Tools for collaborative learning: the use of wiki

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Abstract—**This study focuses on online collaborative learning. The main objective is to analyze how and why the students who start studying at the Universitat Oberta de Catalunya (UOC) use the wiki as a tool in order to develop a virtual project in small groups (3-5 members). Starting from a qualitative point of view, we analyzed a pilot test where wiki was introduced for collaborative work in the Digital Literacy subject. Two different student profiles were involved in this study: students from Computer Engineering and Psychology. The outcomes show that there are several factors that affect how students use the wiki. At the same time, the most important aspects of the wiki to construct a virtual project are analyzed.**

Keywords-collaborative learning, tools for collaborative learning, wiki.

I. INTRODUCTION

As literature suggests, collaboration is the basic premise of the networked learning [1]. Some researchers have called the current educational paradigm "networked collaborative e-learning" [2].

The Internet trends that are most interesting for online education today are related to social software and Web 2.0 [3]. E-learning research asseverate that these innovative technologies have the potential to change the way people learn [4], shaping new challenges for education and increasing the opportunities to learn and work in a virtual team. Following Rhoades *et al.*, a key characteristic of Web 2.0 technology is the ability of the end user to edit or create information provided by another user [5].

Researchers agree that social software like blogs, wikis, social bookmarks, podcasts, etc. increase collaboration, communication and knowledge production. At the same time, such research evidences that most studies focus on tools from technological aspects, highlighting its potential or offering a user guide [6]. Few studies analyze real practices that take place as a result of introducing these tools in a collaborative learning environment: how student use web2.0 tools, which are their motivations, etc. Such studies emphasize that changes by the introduction of social software go further than allowing the user to use tools from a technical point of view. The shift towards personalized learning environments implies the restructuring of educational processes [6]. A recent research evidences this fact when reported a failed experiment with the Wiki technology as a student engagement tool, highlighting the

consequences of a poorly designed and supported integration of the wiki into educational practices [7].

In this context and taking into account the UOC environment, where students work in small groups in a virtual space, we introduced the wiki as a pilot experience in order to facilitate collaboration processes among students. This situation allowed us to analyze the experience to facilitate, in the future, guidelines for students as well as for teachers that deal with strategies in the use of wiki.

II. METHODOLOGICAL FRAMEWORK

Under the methodological framework, our research was based on a qualitative case study. Its main goal was to analyze the usage of the wiki as a collaborative tool in order to develop a virtual project. We analyzed how and why the students who start studying at the UOC used the wiki in small groups (3-5 members). We understand the wiki as a "set of web pages created and edited from a non-hierarchical and collaborative technology that allows that any user, at any time, may make contribution of contents and edit electronic publishing with its interventions" [8].

A. Research scenario

The UOC is a fully online university, with a Virtual Campus where all learning activities and communication take place. The average profile of the UOC student is an adult (most of them between the ages of 25 and 40) who works more than 30 hours a week [9].

Two different studies were selected for the study: Computer Engineering and Psychology. The aim of this decision was to contrast the use of the wiki made by groups among different students' profile. Within each profile, two classes of the same subject, Digital Literacy (DL), were chosen randomly. DL is a 4,5-credit subject, cross curricular to all UOC disciplines and compulsory for most of them. It is recommended to be taken on the first semester at the UOC. Its aim is to put into practice learning, work and study strategies in a virtual environment through the acquisition of skills expressed in terms of generic ICT competences in a collaborative work scenario.

Students involved in this research shared the same characteristics: to be on their first year/semester at the UOC and to be taking DL subject. DL for Computer Engineering and for Psychology has the same goals and tools for the project development. As average, there were 65 students per classroom, distributed in small groups (3-5 people). Each of

them had their own UOC online working space with the following tools: debate, wiki, chat and file area. The wiki was introduced in the subject as a new tool in order to construct knowledge in a collaborative way; nevertheless the result of this process had to be delivered in a text document. The wiki was founded on PMwiki (http://pmwiki.org/). Its main features were: custom look-and-feel, access control and customization and plug-in architecture. The guidelines were scarce and were basically focused on explaining what a wiki is. It is important to mention that the use of the wiki was voluntary and its possibilities, from a technological point of view, were limited.

Among the four classes, different groups were chosen as the specific analysis context. The choice of these teams was founded on two main requirements: that the group developed a successful dynamic in relation to the course objectives and that they used the wiki. Finally, 6 groups of Computer Engineering (3 for each of the two classrooms) and 1 of Psychology were chosen. The 7 groups shared the following characteristics:

- All received high marks, during and after the process
- All the interaction in order to develop the project was registered in their respective virtual spaces.
- The tools chosen by groups were basically asynchronous: debate, wiki and area files. These tools were combined as shown in "Fig. 1".

STUDY	GROUP	PEOPLE	DEBATE (contributions)	Mg FILE AREA	WIKI USE	CHAT
Comp. Eng.	A	4	478	60	DP	-
	B	5	208	7,5	ALL	-
	C	4	178	93	ALL	8
	D	4	175	21,4	DP	1
	E	4	186	7,7	C, PM	-
	F	4	130	2'96	DP	2
Psych.	G	4 → 2	257	6,21	ALL	-

Fig. 1. Use of the tools for collaborative teamwork.

The letters related to wiki refer to the different uses identified in section III: Communication (C), Project Management (PM), Diffusion Project (DP), and Project construction (PC).

B. Data collection and analysis tools

The data collection tools were mainly the following three: observation, a questionnaire and some semi-structured interviews.

The observation was carried out in the different group spaces from the DL subject: debate, file area, wiki and chat.

At the same time, an anonymous online questionnaire was created in order to analyze group work processes as well as tools and teacher role. With the objective of collecting as much data as possible in order to evidence the results beyond the selected cases, the questionnaire was sent to all classrooms (14) of the selected studies and answered by 192 students. The questionnaire was voluntary, anonymous and

non-assessable. This research was based on two of the questions referred to tools: an open one and a closed one. It also took into account questions related to the student's profile.

In order to complete the data from the observation and the questionnaire some individual semi-structured interviews were conducted with 14 students (two per group), trying to focus on their perception of collaborative group processes. Some of these questions also focused on the use of tools in the collaborative processes.

All these data was triangulated. It is important to mention that all data was collected in Catalan, so it was translated.

III. DATA ANALYSIS AND RESULTS

Bearing in mind the research objective as well as the methodological approach, the outcomes point out that the motivations that lead students to use the wiki determine how they use the tool in the process. In this section we will deepen into these motivations as well as the specific uses of wiki made by students within a virtual collaborative group.

A. Motivations for using wiki

Students in both degrees admit that use of the wiki became a "*new experience*". One interviewee in Group B reflected how the wiki represented an innovation when he said that previously he "*did not know what it was*". At the same time, another student in the group F argued that he edited some of the wiki pages "*out of curiosity (...) to investigate how it worked, because... these things are so, so new that I never ... I never seem to actually check them out*".

Regardless of the student profile, the data proves that there are three main causes that lead groups to use the wiki or not:

a. *The degree of knowledge of the tool*, that is, what a wiki is and what possibilities it has for collaboration in a virtual environment.

On one side, a person belonging to group B asserted in this sense: "*I introduced the wiki into the group (...) I realized the potential of the tool because… in the debate area, one person proposed a title for the project, another one added another thing, but…you know, that stays there… so when you access the debate area of the group in order to get an idea of the titles that we have been discussing… well, I don't have too much memory... so I have to go through all messages and check them all by opening one by one*". Later, he commented referring to how, from the beginning, he tried to encourage their group mates to use the tool: "*For example, in relation to tasks… I listed the tasks and I noted with asterisks or with an "x" what we had to complete and I said: put your name down next to the tasks that you prefer*".

On the other side, a member of the group E stated in the questionnaire "*The Wiki seems like a good initiative, but it wasn't accepted as a whole, probably, because it requires some learning*". Another member in Group G affirmed "*we were very slow because we weren't familiar with it*".

b. *The degree of difficulty in terms of usability*. Students'

comments in the questionnaire as well as the observation carried out in group spaces confirm that students see the wiki as a complicated tool in terms of use. One interviewee of the group D said: "*Had the editing in the wiki been easier, maybe we would have done better. (...) I saw the tool a little bit complicated to work with... to write there*". Even though the group G worked with the wiki in order to develop their work, they evidence this factor in the following comment: *"I personally won't use the wiki again because it is very complicated"*.

Data show that those tools easier to use are the most used ones. While all the groups in the four classrooms worked intensively in the debate and file area, not all of them decided to use the wiki. As a student pointed out in the questionnaire: "*The learning curve at the beginning slows the use of wiki as a tool against the ease of the debate or the file area*".

c. *The availability of time.* Most of the groups that were unable to use the wiki or used it below its potential referred to the lack of time as the main cause.

At the same time, there are evidences that two elements are relevant in these factors: predisposition of use linked to student profile; and the initiative of one of the members.

- *Predisposition of use*

With the same conditions, guidelines and available tools just one group of Psychology worked with the wiki. On the other hand, all teams of Computer Engineering included this tool to their dynamics, although with different objectives in mind and, in some cases, edited only by one member. It is clear that Computer Engineering students are more likely to work with new tools than Psychology ones. Therefore, the predisposition in the use of the wiki is related to the students' profile. In this sense, it is important to mention that 84.08% of the students surveyed of Computer Engineering agreed that their previous ICT skills had facilitated their task in the group, in comparison to 65.51% of Psychology ones. Data suggest that this domain of ICT is an important factor in their willingness to use the wiki. A member of group C mentioned about the motivations for using it: "*to learn how it works, to take advantage of the possibility offered to use something that I personally had never used before. Word, Excel... this kind of software I already know how it works, so I was interested to learn how the wiki works too*".

- *Initiative of any member*

The observation in the group debates shows that the origin of incorporating the wiki into their dynamics comes from the initiative of one of the members. That is, normally, it is a person who raises its use and/or encourages to. The following are two examples of the discussion that took place in the debate area of the groups F and G as the result of the approach of using the wiki.

A.
"*What I would like (...) is to use the wiki, it seems like an interesting tool to work with our project. What do you think?*"
"*Ok, we could try to use the wiki, but just now I see it as something a little complicated to use. It is a question of spending time with it*".
"*Concerning the use of the wiki, I agree (...) but just now I don't know what we could put in it*".
B.
"*What do you think about using wiki? I had a look and it does not seem too difficult to use*".
"*I think this is a very interesting idea (...) It's a good idea so that we avoid sending so many files to the file area and also we can see straight away what we are doing, we can add and correct...*".
"*PS: somebody told to me that the wiki is really easy to use and really useful. Someone will help me with it so if you want to use it and you have any questions, we can have a look at it together*".

All these elements affected the group dynamics in relation to the different available tools for working in groups and, specifically, to wiki and determine the way they used them.

B. Use of the wiki

The main uses of wiki were as follows:

- *Communication (C)*

In some cases, students used the wiki as a space for exchanging opinions or discussing specific aspects of the project. An interviewee of group B reflected this feature when he claimed they had used the wiki as "*a forum that everyone can edit (...) the wiki was like a dynamic board that could be modified*".

In other cases, the wiki was also used for communication related to social dimension, mainly in relation to asking for help and to encouraging participation. For example, one student of the group E wrote in his wiki page: "*I'm doing a test. Does anybody know how to use wiki in an effective way and create our forum space for working?*" Another student who belongs to group C said in the wiki: "*I don't know what I can write here guys! Let's see if someone has any idea ;-)*". Also, the group G wrote: "*I'm not sure if it's this???*"

- *Project management (PM)*

The wiki was used in other cases to control and monitor the process. One student noted in the questionnaire that the wiki was useful as "*a scheme of the work done and the pending one*". Also, a member of team C claimed that the wiki "*allows the group to be organized in a different and attractive way*". In this line, groups B and C used the wiki to distribute their project tasks.

A very important use in relation to the Project management was the management of information generated in the process. In this sense, we distinguish three related functions.

Firstly, the possibility of a quick and easy control of the different versions of the project, that is, in the words of one member of group C "*to add and modify content knowing who did it and when*".

Secondly, as a digital information repository, in other words, to store and share the information generated during the process. Groups B, C, E and G are an example of this use.

Thirdly, as an organizer of ideas and content to facilitate taking decisions. One interviewee of group B said in this sense that the wiki had been very useful to "*reach agreements (with brainstorming, for example)*". Also, he referred to this functionality as follows: "*Who is in charge of this task? Him... Which titles do we have? These ones... so it seems we have this title repeated several times, maybe this will be the one*".

- *Diffusion of the Project (DP)*

Groups A, D and F used the wiki to publish their work. In other words, the project was created through the other available tools and the outcomes obtained as a result of the process were uploaded on the wiki. One interviewee of the group A noted that they published "*each stage of the study, turning the Wiki into a web presentation of our work. It was very interesting as a self-publication tool*".

However, the role of the wiki "is not so oriented to the regular publication of content but to the structured information published that is increased and modified as users make new contributions" [8]. In this sense, a member of group acknowledged that they used the wiki "*below its real potential*".

- *Project construction (PC)*

Groups B, C and G used the wiki to build the project. This function covers the entire process: from first ideas to the final diffusion. The construction of the project on the wiki, therefore, includes the other uses mentioned above. One interviewee of the group C said: "*on the wiki we were creating the temporary work that we had to deliver*". Indeed, this group valued the tool as very positive, stating that "*The use of the wiki makes work easier*".

IV. CONCLUSIONS

The data analysis shows some conclusions in relation to the use of the wiki for the virtual construction of a project in small groups.

Regardless of the student profile, three main factors affect the use of the wiki.

First, the degree of knowledge of the tool. The analysis shows that, in general, the experience analyzed was the students' first practice in using a wiki. However, it has become clear that some students knew or knew by intuition the most important benefits of the tool while others did not.

Second, the degree of difficulty, in terms of usability. In general, students value the tools that are easier to use (debate and file area) as more useful. In this sense, a member of the group G said in her interview: "*For the group it is much more useful the debate and the file area*".

Third, the availability of time. In this sense we have to take into account that the most of UOC students are adult people who have a job outside the university.

In addition to these factors, two elements are relevant in the use of wiki. First, their predisposition of use, which is linked to the students' profile. However, we analyzed just one group of Psychology, so it requires further investigation. Second, the initiative of any member to introduce the tool and the group mates reaction.

All these elements determine the role of the wiki and, at the same time, impact on how they use the tool. Four functionalities of the wiki have been founded: communication, project management, diffusion of the project and project construction.

All groups using the wiki recognized its potential for the collaborative construction of knowledge. However, in general they agree that they could have taken more advantage of it, especially those who just used it as a repository of information or as a publishing tool.

These elements lead us to conclude that students need more information, guidelines and strategies of use in order to build the entire project using wiki. An interviewee of group C evidences this fact: "*The nature of the wiki in itself for this kind of subject was useful. Maybe not to construct the final document because for this to happen, I think a few years should pass and that people learn to use the wiki better. But it could have been used if you were a bit skilled... it requires more time because everyone knows how to use Word, but not everybody knows how to use the wiki*".

According to these elements, in the context of the Digital Training Area at the UOC we are creating a guide for using the wiki as a tool for the construction of a virtual project in groups.

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