EXPLORING THE USES OF BLOGS AND WIKIS AS TEACHING AND LEARNING TOOLS IN MATHEMATICS: FINDINGS AND IMPLICATIONS

R. Zein
Zayed University (UNITED ARAB EMIRATES)

Abstract

With the overwhelming technological innovations as Web 2.0 tools and their various integrations in education, instructors have struggled with the issue of these tools. While students report that social media tools assist them academically through collaborations, some instructors have expressed concerns that they encourage socializing and loss of educational focus. The present paper examines the uses of Blogs and wikis in two math middle school classes. The themes emerging from this study are: students’ uses versus teacher’s uses of Web 2.0 tools; quality and quantity in Web 2.0 communication; quality of content and the balance between online and face-to-face in Web 2.0 learning and finally the teacher's role in Web 2.0 learning.

Keywords: Math education, Blogs, Wikis, social media, e-learning.

1 INTRODUCTION

Web 2.0 is either defined as a software [35, 24] or a set of internet services and practices [13], or a set of tools [6] or a platform of services [27]. Some stress the social phenomenon, or the communication, or the collaboration, or the collective intelligence perspectives which are dealing with the group dimension in the internet or online environment [42]; while others stress more individualization, personalization, customization, and empowering end-users which are dealing with the individual dimension in the online environment [1, 43]. However, some of these definitions include both the group and the individual dimensions.

The current study has presented the students and teacher's views on their experience using blogs and wikis within the middle school math classroom and how these tools supported social constructivist learning.

The research question investigated in this study: How Blogs and Wikis are being used in Math classes as a teaching and learning tool?

1.1 The Learning Context

Two teachers with two middle school classes of 27 and 28 students each participated in this study. After giving the students an introductory session on blog, the math instructor explained an algebra unit. She posted on blog 8 activities as classwork and 12 activities as homework. The students solved these exercises and shared their responses on the class blog. The blog was utilized for daily after school communication between students and the teacher. By the end of the unit, the instructor posted a revision sheet on the blog. A unit exam was done using paper and pencil. The instructor posted the exam answer key and general comments about the test on the blog. Therefore, the blog was used for both classwork and homework, for after school communications between student-student and student-teacher, as well for revision before the test and for test correction.

An arithmetic unit was given to students using wiki. The math instructor posted on wiki 8 classwork and 12 homework activities. At the end of the unit, the students took a paper and pencil test. Wiki was used for the same tasks as blog: classwork, homework, communication, revision sheet and test answer key.

The third lesson given was a geometry one. The instructor started it by posting website links related to the new topic. As homework, the students had to study the content of these websites which comprised video explanations and practices associated to the unit. They were given as an introductory brainstorming practices before the instructor start explaining the unit in class. Moreover, a group geometry word problem project was posted on wiki as homework.
As sum-up, class blog and wiki were utilized in various teaching and learning tasks: homework, classwork, communication, brainstorming introductory activity before the start of the unit, flipped learning, individual activity, group work activity, in various mathematical subjects: algebra, arithmetic and geometry.

2 METHODOLOGY

The approach of the current research is a case study aiming to obtain 'thick description' [17]. According to Ponterotto, 'Thick description involves accurately describing and interpreting social actions within the appropriate context in which the social action took place' [29]. Aiming to understand a new educational phenomenon the case study mixed methods pragmatic paradigm was utilised in the application of a combination of Web 2.0 tools in a Math unit in a middle school class. Few research has, to date, been published in Web 2.0 in Math and the focus of this study has been to develop in-depth study of how individual students perceive and make use of these technologies. The mixed-methods approach was selected as it suited the descriptive-orientated aims and objectives of this project. The mixed-methods descriptive case study aimed to elaborate a profound understanding of the use of the Web 2.0 tools as blog and wiki from experiences and perceptions of teachers and students.

Data from students' survey is triangulated with students' and teacher's interviews, document's study of blog and wiki posts and class observations. Collected data was grouped in themes. The analysis of findings discusses the following: students' uses versus teacher's uses of Web 2.0 tools; blogs and wikis as tools to construct knowledge; quality and quantity in Web 2.0 communication; quality of content and the balance between online and face-to-face in Web 2.0 learning; students as digital natives; and finally, social constructivism in Web 2.0 learning and the teacher's role. The paper ends with the suggestions for future research.

3 RESULTS

While it is crucial that students widen their skills and abilities in implementing technology, it is essential that teachers also grasp how these technologies can be handled to improve teaching and learning [34]. As with any tool used in education, the key to using blogs and wikis lies in the way in which they are exploited in order to help students develop their learning [14].

3.1 Students' Uses versus Teacher's Uses of Blog and Wiki

In the present study, both the teacher and the students had identified and experienced different ways for uses as individual activity versus group activity, as homework versus class work, as a direct application activity versus problem-solving application, as algebra versus geometry, as introductory lesson activity versus review before the quiz.

It is also noticeable that studies have found a difference behind the students' interest in the Web 2.0 tools and their teachers' interest. Although teachers recognized the potential of blogs and wikis to support knowledge construction [33; 42], studies repeatedly suggest that it is the communication aspects of Web 2.0 tools that students mostly appreciate [23] along with their facility for easy anytime anywhere learning, without the need for a formal, time-and-place dependent educational institution. Similarly, the findings of this study supported these issues. The students especially used the blog and wiki as a repository for storing work in progress; a place where they could work individually or collaborate with others; and a means to communicate the progress of their work with other members of their group and with the teacher.

In this study, the conclusion drawn from blog and wiki experience is that these tools provided a way to support the students' learning in collaborating, communicating, enhancing self-image, motivating, documenting and publishing their work. These tools provided a way to support the teaching process through their use as learning management systems utilized to post activities, reminders, review sheets, Homework...; as awarding or motivational tools; and as an open communication tool between the students and the teacher. However, the particular software of blog and wiki used in this study had limitations in supporting math symbols and graph manipulation limiting the math communication and collaboration process.

In this study, certain learning needs were found driving the uses of the blog and wiki, for example in providing communication channels before quizzes and tests or during short or long vacations where
students did not meet face to face with their friends and their teacher. It was also found to be useful with shy students who did not like to speak in public and feared face-to-face interaction. Moreover, formal and informal learning were found connected in the Web 2.0 environment where formal activities as well as side communication were put together online [11]. Web 2.0 tools addressed a need in learning practices that was not perceived before, and not catered to.

3.2 Blogs and Wikis as Tools to Construct Knowledge

Although the literature around Web 2.0 tools is still developing, a clear theme around their use is emerging in this study: The primary use of blogs and wikis relates to supporting both the process of teaching and learning. While some research studies revolving around Web 2.0 tools and their uses suggest that they have the potential to provide students with the ability to engage in ‘deep learning’ online, the findings of this study support that hypothesis, and also conclude that without the teacher’s intervention the students’ outcomes would have become an unguided socializing and added very little to the learning outcomes. Although it is possible that students might develop more skills in knowledge construction over time, the students had generated knowledge through the various activities applied in the blog and wiki as individual homework, classwork, lesson brainstorming, review sheets, and group assignments.

Moreover, throughout the course of this study blog and wiki had documented in one location all the learning tasks assigned, their solutions, the teachers and student interaction and the teachers’ feedback which had an impact on students’ performance as they were able to see the work of their classmates alongside the teachers’ feedback, a facility which is not available in traditional settings. Some students increased the reflection on their work before posting while other students learned from their classmates' answers and mistakes. All these issues had an impact on the students' knowledge construction.

3.3 Quality and Quantity of Web 2.0 Communication

Social interaction between learners had a significant role in the learning process and had an important influence on the learning outcome [ 4, 38 ]. It is particularly interesting to note that while the students in this study were working individually and in small groups, they felt that they had the opportunity to have a whole class discussion after the school day which was not possible within a traditional learning setting. This amplified communication and collaboration were mainly due to the learning environment with un-notified cyber bullying or misbehaviour but rather supportive attitudes between the students themselves and the teacher who made this experience successful. Moline stated that cyber bullies or misbehaviour in virtual school environments impacts learning in the physical school setting [26]. In extreme cases, negative feelings and unethical uses might hamper learning in this Web 2.0 open environment [26].

This fact is asserted by Garrison and Kanuka who claimed that the key issue in online learning is “…the quality and quantity of the interaction and the sense of engagement in a community of inquiry and learning, achieved through the effective integration of Internet communication technology” [16]. The quality and the quantity of interactions were a major concern for the teachers in this study. Too many communications could not be answered or corrected by the teachers. On one hand the quality of interaction in this study was found to be a factor of the students’ self-responsibility and self-regulation; on the other hand, it was regulated by the teachers’ preparation, serious follow up, and the rules and regulations set. These regulations needed to be flexible in order not to prevent students’ interaction and at the same time limit chaotic communication.

Classroom interaction in a traditional learning environment typically is predominantly teacher-centred; whereas in the Web 2.0 environment, it was oriented towards student-centred interaction. One of the main characteristics of Web 2.0 technology is the way in which it can facilitate communication. The fact remains that the students in this study were more oriented towards face-to-face communication with their teacher when they had the possibility to discuss issues during the school day [44]. However, this Web 2.0 students-teacher communication was necessary during vacation and before the test. Blog and wiki were mostly used as a complementary communication tool to face-to-face learning. Moreover, the peer to peer communication was dramatically amplified and the school time was extended at the students' level much more than at the teacher's level [41].
3.4 Quality of Content & Balance between Online & Face-to-Face Web 2.0 learning

However Chizmar & Walbert [12] agreed that online learning tools should be utilized as part of a well-balanced learning environment, while Garrison and Kanuka declared that the actual test of online learning is managing the equilibrium of the integration of the face-to-face learning activity with the internet technology [16]. In this study, it was noticed that not all math activities were found efficient for online uses. Open ended group work assignments were found to be more suited to being used in blogs and wikis than the individual single answer math assignment. Algebraic math symbols, as well as drawings in geometry, were not supported by the blog and wiki text editors. This fact put certain limitations in math lesson's implementation. As this research demonstrated, the actual challenge for the teacher was to find the right math online activity in order to make sure that the students were able to effectively utilize both ICT and face-to-face learning [36]. It is undoubted that today's students must be competent and confident using technology [37]. However, the challenge for middle schools implementing online learning activities is to guarantee that the quality and the best of any form of learning tasks are preserved.

This study raised the issues of quality and balance between face-to-face and online learning content in Web 2.0 environment. It provided an insight for future integrations of Web 2.0 tools in the school curriculum.

3.5 Students as Digital Natives

While many writers highlight enthusiastic accounts of today's students' abilities and interests in ICT [31] it is possible that some of them have an over romanticised view on students' ICT skills that might be present in few very talented students [19, 20, 21]. This is similar to any aspect of school life where some students might have special skills and abilities [25] while other students are average or above average and some have limited skills. Certainly, as in any generation of students, the students' sample of the study represented a broad range of skills and interest in ICT [21].

While there were students in this study who were motivated to use ICT they did not develop a refined educational approach towards their use of blog and wiki. In general, this study does not maintain the idea that a high level of ICT skills was a reality for most students. While it is identified that today's teenagers are high ICT users and have high access level to internet [8,10], this does not automatically indicate that most teenagers are using ICT in sophisticated manners outside their use of entrenched technologies such as internet, cellular, Facebook and emails [21]. Similarly commenting on students' ICT uses Selwyn et al. said that: "While our data depicts a generation of young people for whom ICTs are part of their everyday lives, close inspection shows many primary pupils' actual engagement with ICT to be often perfunctory and unspectacular" [34].

On the other hand, although it is imperative that teachers do not undervalue the students' ICT skills [8], it is also apparent that not all students are more technologically advanced than their teachers, especially when using ICT for more than a basic set of core tasks [34]. This was certainly the case for the majority of the students in this study. It is important to note that all the technical problems were solved by the teachers who trained the students on how to overcome them. Moreover, whether the students were knowledgeable in technology or not, very few had the possibility to integrate their ICT knowledge in the math core curriculum. Students might present suggestions, take part in the lesson plan preparation or give feedback for improvement; but with the present technologies, they do not have the expertise or the time to manage all the processes needed for a successful integration. This was confirmed in this study when the students did not have any noticeable input when asked by the teacher to suggest new ways of using blog and wiki in math.

With the advent of smarter and more developed technologies than the current Web 2.0, students might be empowered to be 'Digital Natives' and have full control of their learning with Web 3.0, Web 4.0 or later versions. But this future vision is not yet elaborated.

3.6 Social Constructivism and the Teacher’s Role in Web 2.0 Learning

As discussed throughout this study, the use of the blog and wiki clearly supported social constructivist approaches to learning in that in this specific learning context it clearly placed the learner in the centre of the learning context [39].
In this study students were provided with the chance to participate in social constructivist approach to learning and, in particular, collaboration, knowledge construction and reflection; however, they did not always do this knowledge construction and reflection automatically and required guidance from the teacher to direct their progress through this phase. The role of the teacher was found in this particular situation to be necessary in order for the students’ learning potential to be fully realized within the boundaries of the current schooling system shaped by the curriculum objectives, content and time.

Moreover, while it is not possible to measure developments in student reflection over such a short time frame, Roschelle and Pea make the point that teachers must support students in developing reflective skills both in digital or traditional environments because reflective learning skills have to be taught, modelled and practiced in order to develop deeply and effectively over time [32]. This is seen when the teacher paired the students in order to reflect and correct their friends' activity. Moreover, in the wiki open ended word problem activity the teacher required to make all the mathematical discussions online to show how students collaborated reflectively. Furthermore, Bull et al suggest that one reason why ICT technologies such as blogs and wikis are not widely incorporated into education is the lack of teachers’ modelling and recommend that instructors play a key role in bridging the gap between learners’ use of ICT outside the classroom and effective use of ICT for learning purposes [9]. Aspden and Helm noted that students require lots of preparation and training in order to effectively use ICT in their daily learning [5].

Concluding this section, the teacher’s role remained highly significant within Web 2.0 blended learning environment and the teacher had four particular functions to practice. The first is in helping scaffold the students’ learning so that they are able to develop both their skills and knowledge. The teacher in this study scaffolded the students’ learning [18] by preparing curriculum-based activities in various ways through the math lessons. The second role of the teacher involved careful management of online relationships in order to ensure that the students’ communication with both the teacher and other students stayed in the ethical framework. The teacher was concerned not to have unethical or harmful comments from students towards each other in this open environment. So, she was constantly checking the posts. The third role of the teacher is to support students in making the transition from social to effective learning tasks [40], and set rules and regulations when students are not self-regulated. The math teachers intervened by regulating the social aspect of Web 2.0 when it had a negative effect on learning. The fourth one is to model ICT pedagogical uses and any other skill as reflection, knowledge construction and collaboration and train the students to work in social constructivist learning environment [3, 4, 5]. The teachers in this study modelled pedagogical uses of Web 2.0 tools by preparing various math activities, doing a follow up and reflecting when needed on the students’ posts.

4 IMPLICATIONS FOR PRACTITIONERS

The implications for practitioners that emerged from this study are summarized as follows:

1. The type of math activity used with Blogs and Wikis has to be chosen carefully. Collaborative open ended activities are much more beneficial than single answer activities in Web 2.0 environment.

2. To date, geometry drawings and math symbols are not supported by Web 2.0 tools such as blogs and wikis. There is a need to use another application that handles these issues then copy and paste the drawings or math symbols in the tool. The recommendation is to work with software developers to develop tools which can handle mathematical operations, drawings and symbols.

3. It is suggested that Blogs and Wikis might be used as archiving tools, where both students and teachers can go back to what have been posted and corrected to check the students’ improvement over a certain period of time. It is recommended to pre-plan and organize the teacher and students’ posts on Blogs and Wikis from the beginning of the course or series of lessons in order to benefit from the open collaborative archiving feature. Well organised posts can limit chaotic data in the online open environment.

4. Blogs and Wikis might be used for both single and group work activities but they are more recommended in group work for practical issues and for their potential and flexibility in anytime anywhere contribution.
Setting a balance between informal learning and socializing is challenging for teachers. Learning can be hindered by socializing issues. Either the students have to be self-regulated and responsible or the teacher has to set rules and regulations.

Teacher's overload needs to be controlled by either checking the important tasks and posts or by limiting the number of students' posts.

The current Blogs and Wikis text editors are most suited to humanities subject matters as languages and social studies much more than mathematics. Therefore, humanities subjects' teachers can implement most of their activities on Blogs and Wikis while math teachers face limitations.

Students need to be trained educationally, technically and ethically in order to benefit from Web 2.0 tools. Online rules of conduct have to be set clearly for students and emphasised throughout their learning. Ethical issue is a major concern in open environment and needs to be handled with care.

Students need to be trained to work collaboratively and be accustomed to a more dialogic approach that makes interactions in such a socio-cognitive context more educationally productive. In open environment, it is important for teachers to emphasis dialogic teaching where learning is collective. Teachers and students deal with learning tasks together as a group or a class rather than in isolation [2].

5 CONCLUSIONS

Although many students in this study enjoyed experiencing blog and wiki in their math learning and had recommended it to other students, they saw it as a way to complement the face-to-face teaching and learning process. Web 2.0 technologies have the potential to motivate students and help support their learning. In this regard, Osguthorpe and Graham suggest that in Web 2.0 learning tasks teachers and students should try to “…maximize the benefits of both face-to-face and online methods- using the web for what it does best and using class time for what it does best” [28]. The debates over the use of ICT within the classroom and specifically in math curriculum will continue and in some ways, this study does suggest that ICT tools do have the power to support students’ learning for particular learning objectives.

Although this study was small-scale, focused on a specific two math classes in a middle school context, it does generally confirm findings from researchers who argue that “Technology does not teach. People do” [30] as it was made clear in the findings of this research there is a fundamental role the teacher plays in supporting students' learning through ICT integration.

Finally, technology is not an end by itself but should be seen as a means towards an end, with that end being improved learning outcomes for students of all ages [7, 15].

REFERENCES

[1] EH. Alkhataba, S. SA bdul-Hamid, B. Ibrahim, Technology-supported online writing: an overview of six major web 2.0 tools for collaborative-online writing


