

Learning and Teaching with Web 2.0 Applications in Saudi K-12 Schools

Dr. Khalid Abdullah Bingimlas

*Assistant professor at the Faculty of Education, Dean of Community Service and Continuing Education (DCSCE), Prince Sattam bin Abdulaziz University, PO. Box. 1365, Alkharj, 11992, Kingdom of Saudi Arabia
alghimlas@psau.edu.sa*

ABSTRACT

This study aims to understand teachers' perspectives of the use of Web 2.0 applications in learning and teaching and to explore the barriers to their use. The sample of this study involved teachers from primary, middle, and secondary schools in the Kharj region. The total sample consisted of 352 teachers. A quantitative survey instrument was utilised. Analyses of the resulting data were performed using both descriptive and inferential statistics. The findings of this study indicate that most of the participant teachers are familiar with Web 2.0 applications. However, their uses in education seem to be rarely mentioned. As they reported, the top barriers preventing them from the effective use of Web 2.0 applications in education are related to school level barriers, such as the large number of students in the classroom, the lack access to the Internet in schools, and the lack of a clear plan for the use of Web 2.0 in education. The findings also show that there is a significant difference in teacher responses about Web 2.0 applications in education in accordance with gender, educational levels, and teaching subjects. Finally, recommendations for teachers, educators and educational decision and policy-makers are provided. Recommendations for further research are also offered.

Keywords: Web 2.0 applications, teachers, technology, education, K-12 schools, Saudi Arabia

INTRODUCTION

The use of Information and Communication Technology (ICT) in education has been believed to improve learning and teaching environments (Bransford, Brown & Cocking, 2000; Grabe & Grabe, 2007; Lefebvre, Deaudelin & Loiseau, 2006; Romeo, 2006). The Internet is continually growing and moving from searching tools of information to creating content and collaborating among users. Web 2.0 tools are expected to assist teachers and students to create an effective learning and teaching environment and facilitate blended learning (Majid, 2014). Web 2.0 applications are being implemented at all levels of education with the intention of enhancing learning and teaching (Anastasiades & Kotsiadis, 2013). Web 2.0 tools have impacted a variety of life skills including promoting sharing, collaboration, interaction, socialisation, creativity, autonomy and communication, teamwork, and inventive thinking (Karkoulia, 2016; Kontogeorgi, 2014).

There is evidence that the majority of teachers have a positive attitude towards the integration of Web 2.0 tools into teaching (Karkoulia, 2016; Majid, 2014). However, teachers' uses of Web 2.0 tools in learning and teaching environments still need to be investigated and measured.

Saudi Arabia has expended effort, money and time, to provide new technologies to schools. However, most educators and decision makers concern about whether or not teachers use new technologies in their teaching effectively (Bingimlas, 2010). Many Saudi researchers have been interested in studying the importance of using new technology in education. Several Saudi studies discussed the use of Web 2.0 in high education (i.e. Alhazani 2013; Algumaizy & Alghimlas, 2016; Maatouk 2013). However, rare studies have focused on the use of Web 2.0 in the Saudi middle schools. This study aims to understand Saudi teachers' perspectives of the use of Web 2.0 applications in learning and teaching and to explore the barriers to their use.

WHAT IS WEB 2.0?

The term Web 2.0 was founded by O'Reilly (2005) referring to a new generation of World Wide Web tools that enable users to create and share their own content. Web 2.0 applications can be described as technologies that facilitate online collaboration and interaction with users. This depends on the behaviour of users who need to be more active and collaborative, generative, interactive (Anastasiades & Kotsiadis, 2013). According to Redecker, Ala-Mutka, Bacigalupo, Ferrari and Punie (2009), Web 2.0, sometimes called “*social computing*”, refers to “the range of digital applications that enable interaction, collaboration and sharing between users” (p.19). From their experiences, teachers who participated in a study conducted by Kiyici (2010) defined some popular Web 2.0 applications. For instance, they defined forums as tools used to share and discuss, and blogs as the technologies

used to create personal web sites and share information and experiences. They defined the concept of a wiki as an application used like encyclopaedia and dictionary sites.

WEB 2.0 IN EDUCATION

The idea of using Web 2.0 applications may be based on several learning theories. Dumitrescu (2015) argued that, with the use of Web 2.0, learning and teaching approaches seemed to be based on the theories of connectivism of cognition and instruction. However, they cannot discard other learning theories such as traditional-behaviourist, cognitivist, and constructionist, on which technologies may rely to a lesser extent than connectivism. Farkas (2012) argued that when teachers use Web 2.0 in the classroom learning environment, they need to understand social constructivist and connectivism pedagogy.

Web 2.0 applications have the potential benefit to establish effective teaching and learning environments. For example, Rogers-Estable (2014) suggested that Web 2.0 tools offer opportunities for learning, whilst creating connection and interaction between teachers and students inside and outside of the classroom. These tools help students to create groups for sharing, collaborating, and growing together. Aman et al. (2016) also found that Web 2.0 has contributed to sharing knowledge as it can help students in content sharing, collaboration, and communication. Similarly, Wheeler (2010) found that the use of Web 2.0 helps students who are geographically separated to interact, communicate, and share the learning content of the courses. An et al. (2009) concluded that Web 2.0 applications have allowed users to share content online and to connect with other users who have similar interests. Students using Web 2.0 tools can create, produce, edit, and evaluate knowledge (Richardson, 2009). This can help teachers to create effective student-centred learning environments. According to An et al. (2009), the use of Web 2.0 applications in teaching include building a sense of community and increasing interaction and communication among teachers, students, and other people.

Moreover, Web 2.0 applications can increase students' motivations (Becta, 2008; Karkoulia, 2016). A recent study conducted by Majid (2014) indicated that the perceptions of students towards the use of Web 2.0 applications were positive. Dumitrescu (2015) found that the integration of Web 2.0 into classroom learning helps teachers to expand and diversify teaching and learning approaches, and thus increases student motivation and engagement.

Furthermore, the use of Web 2.0 applications in learning and teaching environments provide valuable pedagogical tools. For instance, Newland and Byles (2014) argued that the use of Web 2.0 applications can create a different pedagogical approach through collaborative learning and the social creation of knowledge. Learning and teaching with Web 2.0 requires new teaching and learning skills. The new learning approach, called "learning 2.0" by Redecker et al., (2009) requires teachers who can act as guides, coaches, facilitators, and moderators, who provide a supportive, collaborative and interactive learning environment. In a similar view, Farkas (2012) called the new learning as "Pedagogy 2.0", which can be described as a learning ecology that unlocks the benefits of participatory technologies (p. 11). Such an environment allows for the creation of a learning community among students who can contribute to and discuss collaborative thinking and understanding of the topic. Recent studies have emphasised the significant need to adjust traditional methods of education to suit the new technological era and students' mindsets, needs, and expectations (Dumitrescu, 2015; Wilson, 2015). In other words, the new teaching and learning methods that use new technologies, especially Web 2.0, should be student-centred methods that encourage student autonomy, interactivity, collaboration, creativity, and critical thinking.

The use of Web 2.0 applications can also help to develop high level skills when they are used with pedagogical conditions. For example, Anastasiades and Kotsidis (2013) suggest that the use of Web 2.0 in education can develop critical thinking skills, meta-cognitive abilities, and problem-solving skills.

There are hundreds of Web 2.0 applications offering opportunities for creative interaction and the number continues to increase (Karkoulia, 2016). The literature suggests that the top Web 2.0 tools used in education include blogs, wikis, social networking sites such as Facebook and Twitter, video sharing (YouTube), podcasts, and discussion forums (Ahmed, Almuniem & Almabhuh, 2016; Brcta, 2008; Rogers-Estable, 2014). According to Kiyici (2010), teachers can define most of the Web 2.0 applications such as forums, wikis, blogs and social websites, but they have difficulty in defining Really Simple Syndication (RSS) and bookmarking applications. These Web 2.0 applications seem to be very popular and appear to be part of the daily lives of many students. Therefore, these are applications on which this study will focus.

EXAMPLES OF WEB 2.0 APPLICATIONS IN EDUCATION

There are several studies examining specific Web 2.0 applications regarding their use in education. For example, Churchill (2011) argues that blogs seem to be student-centred learning tools; a blog-based environment allows students to access course material, to post reflections on learning tasks, to comment on each other's contributions, and to participate on a regular basis throughout the semester. He concluded that blogs have the potential to support learning and teaching activities. The potential pedagogical use of blogs includes online diaries, discussion fora, or communicative channels; they can encourage students to discuss what they have already learned in the classroom (Anastasiades & Kotsiadis, 2013).

Twitter is a popular micro blogging application that allows users to send and receive brief text, images, and video online. Bicen and Cavus (2012) assert that Twitter can be used as a professional and social networking tool because people can share their interests via Twitter. They found that the most commonly shared items on Twitter are quotes, photos, videos, music, news, IT news, and magazine news.

Grosseck and Holotescu (2008) suggest several advantages of Twitter as an educational tool, such as building a classroom community, collaborating across schools and countries, assessing opinions, encouraging education and sharing best practices, getting helpful information, and making quick announcements. Twitter was proved to be used as an instructional tool (Yakin & Tinmaz, 2013). It can enhance students' interaction with their teachers; it can help communication among students and can enable access to information related to lesson materials (Rinaldo, Tapp & Laverie, 2011). In another study, Kassens-Noor (2012) explored the learning and teaching practices of Twitter as an active, informal, outside-of-class learning tool through a comparative experiment in a higher education classroom setting. The study found that Twitter offers advantages for learning and teaching environments rather than traditional teaching environments. He concluded that Twitter could bring advantages to the e-learning community in higher education. However, Grosseck and Holotescu (2008) argued some negative points of Twitter, such as it being a time-consuming task, not supporting rich learning for students, (sometimes) no social/educational value, Twitter's privacy issues, and Twitter's spam problems.

Facebook is the most popular social network that allows students to communicate, interact, and share with others (Anastasiades & Kotsiadis, 2013). Students appear to be motivated to use Facebook. For example, Roblyer, McDaniel, Webb, Herman and Witty's (2010) findings indicate that students were using Facebook more than faculty members, but members were using traditional technologies such as email much more than the students. They also reported that students were significantly more open to using Facebook and similar technologies to support classroom work.

Another example of Web 2.0 in education is discussion boards (forums). Aljeraisy, Mohammad, Fayyumi and Alrashideh (2015) conclude that discussion boards have a positive impact on students' grades and students' satisfaction with the learning environment. They assert that online forums can encourage students' activity, collaboration, reflection, motivation and social constructivist attributes of learning when they are well designed. However, they may have negative impacts, including their time-consuming nature, and being discouraging when there are too many long posts.

YouTube has been proved to improve learning and teaching approaches. Wilson (2015) argued that teachers' use of YouTube in their teaching practices has valuable learning resource as it can increase student engagement and reduce classroom management issues. In his study, Jaffar (2012) found that there was an awareness about using YouTube in education because it can be an effective tool to enhance anatomy learning if the videos are scrutinised, diversified, and are aimed towards course objectives.

Wikis were introduced more than twenty years ago. Although they do not appear to be used in all schools in the world, many researchers suggest that wikis can facilitate communication, collaboration, and the sharing of knowledge (Parker & Chao, 2007; Reinhold, 2006). According to Parker and Chao (2007), the most commonly listed learning paradigms that can be supported by wiki applications are "the cooperative/collaborative learning paradigm and the constructivist paradigm" (p.58). In their study, Chen, Jang and Chen (2015) found that the use of wikis in education assisted science teachers to generate imaginative teaching strategies and to design more understandable science teaching content. Similarly, a recent study conducted by Fuchs (2015) showed that teachers used wikis as discussion tools, designing tasks and writing collaboratively. Another recent study (Lau, Lui, & Chu, 2016) concluded that a well-planned wiki-based learning experience supported young students to develop their Internet searching skills, their collaborative problem solving competencies, and their critical inquiry abilities.

WhatsApp is one of many applications that provide cross-platform communication, such as Skype, Viber, Facebook Messenger, Google Hangouts, Kik, and WeChat. Susanti and Tarmuji (2016) utilised the features of the WhatsApp application, such as share audio, video, picture, links, document, create groups, and text, and explained several techniques of writing activities to help students in developing their English writing skills using WhatsApp. The techniques are brainstorming, group drafting, quick writing, peer feedback, information gathering, preparing exercises and checklist. Several researchers have studied the impact of WhatsApp on education. For example, Sayan (2016) found that the use of WhatsApp has a positive effect on students' achievement and performance by preparing them for their final exams. He stated that "using WhatsApp application, offers external activity around student-centered learning for the exam preparation in order to raise their achievement" (p. 88). However, Yeboah and Ewur (2014) explored the impact of WhatsApp messenger on the tertiary students' performance and found that most students (76%) indicated that WhatsApp had a negative effect on their performance. This is because WhatsApp is time consuming, it weakens students' language grammatical skills, and it may lead to losses of concentration during lectures.

In general, the integration of Web 2.0 applications into learning and teaching environments has many advantages but it may not be an easy way of teaching. It requires new thinking around the concept of pedagogy as the process needs a high level of support from both pedagogical teams and technical specialists (Newland & Byles, 2014). The following discusses the literature about the possible barriers to the use of Web 2.0 in education.

BARRIERS TO THE USE OF WEB 2.0 IN EDUCATION

There are several barriers to the use of Web 2.0 in teaching and learning. Many studies have attempted to categorise the barriers to the use of these technologies. Ertmer (1999) grouped the barriers into two categories: first-order barriers extrinsic to teachers (i.e. access, time, support, resources, training) and second-order barriers intrinsic to teachers (i.e. attitudes, beliefs, practices, resistance). Similarly, Rogers-Estable (2014) stated that some of the barriers to the use of ICT in education are extrinsic, such as time, training, and support. Others are intrinsic, such as beliefs, motivation, and confidence. However, Becta (2004) grouped the barriers according to whether they relate to the individual (teacher-level barriers), such as lack of time, lack of confidence, and resistance to change, or to the institution (school-level barriers), such as lack of effective training and lack of access to resources. Likewise, Bingimlas (2009) classified barriers into two groups including teacher-level barriers such as confidence, competence, and resistance to change, and school-level barriers such as time, support, and accessibility.

Several studies have found that these barriers are preventing teachers from using Web 2.0 in education. For example, An et al. (2009) conclude that there are three main barriers to teaching with Web 2.0: uneasiness with openness, technical problems, and time. Similarly, Karkoulia (2016) suggests that the main barriers to the use of web 2.0 in teaching include a lack of training and a lack of technological equipment.

Some other barriers to the use of Web 2.0 in education were found to be related to privacy issues and the reliability of information. For example, Amin, Hasnan, Besar & Almunawar (2016) concluded that teachers did not prefer to use Web 2.0 in their teaching due to privacy issues and outdated and unreliable information on websites. A lack of awareness of legal and copyright issues when using external resources (Becta, 2008) were also barriers related to privacy.

To sum up, reviewing the literature showed that K-12 teachers have shown positive attitudes towards the use of Web 2.0 applications in the learning and teaching processes. Many studies have addressed the situation of using a specific Web 2.0 tool, such as Facebook, wikis, blogs, Twitter, and YouTube in education. They can be used in K-12 education effectively. However, this may require a change in the teacher's role in the classroom; teachers may face several barriers to the effective use of Web 2.0 in education such as time, privacy, confidence, and training.

RESEARCH QUESTIONS

The main purpose of this study is to explore the extent of teachers' use of Web 2.0 applications in teaching and learning. Thus, the research questions are as follows:

- 1- To what extent are teachers familiar with Web 2.0 applications?
- 2- How often do teachers use Web 2.0 applications in education?
- 3- What are the barriers to the use of Web 2.0 applications in education?
- 4- Is there a significant difference in teachers' responses about Web 2.0 applications in education in accordance with gender, teaching subjects, educational level, and teaching experiences?

RESEARCH METHOD

The sample of this study involved teachers from primary, middle, and secondary schools in the Kharj region. Kharj is a big city, which lies 85 kilometres south of Riyadh. The total sample in this study consisted of 352 teachers.

The population of this study included teachers, male and female in Saudi schools. More specifically, the target groups were teachers of schools in the General Directorate of Education in the Kharj Region. For the sample design, a questionnaire was designed and distributed by using an online survey through the Google Forms. This method offers a low cost for data collection, time shortcut, potential high speed return (Aljerasiy, et al., 2015). All teachers (about 8000 teachers) in the Kharj Region were invited by email to participant in this survey. The General Directorate of Education provided the researcher with teachers' emails. The total completed responses of the teacher questionnaires were 352 including 157 males and 195 females. Seven questionnaires were invalid because the teachers appeared to answer randomly or of incomplete and meaningless data.

Some demographic information about the participants has been provided in Table 1. As shown in the table, the sample of the study involved 157 males and 195 females, composed of 125 primary school teachers, 77 middle school teachers and 156 secondary school teachers. Moreover, about half of them (54%) have teaching experience of more than 10 years and approximately 28% have teaching experience from five to less than 10 years.

Table 1: The frequencies and percentages according to demographic information.

Variables	Answers	Frequencies	Percentages
Gender	Male	157	44.6%
	Female	195	55.4%
	Total	352	100.0%
Teaching experience	Less than 5	63	17.9%
	5-10	99	28.1%
	More than 10	190	54.0%
	Total	352	100.0%
educational level	Primary	125	35.5%
	Middle	77	21.9%
	Secondary	150	42.6%
	Total	352	100.0%
Teaching subject	Islamic studies	89	25.3%
	Arabic Language	66	18.8%
	Sciences	65	18.5%
	English Language	12	3.4%
	Mathematics	26	7.4%
	Social studies	22	6.3%
	Computer	22	6.3%
	Other	50	14.2%
Total	352	100.0%	

In this study, a quantitative survey instrument was utilised. It was self-administered because participants were allowed to complete it at their own chosen place and at any time that was convenient for them (c.f. Robson, 2002). The survey was developed by the researcher to gather demographic information and descriptive data regarding teachers' views about Web 2.0 applications in education. The basis for the survey items was derived from the review of the literature and the objectives of this study. The survey had two parts. The first part was designed to collect demographic information such as participants' gender, school grades (whether primary, middle or high), teachers' subjects and their teaching experience. This was useful for understanding participants' backgrounds and helped in testing different variables. The second part included 35 items and was divided into three sections: 1) understanding teachers' knowledge of Web 2.0, 2) exploring their use of Web 2.0 tools in the teaching and learning processes, and 3) determining the main barriers to employing Web 2.0 in education at Saudi K-12 schools. In the first two sections, measurement scales for the items were 5-point Likert scales and, in the third section, they were 4-point Likert scales.

MEASURES

The survey was piloted to increase its validity (Roberts, 1999). This allowed for some suggestions to occur that helped to address any misinterpretation or ambiguity. The survey was also given to a panel of expert university faculty members from within the Saudi context in the field of educational technology and pedagogy. They provided feedback and suggestions to help in revising any ambiguous or unclear text.

The reliability coefficient was examined by using Cronbach’s Alpha (Cronbach, 1951), which is generally used to measure the reliability of a set of items in a survey. Cronbach’s Alpha was examined for the main three sections as shown in Table 2.

Table 2: The reliability coefficients Cronbach's alpha

Sections	Items	Coefficients Cronbach’s alpha
Teachers knowledge of Web 2.0	10	0.866
Teachers use of Web 2.0 in education	10	0.888
Barriers to the use of Web 2.0 in education	15	0.840
Total (n=352)	35	0.859

The analysis showed that the reliability coefficients of Cronbach's Alpha for the three sections ranged from .840 for the barriers section to .888 for the usage section. A value of Cronbach’s Alpha that indicates an acceptable level of reliability has generally been .7 or higher (Field, 2009).

DATA ANALYSIS METHOD

Analyses of the resulting data were performed using both descriptive and inferential statistics. Descriptive measures, including percentages, mean, and standard deviations were calculated to answer the first three research questions, including teachers' knowledge of Web 2.0, teachers' use of Web 2.0 in education, and barriers to the use of Web 2.0 in education. The interpretation of the mean scores was based on the length of the cells as shown in Table 3.

Table 3: Interpretation of mean scores

Sections	Mean scores	interpretation
Teachers knowledge of Web 2.0	1.00 – 1.79	Not at all familiar
	1.80 – 2.59	Slightly familiar
	2.60 – 3.39	Somewhat familiar
	3.40 – 4.19	Moderately familiar
	4.20 – 5.00	Extremely familiar
Teachers use of Web 2.0 in education	1.00 – 1.79	Never
	1.80 – 2.59	Rarely
	2.60 – 3.39	Sometimes
	3.40 – 4.19	Often
	4.20 – 5.00	Always
Barriers to the use of Web 2.0 in education	1.00 – 1.74	Does not limits
	1.75 – 2.49	Slightly limits
	2.50 – 3.24	Somewhat limits
	3.25 – 4.00	Greatly limits

Inferential statistics were used, including independent samples *t*-tests, to see the significant differences between the mean of the responses of the study sample according to gender. One Way ANOVA was used to see the significant differences between the mean of the responses within the study sample according to teaching experiences, educational levels, and teaching subjects. Fisher's LSD (Least Significant Difference) test was used to see any significant differences in each of the two groups. This technique was used to compute the smallest significant difference between the two means (Abdi & Williams, 2010). All these statistics were performed using the Statistical Package for Social Sciences (SPSS) and were symbolised by the short code (IBM-SPSS statistics, 23).

RESULTS

The main purpose of this study is to investigate Saudi K-12 teachers’ understanding of Web 2.0. In particular, this study aims to answer four main questions about teachers’ familiarity with Web 2.0 applications, teachers’

use of Web 2.0 applications in education, barriers to the use of Web 2.0 applications in education, and the differences in teachers’ responses about Web 2.0 applications in accordance with gender, teaching subjects, educational level, and teaching experiences. Therefore, this section is divided into four main headings according to these questions.

FIRST QUESTION ABOUT TEACHERS' KNOWLEDGE OF WEB 2.0 APPLICATIONS

Descriptive measures, including the mean and standard deviation, were calculated to answer the first question: To what extent are teachers familiar with Web 2.0 applications? The study has also included the percentage of the participants who rated the items either *extremely familiar* or *moderately familiar* in one column and *slightly familiar* or *not at all familiar* in another column. This gives an even clearer measure of the way that the participants rated corresponding items. As shown in Table 4, there are ten items that are related to the participants’ perspective about teachers' familiarity with Web 2.0 applications.

Table 4: Descriptive statistics of the participants’ perspective about their familiarity with Web 2.0 applications

Items	Familiar (%)**	Slightly familiar (%)*	Mean	SD	Ranking	Interpretation
Instant messaging (WhatsApp, Kik, Tango)	86.9%	4.5%	4.49	0.93	1	Extremely familiar
Social Networks (Twitter, Snapchat, Facebook)	82.4%	4.6%	4.39	1.01	2	Extremely familiar
Video sharing (YouTube)	68.7%	19.4%	3.93	1.45	3	Moderately familiar
Google applications (Google Doc)	65.1%	23.3%	3.73	1.48	4	Moderately familiar
Photo sharing (Flicker, Instagram)	63.0%	24.4%	3.71	1.50	5	Moderately familiar
Video chatting (Skype)	51.7%	38.7%	3.24	1.71	6	Somewhat familiar
Wiki (Wikipedia)	27.6%	55.4%	2.50	1.59	7	Slightly familiar
Blogs (Blogger, WordPress)	26.4%	59.4%	2.33	1.57	8	Slightly familiar
Really Simple Syndication (RSS) (Google reader)	24.8%	63.4%	2.30	1.57	9	Slightly familiar
Learning Management System (Moodle, Blackboard)	25.0%	66.4%	2.21	1.57	10	Slightly familiar
Overall mean (n=352)			3.28	0.98	-	Somewhat familiar

** Percentage of the participants who indicated either *Extremely familiar* or *Moderately familiar* for the items

* Percentage of the participants who indicated either *Slightly familiar* or *Not at all familiar* for the items

The above table shows that most of the participant teachers reported themselves as being somewhat familiar with Web 2.0 applications. For example, approximately 87% of them were extremely familiar with instant messaging such as WhatsApp, Kik, and Tango. More than three quarters of the participants were also extremely familiar with social networks such as Twitter, Snapchat, and Facebook. However, more than half of the participant teachers reported themselves as being unfamiliar with wikis, blogs, RSS and Learning Management Systems (LMSs) (e.g. Moodle, Blackboard).

SECOND QUESTION ABOUT TEACHERS' USE OF WEB 2.0 APPLICATIONS IN EDUCATION

The second question is about how often Saudi teachers use Web 2.0 applications in education. Descriptive statistics, including percentages, the mean, and standard deviation were calculated to explore this question. As explained previously, the percentage of the participants who rated the items either *often* or *always* was put in one column and *never* or *rarely* in another column.

Table 5: Descriptive Statistics of the participants' perspective about their use of Web 2.0 applications in education

Items	Often (%)**	Rarely (%)*	Mean	SD	Ranking	Interpretation
Instant messaging (WhatsApp, Kik, Tango)	42.0%	40.7%	2.98	1.61	1	Sometimes
Video sharing (YouTube)	38.6%	39.2%	2.95	1.49	2	Sometimes
Social Networks (Twitter, Snapchat, Facebook)	38.6%	48.0%	2.81	1.61	3	Sometimes
Google applications (Google Doc)	27.2%	54.3%	2.53	1.49	4	Rarely
Photo sharing (Flicker, Instagram)	21.6%	61.3%	2.26	1.45	5	Rarely
Blogs (Blogger, WordPress)	12.3%	77.6%	1.74	1.23	6	Never
Really Simple Syndication (RSS) (Google reader)	11.9%	78.4%	1.69	1.28	7	Never
Wiki (Wikipedia)	10.8%	80.7%	1.65	1.15	8	Never
Learning Management System (Moodle, Blackboard)	10.2%	82.1%	1.61	1.19	9	Never
Video chatting (Skype)	9.7%	82.1%	1.59	1.15	10	Never
Overall mean (n=352)			2.18	0.97	-	Rarely

** Percentage of the participants who indicated either often or always for the items.

* Percentage of the participants who indicated either never or rarely for the items

Table 5 shows that the participant teachers rarely used Web 2.0 applications in their teaching and learning processes. Generally, less than half of them reported using Web 2.0 applications in education. For instance, although some of the participant teachers (about 40%) used instant messages and video sharing services such as YouTube in their teaching, only approximately 10% of them used wikis (e.g. Wikipedia), an LMS (e.g. Moodle, Blackboard), or video chat (e.g. Skype).

THIRD QUESTION ABOUT BARRIERS TO THE USE OF WEB 2.0 APPLICATIONS IN EDUCATION

The third research question concerns the barriers to the use of Web 2.0 applications in education. In this question, the mean and standard deviation were calculated. The percentage of the participants who rated the items was presented in two columns, comparing the *greatly limits* and *somewhat limits* in one column and *slightly limits* and *does not limits* in another column. See Table 6.

Table 6: Descriptive statistics of the participants' perspectives about barriers to the use of Web 2.0 applications in education

Statements	limited (%)**	Not limited (%)*	Mean	SD	Ranking	Interpretation
The large number of students in the classroom	75.9%	24.2%	3.20	1.11	1	Somewhat limits
No Internet in my school	69.9%	30.2%	3.02	1.17	2	Somewhat limits
The lack of a clear plan for the use of Web 2.0 applications in education	69.6%	30.4%	2.96	1.06	3	Somewhat limits
Preventing students from using the smart phones in the school by school administrators	60.5%	39.5%	2.80	1.27	4	Somewhat limits
The weakness of the impact of the use of Web 2.0 applications in education	59.4%	40.6%	2.76	1.10	5	Somewhat limits
A lack of basic skills in the use	59.1%	40.9%	2.75	1.10	6	Somewhat

of Web 2.0 applications in education							limits
The weakness of the incentives that lead me to use Web 2.0 applications in education	59.4%	40.7%	2.75	1.15	7		Somewhat limits
The weakness of teachers' encouragement by school administrators	57.9%	42.1%	2.68	1.16	8		Somewhat limits
Preparation for using Web 2.0 in education consumes my time and effort outside the official working time	55.1%	44.9%	2.60	1.03	9		Somewhat limits
The large amount of content that I teach	54.8%	45.2%	2.57	1.16	10		Somewhat limits
I do not know how to use Web 2.0 applications	50.8%	49.1%	2.48	1.13	11		Slightly limits
I believe that Web 2.0 applications are related to personal issues.	41.2%	58.8%	2.31	1.10	12		Slightly limits
a negative attitude of my school administrators towards using Web 2.0 applications in education	41.8%	58.2%	2.28	1.19	13		Slightly limits
I believe that there are other teaching approaches better than using the web 2.0	32.1%	67.9%	2.18	0.99	14		Slightly limits
The use of Web 2.0 applications is not suitable in my area	35.6%	64.5%	2.15	1.10	15		Slightly limits
Overall mean (n=352)			2.63	0.63	-		Somewhat limits

** Percentage of the participants who indicated Greatly limits or Somewhat limits for the items.

* Percentage of the participants who indicated either Slightly limits or Does not limits for the items

Table 6 shows the participant teachers ratings regarding the barriers to their use of Web 2.0 applications in teaching and learning. The top three barriers were reportedly the large number of students in the classroom, no access to the Internet at their school, and the lack of a clear plan for the use of Web 2.0 applications in education. On the other hand, other barriers were reported most often as barriers only slightly limiting or not limiting their use. These barriers included the negative attitudes of the school administrators towards using Web 2.0 applications in education, teachers' beliefs that there are other teaching approaches that are better than using Web 2.0, and that the use of Web 2.0 applications is not suitable in their area.

FOURTH QUESTION ABOUT THE VARIABLE DIFFERENCES

The fourth research question is about whether or not there is a significant difference in teacher responses about Web 2.0 applications in education in accordance with gender, teaching experiences, educational levels, and teaching subjects. Here is the answer to this question.

Gender differences

To examine the differences between male and female participant teachers about Web 2.0 applications in education, the mean scores, standard deviations, Independent Samples *t*-test and the Cohen's *d* effect size were conducted as shown in Table 8. The standardised mean difference statistic, referred to as *d* (Cohen, 1988), is a scale-free measure of the separation between two group means. Both the Cohen (*d*) and Pearson correlation (*r*) are measures of effect size. However, *d* may be favoured because the group sizes are discrepant and, in this case, *r* can be quite biased compared to *d* (Field, 2009).

Table 7: Descriptive statistics and *t*-tests for the differences between male and female teachers for Web 2.0 applications in education in accordance with gender

Sections	Male (n= 157)		Female (n= 195)		t-value	P	Effect size (Cohen's <i>d</i>)
	Mean	SD	Mean	SD			
Teachers knowledge of Web 2.0	3.25	0.97	3.31	0.99	-.651	0.515	-0.06
Teachers use of Web 2.0 in education	1.94	0.99	2.37	0.92	4.17**	0.000	-0.45
Barriers to the use of Web 2.0 in education	2.72	0.59	2.56	0.65	2.30*	0.022	-0.26

** Statistically significant at level <0.01

* Statistically significant at level <0.05

The *t*-test results shown in Table 8 reveal that there are statistically significant differences between the male and female participant teachers in their views about the use of Web 2.0 applications; *t*-values reached -4.17 with *p*-values of <0.01 in favour to female teachers. There are also statistically significant differences between the male and female participant teachers in their views about the barriers to the use of Web 2.0 applications in education, where *t*-values reached -2.30, with corresponding *p*-values of <0.05 in favour to male teachers. However, the differences are not large, as the effect sizes are 0.45 and 0.26, which are medium-sized effects (Cohen, 1988). Cohen labelled an effect size large if *d* equal 0.80 or above and small if *d* equal 0.20.

Teaching experiences differences

To examine the significant differences between the teachers' views about Web 2.0 applications in education according to their teaching experience, One Way ANOVA was performed as shown in Table 8. Moreover, the effect size for One-Way ANOVA was calculated using between and within group variances.

Table 8: Descriptive statistics and One Way ANOVA for the three sections in teacher responses about Web 2.0 applications in education in accordance with teaching experiences

Sections	Sources of variation	Sum of Squares	Df	Mean Square	F	P-Value (Sig.)	Effect size
Teachers knowledge of Web 2.0	Between Groups	5.541	2	2.771	2.904	0.056	0.2390
	Within Groups	332.930	349	0.954			
	Total	338.471	351				
Teachers use of Web 2.0 in education	Between Groups	0.261	2	0.131	0.138	0.872	0.0281
	Within Groups	331.317	349	0.949			
	Total	331.578	351				
Barriers to the use of Web 2.0 in education	Between Groups	0.96	2	0.048	0.122	0.885	0.0837
	Within Groups	137.121	349	0.393			
	Total	137.217	351				

The findings from the above table indicate that there are no statistically significant differences among the participant teachers, where the *p*-value is larger than 0.05 in relation to the three sections according to their teaching experience with small effect sizes.

Educational level differences

One Way ANOVA was used to determine the significance differences between the mean of the responses according to educational levels as shown in Table 10.

Table 9: Descriptive statistics and One Way ANOVA for the three sections in teacher responses about Web 2.0 applications in education in accordance with educational levels.

Sections	Sources of variation	Sum of Squares	Df	Mean Square	F	P-Value (Sig.)	Effect size
Teachers knowledge of Web 2.0	Between Groups	4.860	2	2.430	2.542	.080	0.1207
	Within Groups	333.611	349	.956			
	Total	338.471	351				
Teachers use of Web 2.0 in education	Between Groups	5.570	2	2.785	2.981	.052	0.1307
	Within Groups	326.009	349	.934			
	Total	331.579	351				
Barriers to the use of Web 2.0 in education	Between Groups	4.096	2	2.048	5.370*	.005	0.1754
	Within Groups	133.121	349	.381			
	Total	137.217	351				

* Statistically significant at level <0.05

The One-Way ANOVA results reveal that there are no statistically significant differences between responding teachers' ratings in relation to educational levels in teachers' knowledge of Web 2.0 applications and teachers' use of Web 2.0 applications in education, as *p*-values reached greater than 0.05. However, the findings indicate that there are significant differences in the barriers to the use of Web 2.0 applications in the education section according to the educational levels variable at level *p*-values of <0.05. To determine which pairs of the group means differed, post hoc comparisons using Fisher's LSD test were utilised, as shown in Table 10.

Table 10: Fisher's LSD post hoc results of standardized test scores by educational level

Sections	Stages	Mean	Primary	Middle	Secondary
Barriers to the use of Web 2.0 in education	Primary Schools	2.78	-		
	Middle Schools	2.59	*	-	
	Secondary Schools	2.55	*	*	-

* Statistically significant at level <0.05

There are statistically significant differences in the section of barriers to the use of Web 2.0 in education between primary schools (Mean=2.78) and both middle schools (Mean = 2.59) and secondary schools (Mean = 2.55), in favour to primary schools at level *p*-values of <0.05. Similarly, the results indicate that there are statistically significant differences at the same level (*p*-value <0.05) between middle schools and secondary schools in favour to middle schools.

Teaching subject differences

To determine the significant differences between the teachers' views about Web 2.0 applications in education according to their teaching subjects, One Way ANOVA was performed as shown in Table 11.

Table 11: Descriptive statistics and One Way ANOVA for the three sections in teacher responses about Web 2.0 applications in education in accordance with teaching subjects

Sections	Sources of variation	Sum of Squares	Df	Mean Square	F	P-Value (Sig.)	Effect size
Teachers knowledge of Web 2.0	Between Groups	62.346	7	8.907	11.096**	0.000	0.4752
	Within Groups	276.125	344	0.803			
	Total	338.471	351				
Teachers use of Web	Between	14.521	7	2.074	2.251*	0.030	0.2140

2.0 in education	Groups Within Groups	317.058	344	0.922			
	Total	331.579	351				
Barriers to the use of Web 2.0 in education	Between Groups	6.230	7	0.890	2.337*	0.024	0.2181
	Within Groups	130.987	344	0.381			
	Total	137.217	351				

** Statistically significant at level <0.01

* Statistically significant at level <0.05

The results indicate that there are statistically significant differences between responding teachers' ratings in relation to their teaching subjects in all sections about Web 2.0 applications in education, as p-values reached <0.05 and <0.01. The effect size was calculated and shown as large. In this case, post hoc comparisons using Fisher's LSD test were calculated to determine which pairs of the group means differed, as shown in Table 12.

Table 12: Fisher's LSD post hoc results of standardized test scores by teaching subjects

Sections	Subjects	Mean	Islamic studies	Arabic Language	Sciences	English Language	Mathematics	Social studies	Computer	Other
Teachers knowledge of Web 2.0	Islamic studies	3.07	-							
	Arabic Language	2.91		-						
	Sciences	3.66	**	**	-					
	English Language	3.35				-				
	Mathematics	3.14			**		-			
	Social studies	2.91			**			-		
	Computer Other	4.56 3.34	** *	** *	** *	** *	** *	** *	- **	- -
Teachers use of Web 2.0 in education	Islamic studies	2.05	-							
	Arabic Language	2.05		-						
	Sciences	2.39	*	*	-					
	English Language	2.13				-				
	Mathematics	1.72			*		-			
	Social studies	2.35					*	-		
	Computer Other	2.43 2.36					*	*	-	-
Barriers to the use of Web 2.0 in education	Islamic studies	2.75	-							
	Arabic Language	2.74		-						
	Sciences	2.57			-					
	English Language	2.63				-				
	Mathematics	2.70					-			
Social studies	2.44	*	*				-			

Computer	2.28	**	**	*	-
Other	2.56				-

** Statistically significant at level <0.01

* Statistically significant at level <0.05

There are statistically significant differences in all sections of Web 2.0 applications in education among all pairwise comparisons as shown in Table 13. The notable result is that the subject of computers ($M = 4.56$) scored significantly higher on the standardised test than in other teaching subjects in regard to the section of teachers' knowledge of Web 2.0 (p -value <0.01). Similarly, in the same section, there are statistically significant differences, with p -value <0.01, between the subject of science ($M = 3.66$) and other subjects in favour of the science subject. Moreover, there are other statistically significant differences between some subjects in the section of teachers' use of Web 2.0 applications in education, such as mathematics and social studies in favour of the social studies subject, and between science and the Arabic language in favour of the science subject. In regard to the third section, namely barriers to the use of Web 2.0 applications in education, some of the differences and significance appeared among a few subjects, such as computers and Islamic studies, and between social studies and the Arabic language, as shown in Table 12.

The above results will be discussed in the next section.

DISCUSSION

This study aims to give an understanding of teachers' knowledge and use of Web 2.0 in education. The results of this study indicate that most of the participant teachers have been familiar with most of the Web 2.0 applications reported in this study. For instance, instant messaging (WhatsApp, Kik, Tango), social networks (Twitter, Snapchat, Facebook), video sharing (YouTube), and Google applications (Google Docs) were familiar to most of the teachers. However, it should be noted in the current findings that some of the Web 2.0 applications, such as LMS and RSS, were not reported as being well known to the participant teachers. This result is supported by another finding (Kiyici, 2010), which indicated that the teachers had the skills to define fora, wikis, blogs and social networks, but they were not able to define RSS or bookmarking applications.

Moreover, the results of this study indicate that they reportedly used these technologies *rarely*. Although few teachers (approximately 40%) reported using instant messaging, video sharing, and social networks, most of them (about 80%) described themselves as not using wikis, LMS or video chatting. This seems to be consistent with several studies which suggest that some teachers still preferred using traditional technologies such as email (Roblyer et al., 2010; Karkoulia, 2016). In comparison with another study (Pritechett, et. al., 2013), blogs, social networks and cloud computing were reported as being used rarely.

The inconsistency between their familiarity and their usage of Web 2.0 was caused by several barriers. Most of the top barriers did not relate to the teachers' confidence or their competence. The participant teachers reported that large numbers of students in the classroom, the lack access to the Internet, and the lack of a clear plan for utilising Web 2.0 in teaching and learning were obstacles to the use of Web 2.0 applications in their teaching. The interesting thing in this result is that all these barriers are related to the school level barriers (Bingimlas, 2009). In contrast with other studies, some other factors were reported to be preventing teachers from using Web 2.0 in the classroom, including training, technical support, time (Karkoulia, 2016; An et. al., 2009), awareness, accessibility (Becta, 2008), and motivation and confidence (Rogers-Estable, 2014). On the other hand, the participant teachers reported that the barriers that related to their beliefs were not limited to their use of Web 2.0 applications in education (see Table 5).

The interesting aspect in this study is that, although there were no differences between female and male teachers in regard to their knowledge of Web 2.0, the participant female teachers seemed to use Web 2.0 applications in education more than the male teachers. This could mean that female teachers utilise the new technologies in their teaching more often. This result is inconsistent with a study conducted by Kiyici (2012), which indicates that teachers' experiences with the use of Web 2.0 tools did not differ notably by gender. It should be taken into account that Saudi society appears to be strict towards females in regard to social media for instance. However, the results of this study indicate that the female teachers utilise what they already know about Web 2.0 applications in their teaching.

Another interesting finding is that the teachers of computing reported themselves as being very familiar with Web 2.0 applications, more so than the teachers of other subjects, because of the nature of their subject; they have been well prepared in using such technologies. Such results are consistent with Bingimlas' (2010) results that computer teachers could know more about new technologies than other teachers. On the other hand, the

computer subject teachers reportedly were not different from other subject teachers regarding their use of Web 2.0 applications in the classroom. This could be because of the barriers mentioned earlier in this section. The practical implication in this study is that the utilisation of Web 2.0 applications in learning and teaching environments requires new thinking about the concept of teaching and learning, which is called "pedagogy 2.0" in the literature (McLoughlin & Lee, 2009). This means that students need to be responsible for their own learning; they should be encouraged to communicate, participate, and create knowledge, and discuss ideas and solve problems collaboratively (McLoughlin, 2013). Changes in participatory technologies require a corresponding shift in the way of teaching and learning in the classroom (Farkas, 2012). Digital tools and social network applications need educators to pay attention to student participation and communities for learning, and help students in the production of their knowledge.

CONCLUSION

In conclusion, this study attempts to explore the participant teachers' views about learning and teaching with Web 2.0 applications in K-12 Saudi schools. It indicates that most of the participant teachers are familiar with Web 2.0 applications. However, their uses in education seem to be rarely mentioned. As they reported, the top barriers preventing them from the effective use of Web 2.0 applications in education are related to school level barriers (Bingimlas, 2009), such as the large number of students in the classroom, the lack access to the Internet in schools, and the lack of a clear plan for the use of Web 2.0 applications in education. Due to these barriers, when formulating the policy of an education system, educators and educational decision and policy-makers should take into account the environments of teaching and learning, such as the number of students in the classroom and the Internet with the use of Web 2.0 applications in education. Furthermore, it is recommended that teachers should be encouraged and supported by a clear plan for utilising Web 2.0 applications in education successfully. The focus, however, should not only be on Web 2.0 technologies as a tool, but also as an effective learning approach (c.f. Bransford et al., 2000). Thus, rethinking about pedagogical approaches and moving to pedagogy 2.0 may improve learning and teaching.

The findings of this study can provide guidance to educators, curriculum developers and decision makers who embark on using Web 2.0 in education, particularly in regard to designing instructional material, teacher professional development programs and learning environments. This study should contribute to more effective use of Web 2.0 in schools in the future. This study recommends that teachers should relinquish at least some of their authority in traditional teaching methods, and gain some familiarity with the potential utilisation of Web 2.0 applications.

Further research can be conducted to address the question of how Web 2.0 applications can be employed in and out of school environments to improve the process of learning and teaching. Finally, it would be worth investigating practical research with designing instructional Web 2.0 tools in various areas.

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