

Don't leave me alone: effectiveness of a framed wiki-based learning activity

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ABSTRACT

In this paper, the effectiveness of a framed wiki-based learning activity is examined. A one-group pretest–posttest design was conducted towards this aim. The study involved 146 first year university students of a Greek Education Department using wikis to learn basic aspects and implications of search engines in the context of a first year course entitled ‘Introduction to ICT’. Data analysis showed significant improvement in learning outcomes, in particular for students with low initial performance. The average students’ questionnaire score jumped from 38.6% to 55%. In addition, a positive attitude towards using wikis in their project was expressed by the students. The design of the activity, the context of the study and the results obtained are discussed in detail.

Categories and Subject Descriptors

K.3.1 [Computers and Education]: Computer Uses in Education – *collaborative learning, computer-assisted instruction (CAI), distance learning.*

General Terms

Design, Human Factors, Measurement

Keywords

Web 2.0, wikis, activity design, project based learning, collaborative learning, learning outcome.

1. INTRODUCTION

During the recent years, a considerable interest in using Web 2.0 technologies in education is observed. An important advantage of using Web 2.0 technologies is the ascertainment that they constitute a fertile ground for building project-based learning activities [4]. Among them, wikis seem to offer the most dynamic collaboration possibilities [16]. A wiki typically offers the ability to freely edit a website, providing features to add and modify pages as well as integrating hypermedia such as hypertext, images, video, etc. [1]. The adopted interaction model is similar to that of a rich text editor coupled with features of collaboration

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awareness.

The open nature of the wiki technology creates significant opportunities for learning [10, 17]. However, this advantage can at the same time be a major obstacle if the context and objectives of the activity are not well defined or not effectively communicated to the participants [11]. A wiki, by its very nature, facilitates quick content and organization deployment which in turn increases the possibility of introducing inaccurate or unreliable information, or quoting unsubstantiated opinions. However, all participants have the opportunity to edit and improve the provided content. This process of study, identification and correction of content throughout a process of reflection, provides the opportunity for educational approaches which are compatible with socio-cultural views of learning [3].

As it is the case with other technologies used in education, there is often an implicit perception that wikis can by themselves benefit the educational process without addressing the challenges to efficiently integrate them in the educational context. However, preliminary results, suggest that social, organizational and cultural aspects of the learning context are important factors for the effective use of wiki in educational practice and not the intermediary technology itself [15]. The open nature of technology and the dynamic form of collaboration poses the necessity for coordination among members in order to optimize cooperation with emphasis on learning rather than manipulating the environment [16]. In addition, only few studies provide rigorous, validated results on the effectiveness of learning activities mediated by wikis [6, 17].

The aim of the research presented in this paper was to investigate the effect of a framed, rigorously designed wiki based activity on the learning outcome. The design of the activity wiki was based on the framework proposed by West and West [16]. The implementation of the activity took place in an academic course of a Greek Social Sciences Department. The goal of the designed activity was to teach basic aspects and implications of search engines in the frame of a first year course entitled ‘Introduction to ICT’. A one-group pretest–posttest design was adopted to examine the extent of knowledge and understanding before and after the students’ involvement in the activity. Towards this end, a test comprising 40 multiple-choice questions with 4 answer options was designed.

The paper is organized as follows: Initially, the research methodology, the profile of the participants and the design of the activity are presented. Subsequently, the research results are presented focusing on learning outcome as assessed by an appropriately designed knowledge acquisition questionnaire. The implications of the results obtained are also discussed.

2. METHODOLOGY

The goal of this study was manifold. First, to study the students' learning gain after the wiki-based activity. Second, to investigate whether the students with lower pre-test score were benefited from the activity at least to the same extent as students with higher pre-test score. Third, to investigate the effect of the students' role while carrying out the activity, on their learning performance. Fourth, to identify students' grade distribution patterns after activity's completion.

2.1 Research method

A one-group pretest–posttest design was adopted [2]. A questionnaire was used as a data collection technique which was completed by the students at the beginning and the end of the wiki-based activity. The questionnaire included both demographic and knowledge acquisition questions. The latter was used as a students' learning assessment instrument. The knowledge acquisition questions were primarily related to general information about the Google history and services, while the demographic questions were related to personal information regarding ICT, Internet, wikis and blogs usage and adoption. The students did not know that they would be asked to complete the questionnaire at the beginning or the end of the activity.

2.2 Procedure and participants

146 first year university students, 2 male, 144 female, aged 17-40 (mean=19.24, sd=3.58) participated in the study. 35 more students who participated in the study did not respond to the assessment questionnaire (either the pre-test or the post-test) and they were excluded from the analysis. The majority of the participants (136/146) were 17 to 22 years. Participants were attending a non-compulsory academic course entitled "Introduction to ICT", offered in the first semester in the Department of Education and Early Childhood Education at the University of Patras. The activity took place from 29/11/2010 to 16/11/2010, a period during which the students had to complete the activity. Participation in the activity was compulsory and was one of the four required mini-projects given to the students in the context of the laboratory part of the course.

The procedure of the study was the following: First, an instruction on the wiki's basic functionality was given to the students. Subsequently, a compulsory assignment was presented to them in the form of a wiki designed by the researchers. The wiki presented the learning objectives, detailed and organized instructions to carry out the assignment, evaluation criteria and supporting material in the form of references and hyperlinks. The students were divided into 37 groups comprising 5 members each. They were allowed to freely form their groups without any restrictions. Each team member had a specific role in the group such as collector, coordinator, editor and verifier [16]. The roles are discussed in detail in the following.

2.3 Research materials

The wikispaces service (www.wikispaces.com) was adopted both for the activity announcement, as well as the platform provided to the students to construct their wiki. The online questionnaire service Survey Monkey (www.surveymonkey.com) was used to create and distribute the questionnaires of the study. The collected data were organized and analyzed using Excel 2007 and SPSS v17.0. The initial presentation of the activity to the students, the

students' presentation of their wiki and the completion of the questionnaires took place in the computer lab of the Department.

2.4 Description of the activity

The design of the activity was based on the framework proposed by [16] who identify the following critical factors to add context to the wiki environment: establish a purpose for the wiki project, define and classify the learning goals of the wiki project, design a rich context and problem that support the achievement of the purpose and goals, prepare students for work in the new environment, promote a collaborative process through which active, social learning can take place ([16], p. 22). Learning was expected to be achieved by engaging the students into 4 processes: information seeking and retrieval, argumentation development and refinement to support their thesis, cooperation among members and their involvement with the wiki editing process. The assignment was presented to the students through a wiki, which was constructed by the researchers (available at <http://googleactivity.wikispaces.com>). The wiki included the objectives of the assignment, its structure, detailed implementation instructions, the expected learning outcome, the evaluation criteria and representative support material.

The topic was selected for the following reasons: First, the students should be able to understand the importance and impact of search engines on society in general and on education in particular. In addition, the topic helps students to deeply understand a variety of historical, educational, technological and business aspects of search engines thus giving a fertile ground for argumentation. Finally, it is a notable session of the course's overall outline.

The students had to create their own wiki, in which they would develop the theme of the assignment. In order to better support and align the process of organizing their wiki, content and to organize and structure their arguments, an exemplary wiki was constructed by the researchers. In this wiki, the topics that they should cover were presented, organized into subsections with a short description for each one.

The wiki included 10 segment topics on which students relied on to accomplish their task. In particular, the topics used were the following: Google's founders, Google's history, the pagerank algorithm, search techniques, the technological infrastructure of the search engine, Google's working environment, services provided, Google's business model, usage of search engines in education, Google as a monopolist threat. For each topic, an indicative outline and specific arguments were given to the students to develop. However, the context was not restrictive and the students were encouraged to use additional arguments.

For each topic and sub-topic, supporting material and references were given to the students, mainly in the form of hyperlinks. The students had to search for information on these topics and seek additional materials. The use of additional material was not only desirable, but also a discrete evaluation criterion. The other criteria were text relevance, text clarity, argument originality and reasoning, compliance to the provided structure and format guidelines, material appropriateness and richness and appropriate use of references. In addition, it was stressed that usage of other's work should follow specific rules since the open nature of Web 2.0 tools could lead to inappropriate use of content from other sources [7, 16]. The students were informed how to use and cite other sources. Furthermore, they were informed that they could

only use freely available media or media under a creative common license.

Each team member had a specific role [16]. The first role was that of the "Collector", who had the responsibility to obtain appropriate material relevant to the subject undertaken by the team. The second role was that of the "Coordinator" who was responsible to organize the collected material and to check its consistency and relatedness with the objectives of the project. The "Editor" was responsible to compose the outline of the topics according to the objectives of the scenario. The "Verifier" was responsible to check the contents of the work for its completeness, structure and compliance with the objectives of the project. However, all students were allowed to participate and contribute in every aspect of the collaboration process.

Finally, the students had to present their work briefly during the laboratory session of the course. Each project was graded by the researchers on a scale from 1 to 100. The score was multiplied by the number of the group members and was given to the students. Subsequently, the students in each group were asked to discuss and share these points fairly according to each member's contribution.

3. RESULTS

Most of the students (132/146) reported that they have Internet connection at home and use it mainly on a daily basis (89/146) for information retrieval, email and instant messaging. Concerning their wiki experience, only 28/146 students reported that they had previously used wikis (except Wikipedia).

Table 1. Students' pre-test and post-test performance

Question categories	Pre-test (N=146)	Post-test (N=146)	% difference
Google's founders	30.14%	78.08%	159.09%
Google's history	29.79%	67.98%	128.16%
Pagerank algorithm	25.00%	42.12%	68.49%
Search techniques	40.75%	47.60%	16.8%
Google's technological Infrastructure	39.38%	36.99%	-6.08%
Google working environment	42.95%	63.36%	47.41%
Services provided	45.55%	57.53%	26.31%
Google's business model	34.93%	51.03%	46.07%
Usage of search engines in education	53.60%	60.96%	13.73%
Google as a monopolist threat	43.84%	43.84%	0.00%
Total	38.60%	54.95%	42.36%

The knowledge assessment questionnaire included 40 questions, 4 for each subtopic of the activity (Table 1). A decrease in the success rates was observed in 5/40 questions and in 1/10 subtopics. On the contrary, the maximum improvement found was 388.5%. The average students' performance jumped from 38.6% (SD = 9.72, minimum 17.5%, maximum 70%) to 54.9% (SD = 11.52, minimum 20%, maximum 77.5%). The percentage difference is 42.36%, considered very significant; Wilcoxon matched-pairs signed ranks, $p < 0.0001$. In only 11/146 students, a decline in test performance was observed. The latter possibly suggests a low involvement in the activity. However (107/146 students, 73.28%) improved their performance by at least 10%,

while 85/146 (58.2%) students improved their test scores by at least 40%. The highest improvement observed was 50 percentage points (from 22.5% to 72.5%, see also Figure 1).

A notable result is that students' learning gain was not as high in all categories of questions. This could be attributed to the nature of the questions. For instance, as the data suggest, students already had a satisfactory understanding of search techniques, usage of search engines in education and other services provided by Google (Table 1) due to their participation in previous lectures and laboratory sessions. Thus, a modest performance improvement was somewhat expected. Moreover, since the questions of the tenth category were not related to facts but rather with questions requiring reflection on the social implications, one may argue that the proposed activity was not as much beneficial to the students in terms of obtained analysis and synthesis skills. In addition, the poor students' performance in aspects related to Google's technological infrastructure should be further investigated to better anticipate the causal factors.

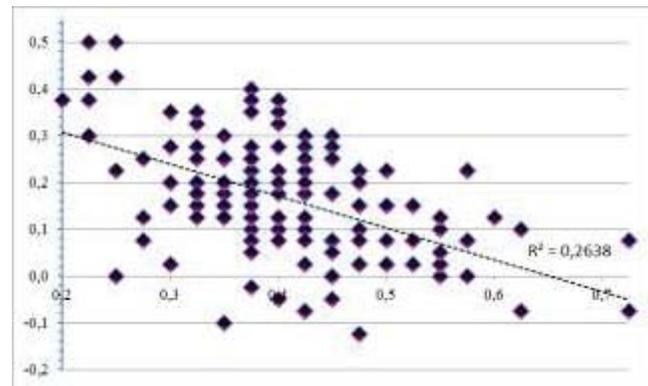


Figure 1: Students' learning gain. Data were sorted according to their pre-test score

The data also suggest that students with lower pre-test performance showed a higher improvement, compared to the students with higher initial performance whose improvement was lower (or marginally negative). In specific, the 73 students with the lowest initial test scores showed an improvement of 21.3 percentage points, while the 73 students with the highest initial scores improved by 11.4 percentage points (Figure 1). Furthermore, a strong negative correlation between students' post-test improvement and their pre-test performance was derived (Pearson's $r = -0.513$, s). This observed pattern of learning gain seems of particular interest and is compatible with the results obtained from another activity in a similar context [14]. However, additional studies are required to identify the specific reasons; if this kind of cooperation was beneficial for the students with lower initial performance, or whether the specific activity did not offer sufficient learning opportunities for the students with relatively high initial performance.

In addition, a one-way ANOVA, did not unveil any significant effect of the students' role on the learning gain; ($F(3,142) = 0.441$, $p = 0.724$). The learning gain according to the students' role ranged from 14.73% (editor) to 17.74% (collector). This finding suggests that the wiki-mediated activity benefited students regardless of the roles selected themselves.

The 37 teams were graded from 50% to 91%. The scores were multiplied by the number of the group members. As far as the score distribution is concerned, a significant differentiation was

observed in only to 9/37 groups. In one of these groups, the participants agreed for a perfect score, 100 for 4 members and 55 for the 5th. In another one, the participants agreed for a perfect score, 100 for 2 members, 77, 65, 50.5 for the remaining students. In addition, the participants of another group agreed for 65 for 3 members, 60 and 45 for the other 2. In the fourth of the aforementioned groups, the assigned 402.5 points were distributed as follows: 100 points were assigned for the 2 members while the other members received 77, 50.5 and 75 points, respectively. Such grade distribution patterns possibly indicate a lack of balanced collaboration. In the remaining groups, subtle differences were observed (11, 10, 8.5, 7 and 5 points difference between the highest and the lowest score).

Finally the students reported positive attitudes towards the wiki-mediated activity while presenting their work and reflecting upon their experience with the rest of the class. Beyond their notable learning gains, they also reported that the activity helped them to acquire better writing, group process and self-organization skills. Moreover, they managed to balance between members' different views, criticism, modifications and suggestions and create effective channels of collaboration.

4. CONCLUSION

The results of a study investigating the effectiveness of a wiki mediated learning activity were presented. The evaluation was carried out using a one-group pretest–posttest design. The results showed significant improvement in learning outcomes, in particular for students with low initial performance. The average students' questionnaire score jumped from 38.6% to 55%.

No significant learning gain differences between the four different students' roles were found. In addition, a significant variation in students' grade distribution was observed in only 9/37 groups. The results suggest that a properly designed, framed wiki-based activity could substantially facilitate students to achieve high levels of learning.

However, the study is not without limitations. The results obtained do not explain how the students have benefited from their involvement in the activity. Moreover, it is not known to what extent the students were improved in other non-cognitive aspects considered important to complete a wiki project, such as self-organization, collaboration, attitudes towards technology and openness [12]. In addition, other future research goals constitute the design of additional wiki-based activities in a variety of educational settings as well as to investigate the learners' behavioral intention to use wiki technology using technology acceptance models [13]. The relation between the observed students' activity and the learning outcome [5,8,9] will be also examined.

5. ACKNOWLEDGMENTS

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