcome the imperfectness of achieving face validity (Light et al., 1990) due to the "lack of statistical index of content validity" (Mueller, 1986, p. 63). Therefore, a pilot study was conducted 4 months prior to the final research study with a response rate of 84% with 16 valid data samples of teacher candidates that represented the potential target population. This was carried out to achieve the measure of content validity (Light et al., 1990) and did support the content validity to a certain degree. First, the respondents of the pilot study did not report confusing wording or unclear statements for the understanding and answering of questions within the instrument. In addition, the pilot study revealed similar results as the final study, which reported participants rarely used Web 2.0 tools.

Cronbach's alpha coefficient was utilized to test the internal consistency of the instruments for this research study in order to learn the consistence of the responses.

The internal reliability of the pilot study was .78 for Web 2.0 tools integration instrument (WTII) and .98 for Web 2.0 tools integration self-efficacy instrument (WTISEI) respectively. Based on the results of the pilot study and suggestions of the experts, a revision of the instruments was constructed. In addition, the Cronbach alpha for WTII instrument was .65 and for WTISEI was.98 respectively.

Web 2.0 tools integration instrument (WTII).

The 6-item WTII was modified from prior research studies (Milbrath & Kinzie, 2000; Vannatta & Fordham, 2004) aimed at measuring the current use frequency of Web 2.0 tools in school classrooms. There were six items accompanied by a five-point Likert scale with the following labels: 'daily (5)', 'at least once a week (4)', 'at least once a month (3)', 'at least once a year (2)' and 'never (1).' The participants were to rate the use frequency of Web 2.0 tools in their classrooms. The Cronbach alpha for this instrument was .65.

Web 2.0 tools integration self-efficacy instrument (WTISEI).

The 30-item WTISEI was developed by modifying similar prior research on computer technology applications (Curts, et al., 2008; Milbrath & Kinzie, 2000; Morales, et al., 2008; Niederhauser & Perkmen, 2008; Ropp, 1999; Wang, et al., 2004), as well as taking into account the guideline for self-efficacy scales construction as proposed by Bandura (2006). It focused on assessing the level of teachers' self-efficacy in using Web 2.0 tools in their teachings. There were five items for each Web 2.0 tool accompanied by a five-point Likert scale: 'strongly agree (5)', 'agree (4)', 'neutral (3)', 'disagree (2)', and 'strongly disagree (1)'. This instrument requested participants to rate their agreement according to statements describing their skill in operating Web 2.0 tools (e.g., 'when using Web 2.0 tools in teaching, I feel confident that I can use course management systems to create quizzes for my students online'). This instrument obtained a high reliability of Cronbach alpha .98.

Data Analysis

Research methods and descriptive statistics were used to analyze demographic information, to calculate the use frequency of Web 2.0 tools, and to determine teachers' self-efficacy in using Web 2.0 tools. Multiple regression was utilized to answer the previous defined research question "What factors predict teachers' use of Web 2.0 tools in K-12 classrooms?"

Results

Use of Web 2.0 tools.

The 6-item WTII instrument resulted in 434 valid data reporting the use frequency of Web 2.0 tools in school classrooms, in responding to six Web 2.0 tools, including blogs (M= 1.25, SD= .77), wikis (M= 1.44, SD= .98), podcasts (M= 1.31, SD= .75), social networking sites (SNSs) (M= 1.37, SD= 1.0), image/photo sharing sites (IPSs) (M= 1.61, SD= 1.01), and course management systems (CMSs) (M= 1.89, SD= 1.45). The participants, in general, reported a very low frequency of using Web 2.0 tools: the mean of the average use of these Web 2.0 tools was only 1.47 (SD=.62), which suggests that teachers tended toward the response of 'never' in terms of using these tools.

The results indicated that most participants reported they 'never' used Web 2.0 tools, ranging from 383 (Blogs, 88.2%) to 296 (CMSs, 68.2%). In contrast, few participants reported they used Web 2.0 tools every day, with a range of 4 (Podcast, 0.9%) to 52 (CMSs, 12%).

Teachers' self-efficacy in using Web 2.0 tools.

As the WTISEI instrument was comprised of 30 items, some items were found to be missing among participants. Therefore, there are different numbers of valid

data reported among individual Web 2.0 tools.

The participants were asked to rate their skills in operating Web 2.0 tools, their confidence levels are as follows: IPSs (M= 3.46, SD= 1.34), SNSs (M= 3.32, SD= 1.25), CMSs (M= 3.32, SD= 1.25), Blogs (M= 3.08, SD= 1.35), Podcasts (M= 2.81, SD= 1.28), and Wikis (M= 2.77, SD= 1.29). The average use of these Web 2.0 tools (M= 3.13, SD= 1.11) indicates that teachers' self-efficacy tended to be 'neutral', which means they were unsure if they had enough confidence to use these Web 2.0 tools.

In comparing the mean of the use frequency of Web 2.0 tools and teachers' self-efficacy in operating these Web 2.0 tools, the results suggest that the uncertainty of teachers' confidence in using Web 2.0 tools agreed with the rare use of these tools in their teaching.

Factors predicting the use of Web 2.0 tools in teaching.

Due to the fact that 136 participants were treated as missing data as they had reported they 'do not know Web 2.0 tools' in responding to the survey item 'school administrative support the use of Web 2.0 tools', only 243 data were used to conduct the multiple regression equation. After deleting the outliers and influential cases, a total of 236 valid data were used to conduct the multiple regression analysis in predicting the use of Web 2.0 tools at schools.

A hierarchical regression was utilized for multiple regression analysis in order to identify the variable most influential in predicting the outcome. First, factors such as professional development, access to Web 2.0 tools at school, access to Web 2.0 tools at home, and school administrative support were entered together in the first step. Then, 'teachers' self-efficacy in using Web 2.0 tools' was calculated with the above factors in step 2.

The *F*-ratios indicate two of the models are a good fit, and both have significant results (Table 1): the F-ratio is 10.426 ($p < .05$) in step 1 and 14.196 ($p < .05$) in step 2. The results suggest that in model two, the entered of variable 'teachers' self-efficacy in using Web 2.0 tools' predicts the outcome not only significantly but even better, as it explains an additional 8.3% of variance (Table 1). This result suggests that teachers' self-efficacy is a strong predictor for the integration of Web 2.0 tools in school classrooms.

Table 1

Summary of R^2 Values and R^2 Changes at Each Step in the Hierarchical Multiple Regression

Predictors Included	R^2 for Model	Adjusted R^2	F for Model	R^2 Change	F for R^2 Change
Step 1	0.153	.138	F(4, 231)= 10.426*	0.153	F(4, 231)= 10.426*
Step 2	0.236	.219	F(1, 230)= 14.196*	0.083	F(1, 230)= 24.950*

Note. dependent variable: web 2.0 tools integration, * $p < .05$.
Step 1: professional development, access to web 2.0 tools at school, access to web 2.0 tools at home, school administrative support.
Step 2: professional development, access to web 2.0 tools at school, access to web 2.0 tools at home, school administrative support, teachers' self-efficacy in using Web 2.0 tools.

The results suggest that three out of five independent variables, including professional development ($t(230)=2.349$, $p<.05$), school administrative support ($t(230)=2.969$, $p<.05$) and teachers' self-efficacy in using Web 2.0 tools($t(230)=4.995$, $R2=0.083$, $p<.05$), contribute significantly to the multiple regression equation (Table 2).

Table 2

Results of Hierarchical Multiple Regression

	B	SE B	β	t	Sig.
Step 1					
Constant	1.144	0.093		12.313	.000
Professional development	0.007	0.002	0.200*	3.196	.002
Access to Web 2.0 tools at school	0.127	0.097	0.103	1.303	.194
Access to Web 2.0 tools at home	-0.043	0.086	-0.033	-0.506	.613
School administrative support	0.113	0.039	0.228*	2.869	.004
Step 2					
Constant	0.628	0.136		4.614	.000
Professional development	0.005	0.002	0.142*	2.349	.020
Access to Web 2.0 tools at school	0.132	0.093	0.108	1.427	.155
Access to Web 2.0 tools at home	-0.131	0.083	-0.098	-1.569	.118
School administrative support	0.111	0.037	0.224*	2.969	.003
Teachers' self-efficacy in using Web 2.0 tools	0.176	0.035	0.302*	4.995	.000

Note. R^2=0.153 for step 1, R^2=0.083 for step 2, dependent variable: Web 2.0 tools integration, * p<.05

The independent variables explained the outcome to a medium degree with the effect size of .31 in this multiple regression model. It suggests that factors including teachers' self-efficacy in using Web 2.0, professional development, access to Web 2.0 tools at school, access to Web 2.0 tools at home, and school administrative support had a medium effect on the integration of Web 2.0 tools in K-12 public school classrooms.

Teachers' suggestions for using Web 2.0 tools.

Additional qualitative data were collected voluntarily by a short open-ended question at the end of the survey in order to gain detailed information from participants about their opinions or suggestions for using Web 2.0 tools with students. Participants reported that schools either filtered or blocked some Web 2.0 tools sites for the purpose of protecting students from coming into contact with unwanted or inappropriate materials. This action not only prevented students from accessing Web 2.0 tools but also discouraged teachers from adopting these tools in their classrooms. In addition, teachers reported that they had limited resources, supports, training, knowledge, and experience; furthermore, they lacked confidence in using these tools.

The unknown of e-safety is one of the main concerns for teachers, school administrators, and parents in encouraging students to use Web 2.0 tools. Participants reported that the needs of safety protocols and use policies should be taken into serious consideration when integrating Web 2.0 tools in school classrooms.

Discussions

The independent variables 'teachers' self-efficacy, professional development, and school administrative support' significantly predict the integration of Web 2.0 tools in schools was supported by the multiple regression equation analysis. These three factors are vital issues when considering the integration of Web 2.0 in teaching and will be discussed as below.

Prior research studies indicated teachers with a high or strong sense of self-efficacy tended to exert greater

efforts (Knoblauch & Hoy, 2008) and are more willing to integrate new implementations (Evers, Brouwers & Tomic, 2002) into their teaching. The results of this study suggest teachers' self-efficacy in using Web 2.0 tools is the primary predictor of Web 2.0 tools integration in school classrooms. This finding agrees with prior research studies showing that self-efficacy is a reliable predictor of behavior change for new technology integration.

Furthermore, this independent variable was positive significantly related to Web 2.0 tools integration with a Pearson correlation coefficient of $r = .302$, $p = .000$ ($p < .05$). This indicates the increase in self-efficacy was correlated with an increase in the use of Web 2.0 tools. As the study showed that teachers are uncertain regarding their ability to implement Web 2.0 tools, this would seem to agree with the current rare use of these 2.0 tools in K-12 public schools.

Prior research (Albion, 2001; Chen, 2008, Curts et al., 2008; Faseyitan, et al., 1996; Lumpe & Chambers, 2001; Milbrath & Kinzie, 2000; Niederhauser & Perkmen, 2008; Overbaugh & Lu, 2008; Wang et al., 2004; Watson, 2006) suggests that professional development is one of the most important factors influencing whether school teachers use and implement classroom technology, which agrees with the finding of this study. Professional development not only significantly predicts but is also positive significantly related to the outcome with a Pearson correlation coefficient of $r = .142$, $p = .020$ ($p < .05$). This suggests that an increase in professional development was correlated with an increase in the use of Web 2.0 tools.

The literature reviewed indicates that professional development enhances teachers' beliefs of self-efficacy (Faseyitan et al., 1996; Overbaugh & Lu, 2008), which assists teachers in implementing technology in their instructional settings. Evidence suggests that as teachers spend more time in professional development, they increase their confidence in using technology, as well as their willingness to implement technologies in their instruction (Chen, 2008; King, 2002; Project Tomorrow, 2009a; Wells, & Lewis, 2006).

Both quantitative and qualitative data suggest the need for school administrative support for the integration of Web 2.0 tools in instructional settings. The Pearson correlation coefficient among school administrative support and the outcome is $r = .224$, $p = .003$ ($p < .05$), which suggests an increase in school administrative support is associated with an increase in teachers' use of Web 2.0 tools in classrooms.

The qualitative data suggested that school districts and administrations not only need to understand the benefits but provide technology resources for the integration of Web 2.0 tools. Meanwhile, the re-evaluation of the use policy regarding the practice of blocking or filtering out certain Web 2.0 tools by schools is a concern because the limitation of accessing Web 2.0 tools at school prevents teachers from adopting these tools in their classrooms.

The truth is many of students live in this web world on a daily basis (Project Tomorrow, 2009a), and they are consumers of Web 2.0 tools (Project Tomorrow, 2008; 2009b; 2010). An initial (and periodically repeated) technology literacy education training (Penrod, 2008) should be considered to aid in the use of these Web 2.0 tools for both teachers and students. Armed with technology literacy, students could learn the use and applications of technology and transfer this knowledge into their life and learning to compete in the 21st century.

Recommendations

Self-efficacy is a perception but not a real action and this research study only focused on self-reported answers among the participants in using Web 2.0 tools instead of testing the technology operating skills. Further research including pre-test and post-test could be conducted in order to investigate the improvements in using these tools in practical conditions. Professional development was an additional predictor that was found to play a vital role in integrating Web 2.0 tools in school classrooms. Further

study focuses on examining individual teachers' needs in different subject areas might facilitate further integration of Web 2.0 tools. The results suggest that the need for school administrative support is one of the influential factors in implementing these tools in teaching. Studies involving school districts, administrators, and decision makers, about the barriers for integrating Web 2.0 tools at schools, may be warranted for future research.

Conclusions

Students are growing up surrounded by a technologically rich environment. They are familiar with digital tools as well as with practicing in the Web 2.0 environment for both their personal and academic work (Lemke, et al., 2009; Project Tomorrow, 2009b; 2010). Findings from prior research studies as well as this study suggest a large gap between teachers and students in the use of Web 2.0 tools. Meanwhile, the integration of Web 2.0 tools in school classroom is in its infancy: the results provided here suggest public teachers only rarely adopt Web 2.0 tools in their teaching. In order to help teachers meet the needs of their students' learning in using Web 2.0 tools, well designed professional development, as well as school administrative support from their school (e.g., Internet or Web 2.0 tools use policy, technology literacy training) are needed to increase self-efficacy in operating these tools.

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Appendix A: Web 2.0 tools integration instrument (WTII)

Web 2.0 Tools Integration

Please check how often do you use the following Web 2.0 tools with your students (check one for each category) and indicate what kinds of Web 2.0 tools do you use.

Please Check one for each category

	Daily	At least once /week	At least once/ month	At least once/ year	Never
Blog	○	○	○	○	○

List Blog you use for teaching

Please Check one for each category

	Daily	At least once /week	At least once/ month	At least once/ year	Never
Wiki	○	○	○	○	○

List Wiki you use for teaching

Please Check one for each category

	Daily	At least once /week	At least once/ month	At least once/ year	Never
Podcast	○	○	○	○	○

List Podcast you use for teaching

Please Check one for each category

	Daily	At least once /week	At least once/ month	At least once/ year	Never
Social Networking Sites(Ex: Facebook, MySpace, Second Life,...etc.)	○	○	○	○	○

List Social Networking Sites you use for teaching

Please Check one for each category

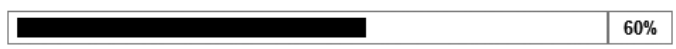
	Daily	At least once /week	At least once/ month	At least once/ year	Never
Image/Photo Sharing sites(Ex: Flickr, Picasa, ...etc.)	○	○	○	○	○

List Image/Photo Sharing sites you use for teaching

Please Check one for each category

	Daily	At least once /week	At least once/ month	At least once/ year	Never
Course Management Systems (Ex: Angel, Blackboard, Moodle, WebCT,...ect.)	○	○	○	○	○

List Course Management Systems you use for teaching



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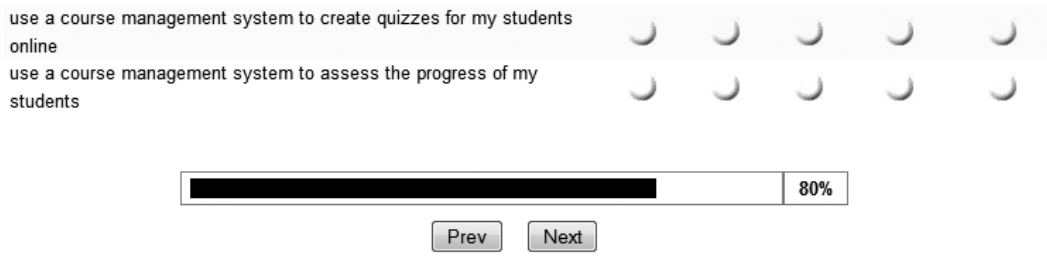
Appendix B: Web 2.0 tools integration self-efficacy instrument (WTISEI)

Web 2.0 Integration Self-efficacy

Please rate your level of agreement using the follow scale: Strongly Agree(SA), Agree(A), Neutral(N), Disagree(D), Strongly Disagree(SD).

When using Web 2.0 tools in teaching, I feel confident that I can...

	Strongly Agree(SA)	Agree(A)	Neutral(N)	Disagree(D)	Strongly Disagree(SD)
create my own blog (to be accessed by my students as part of a lesson)					
post news or comment on a blog					
edit or delete information on a blog					
add links on a blog					
upload attached files on a blog					
add information on a wiki					
edit information on a wiki					
delete information on a wiki					
revise the information version for what I want on a wiki (use the history record tool to verify the version I want)					
upload files to wiki, such as pictures, PowerPoint, word documents, pdf files, ...ect.					
use computers to create podcast, such as mp3 file					
use podcast software or applications to record, edit and convert audio file into mp3 file					
upload podcast files online					
download podcast files online					
use RSS feed to subscribe podcast files					
create my own social network site					
post information on social network sites					
maintain contact with my friends through social network sites					
invite friends to join my social network site					
set up profile security level of my social networking sites					
create an Image/Photo Sharing Site account					
use Image/Photo Sharing Sites to upload images/photos online					
use Image/Photo Sharing Sites to edit images/photos(such as add text, resize image, add tags)					
use Image/Photo Sharing Sites to create slideshow or video presentation					
post comment on Image/Photo Sharing Sites					
use a course management system to manage classroom materials, such as post syllabus and curriculum documents					
arrange the layout of my course management system site, such as display course material as weekly, topics or social issues					
use course management system embedded tools to communicate and interactive with my students, such as Blog, wiki, announcement, chat room					


use a course management system to create quizzes for my students online
use a course management system to assess the progress of my students
80%
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