Wiki-Test case study: the potential of wikis for assessing the collaborative answering of tests

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ABSTRACT

This paper presents a case study where students collaboratively answer a test using wikis in a real educational scenario. The paper explains the methods used to obtain information about the collaborative work done by the students for answering the test. This information can be used by teachers to have some indicators about the collaborative skills of each member of the group. The paper also describes the necessary tools, functionalities and rules that teachers have to follow to create this collaborative space.

Introduction

Wikis are currently one of the most used tools for supporting Computer Supported Collaborative Learning (CSCL) [11-12]. The main reason is that Wikis provide support for sharing and editing a document. One of the common educational practices with wikis is to collaboratively write an article, a composition or a solution for a problem, sharing the contributions. The final version introduced in the wiki is assessed by a teacher. Larusson & Alterman propose in [3] to use wikis for assessing the collaborative skills of the members of a group in a task.

The benefit of using wikis with assessment objectives is twofold: (1) to assess the contributions of the students; and (2) to assess and analyze the collaborative skills of the students. Regarding these assessment objectives, Macdonald makes a distinction between [2]: the *product* (final version of the wiki) created by a group, and the

process (actions done in the wiki) for creating this product. Whilst assessing the product consists on reading the final version edited in the wiki, assessing the collaborative process can be a hard task. For checking the collaboration performed by a group it is necessary to know the actions done by the students during the collaborative edition. This information is contained in the History of the wiki. However, to check the data contained in the History section is a hard task for the teacher. Some wikis capture the information of the actions done by the participants in a log file. This file has a big quantity of useful information, but it is also a hard task to analyse it manually.

An example of an educational scenario where wikis have been used with assessment objectives is proposed by Liu et al. in [10]. In their work wikis were used in combination with an assessment module for creating self-assessment tests. Students answered individually the questions and the tool provided support to share the methods used by the students to solve the questions. With this solution teachers can assess automatically the final product of the test. The tool used the collaborative characteristic of wikis to share the solutions. But in this case the authors did not benefit much from the collaborative edition that wikis offer, and they did not capture the process done in the wiki to answer the test.

Once a teacher is decided to use wikis with assessment objectives, an important task to do is to promote the effectiveness of the activity. The teacher has to design a collaborative space using a wiki (or a group of wikis and other tools) taking care of facilitating a positive interdependence between the students, promoting the group (and individual) responsibility and giving an incentive for supporting the development of social skills [4]. The teacher also has to indicate a set of rules and guidelines, highlighting the correct use of the tools and the assessment objectives of the activity. Previous studies demonstrate that this organization is helpful for obtaining a good collaboration between the members of a group [5-6-7].

In this paper we focus on analysing how wikis can be used for collaboratively answering a test. We explain the method followed to analyse the log files in order to assess the *process* performed by the group to solve the test through a case study. As a basis for this study we take as the main reference the work done in the Evalhida project [1]. This project used blogs, forums and wikis in educational assessment scenarios to understand the advantages and limitations of these tools for evaluating competencies. Regarding wikis, they detailed a set of collaborative aspects which can be captured from the log files. These aspects are analysed in the paper. In the case study presented three teachers decided to create a collaborative space called "Wiki-Test".

The paper is organized as follows. Next section is devoted to present the case study, the educational context and the space especially designed to create the activity: the Wiki-Test. The rules and guidelines that the students had to follow to participate in the Wiki-Test are also presented in this section. Then, a new section describes the evaluation of the case study by introducing the methodology used to capture the data and the results obtained from the experience. Finally the conclusions and future work are exposed in the last section

Description of the Case Study

Wikis for Collaboratively Answering a Test

The case study was conducted in a seminar called "eLearning: from the basis to the future" framed in the Communication and Education International Master of the Universitat Autonoma of Barcelona (UAB), Spain. The seminar was carried out in 4

days of a week in March 2010 with a free day of lectures in the middle. It combined face to face (f2f) sessions with virtual activities (supported by a Moodle course). The pedagogical method used was based in Collaborative Learning practices. 19 students with an average age of 30 years participated in the seminar and they were organized in 5 groups. Three teachers did the lectures of the seminar and helped the groups in their practices. During the 4 days the students learnt new concepts about eLearning. In groups they had to practice with an eLearning tool. The assessment objectives of the teachers were: (a) to check if their students understood the concepts explained in the sessions; (b) to verify that the students related the concepts learnt with the practice performed in the tasks; and (c) to analyse the collaborative skills of the members of a group.

During the week of the seminar the students had to collaboratively answer a test using a special section designed in the Moodle of the course. Everyday, at the end of each session a group of new questions appeared. The questions were about the concepts explained during the sessions. There were four types of questions: Multiple Choice, Multiple Response, Yes/No and Fill in the Blank questions. Students were free of justifying their answer by adding some text at the end of the question. Next section details the characteristics and objectives of the Wiki-Test activity.

The Wiki-Test Space

Moodle was the Learning Management System (LMS) selected for creating the Wiki-Test space. This system enables the organization of students in groups. This option hides the contributions performed by a group in a wiki to the others groups. Another important feature is that Moodle captures, in log files, all the actions performed by the members of a group. Other wiki systems (e.g. Wikispaces or Wikipedia) do not provide this option. The log file of the Moodle's wiki offers information of the user data, the access, the actions of editing and visiting, and also the changes done in the wiki's configuration by a user. These files contain a big amount of information, which makes difficult for the teacher to analyze it without an automatic tool. Although Moodle does not provide support to analyse the log files it generates the logs in a spreadsheet format. The authors of this paper helped the teachers in the analysis of these logs using a spreadsheet tool. They analysed which were the necessary formula that could be applied to the Moodle's logs to create graphics and statistics with information about the collaborative work done by the students. More detail about the methodology used to compute this information is explained in the next section. We now specify the functionalities and sections of the Wiki-Test space:

Wikis: 8 wikis (one per question) were added to the Wiki-Test space. The teachers wrote the questions using the text editor of the wiki. Each group of students had to collaboratively answer to the questions. The teachers encouraged the students to solve the questions, but also to eliminate incorrect contributions of their mates, fix the text (moving sentences, correcting content) or cross out sentences from their peers. The goal of a group was to select the answer to the questions that they agree as the best or correct option(s).

Forum: students could use this tool to discuss asynchronously about the questions.

Chat: due to the fact that wikis only enables asynchronous edition, the chat was added for facilitating the discussion and for establishing a turn for editing. A rule established by the teachers was that before editing in a wiki, the student had to

verify in the chat whether there was someone else editing at the same moment. If nobody was editing then the student had to write in the chat that s/he was editing. In case of finding someone editing the student had to wait until his/her colleague finished.

Rules and objectives section: a document which contained the rules of the Wiki-Test space, the correct use of the tools and the assessment objectives of this space.

Final results: once the activity finished, a document with a table summarising the final responses and correct answers was added. Also the graphics and statistics of the collaboration performed by each member of the group in each question were published.

Evaluation

Methodology

As we have explained in the previous section, an authentic educational situation with real users was carried out to evaluate the use of the Wiki-Test. The evaluation is structured as a case study [8]. We have adopted a mixed evaluation method [9] using various quantitative and qualitative data gathering techniques:

Moodle's logs: The Wiki-Test was composed by 8 wikis (one per question) for facilitating the analysis of the logs generated by each wiki. The data saved in the log files was analysed using a spreadsheet tool. For each question, the authors of this paper organized the information of the actions performed by the members of the same groups. Once the data was structured, the authors created graphics and statistics to help the teachers to obtain primary evidences of the following aspects of the collaborative work:

(a) *Amount of actions:* the Moodle's logs save the number of editions and visits performed by a user in a wiki. A total of 8 log files (one per wiki) were analyzed. The data of the actions were summed and as result two pie charts were created (one with the percentage of edits and another with the views).

The analysis of these graphics provides an overview of the amount of work done by each participant. In the UAB case, the average of the actions done by participant in the Wiki-Test was: 32.47 views and 6.57 editions. Participants from groups 3 and 4 obtained a positively significance difference from this average with: 49 views and 14.5 edits (group 3) and 53.75 views and 8.25 edits (group 4). The teachers verified that the answers introduced by these groups in the Wiki-Test were the most complete.

Moreover using the amount of actions teachers can check who was the student who did more and less actions in the Wiki-Test. In our case, G4-user4 was the student who participate more with 103 views and 23 editions, whereas G2-user4 only did 3 views and 0 editions.

This information is useful but teachers have to take into account: (1) that this data does not consider the quality of the editions and (2) that the students might did not follow the rules established by the teacher and used other tools to discuss the answers. Then students only used the wiki to make a unique edition with their answer. Teachers have to compare the amount of actions with the final answers introduced in the wikis.

(b) *Temporal distribution:* when a user does an action (edition or visit) in the wiki, each action has a timestamp. This information can be organized and computed using

the spreadsheet tool. The generated result is a graphic with the number of editions and views performed by the members of a group in a day. If the activity has a duration of 5 days, the graphic contains the information of the work done during these days (see
Figure **1**). This information can be used to know how the students distribute their time for answering the questions. For instance, Figure 1 (a) shows that group 3 used the first two days only for reading the question, in the third day (the day free of lectures) they did the main contributions to the question, and they used the next day to make little changes. The group 4 distributed their time differently (see Figure 1 (b)). The first day they read the question, they used the others days to complete it, and made the final big contribution the last day.

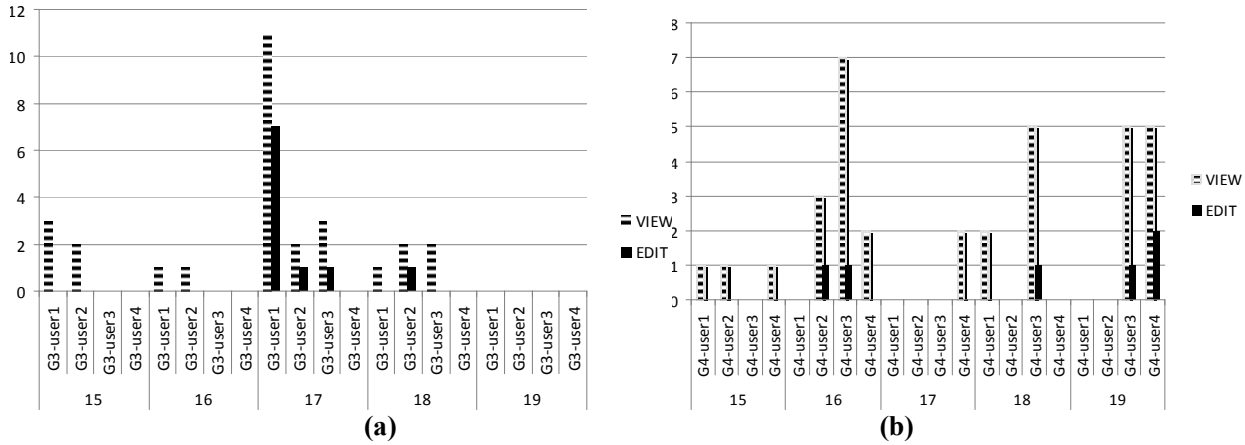

Figure 1. Question 2 (a) temporal distribution of the work done by Group3 (b) temporal distribution of the work done by Group4. The X axis shows the participants of a specific group and their actions in a specific day, and the Y axis shows the quantity of views and editions done in the wiki)

(c) *Indication of motivation:* from the Moodle's log files it is possible to obtain indicators about the different grades of participants' motivation. We propose a first approximation to distinguish between different grades of motivation: the 1st grade (and the best one) is when the student makes a considerable number of editions (and views) to the wiki. The 2nd grade occurs when a student makes little editions to the wiki but s/he visits the contributions done in the wiki regularly. In the 3rd one the student does little editions and/or views to the wiki. Finally the 4th grade occurs when the student does not interact with the wiki at all. These grades of motivation can be obtained comparing all the actions performed by the members of a group during the time that they have to answer the test. For instance Figure 1 shows how the G3-user1 did the highest quantity of actions in this group, whereas the participant G3-user4 did not contribute in the answer.

(d) *The roles:* two important roles regarding the hierarchy of the group can be detected using the log files, the *leader* and the *reviewer*. The teacher can obtain some evidences that indicate who play these roles. We suggest that a potential leader in a group is the person that has the biggest participation (edition+views) in the wiki. The reviewer is the type of student that is constantly reading the contributions of others participants.
We have to remind that these roles can be detected only if the students follow the rules established by the teachers, and use the Wiki-Test space correctly.

Others aspects can be extracted from the logs: the graphics of temporal distribution can be used to know in *which questions students have more difficulties*. Normally the more difficult questions are those that have a big amount of visits but no significants contributions. And of course the mark obtained in these questions is lower. Another useful graphic is one that compares the number of editions and visits done by each member of a group in a specific question. The teachers can have an initial idea of *which groups work collaboratively without problems, and which are the groups which have problems during the collaboration*. As we can see in Figure 2, the group 1 (G1) and the group 5 (G5) had problems answering the question 8 because not all the members of these groups collaborated equally.

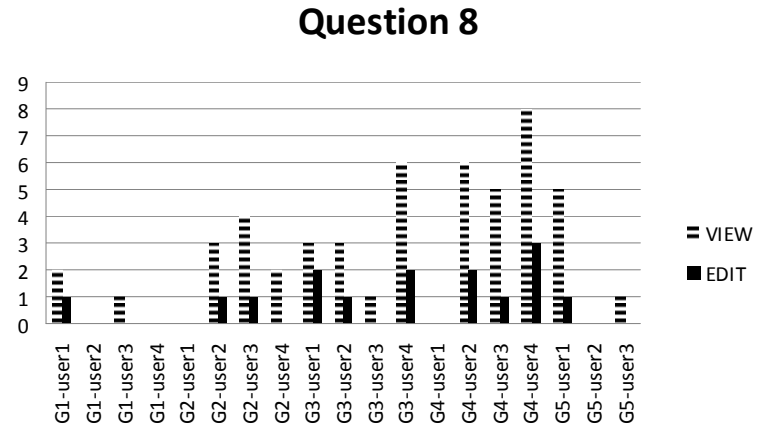

Figure 2. Comparing the work done by the 5 groups in Question 8 (where the X axis shows the participants of the five groups, and the Y axis shows the quantity of views and editions done in the question 8)

Chat and Forum's contributions: the comments added by the groups in the chat and the forum were used to evaluate: *(e) the decision making and negotiation skills of the members.* Moodle generates log files for both tools.

Questionnaires: After answering the test of the Wiki-Test, the last day of the seminar the students answered a questionnaire for evaluating the Wiki-Test space. The questionnaire contained open and closed questions. The answers were used to evaluate the feasibility of the Wiki-Test space and to collect ideas for improving this space in the future. Also some answers were used to understand if the data obtained from the logs fits with the description of the work done by each participant.

To conclude this section, we have to remind that the results obtained from the log files give initial evidences of the collaboration performed by a group. This data is very useful for the teacher, but it is not enough to evaluate the collaborative process. The teacher should have to compare these results with the mark obtained in each question. Also at the end of the activity we recommend practitioners to do a self-assessment activity using rubrics where students should have to value their work and the work performed by their peers. This data can be used to obtain final conclusions.

Results from the Experience

36% of the students that participated in this experience were using the wiki for the first time. In addition the 57% of the students commented that before this activity they only used wikis to read articles. Only the 7% of the students had already edited in a wiki before this experience. This means that using the Wiki-Test was a challenge

for an important part of the students in the seminar. After using the Wiki-Test, the 64% of the students indicated that the use of this collaborative space was very easy.

The students indicated the different methods that they use to organize their collaborative work. We distinguish three of them. First, some students distributed the number of questions between the members of the group, one student said "*we have divided the number of questions between us*" [G1-user4]. The problem with this method is that students are not working collaboratively. Each participant becomes expert of a question, but they do not demonstrate their expertise in the entire test. The teacher can detect this problem comparing the number of contributions performed by each member of the group in each question (see Figure 2). For avoiding this problem, teachers have to highlight that all the questions have to be collaboratively answered and the collaborative work of the group has to be an important part of the final mark of each student. Second, the students used the chat and the forum for answering the questions and then one of them (the leader) answered the question in the wiki. A participant indicated "*we use the chat for confirming the answers*" [G3-user3]. In this case all the students worked collaboratively, the problem is that only the actions performed by one of the students were saved in the log files. The teachers would have to check the logs (or the comments) saved in the chat and the forum. And third method, all the members of the same group use the wiki to edit or review and/or change the answers. For instance some participants indicated, "*Each one put his/her idea in the wiki*"[G4-user4] and "*Some of us answered first, and then the others review the answer*"[G1-user2]. In this case the students were working collaboratively in all the questions. Moreover, in this case, the actions performed in the wiki are saved and analysed with the spreadsheet tool. For example we can verify that the participant G4-user4 is saying the true because using the Figure2 we can check that all the members of the group collaborated to answer the question 8.

We have detected, that students are not confidence enough to change or eliminate contributions performed by their peers. They only changed grammatical mistakes but they did not change the option selected in a question by other student or delete the content of an answer. Their comments were: "*I think that I do not have the authority for evaluating the opinions of others persons*" [G1-user3], "*I think that all of us have valid opinions*" [G3-user3] and "*I only changed some grammatical errors. For instance, I deleted some redundant words or I added commas or points…*" [G4-user4]. A possible solution is to highlight that their tasks as members of the same group is to obtain the best answer, changing the content if it is necessary. In a future work, a possible wiki-question in a Wiki-Test could provide a highlighted space for selecting the correct option or filling a blank. Also in this space it would be necessary to add a message reminding the students that they can change the option selected by others or the text for justifying the answer before submitting the question.

The majority of the students indicated that the worst aspect of the Wiki-Test was that wikis do not enable synchronous edition and that they could only edit using turns. The chat was a good solution for solving this problem. They also commented that they used the chat for discussing about the questions, *"Using the chat you can directly clarify with your mates some aspects or doubts about the questions"* [G3-user4]. The 71 % of the students would have preferred a collaborative space were they could edit at the same time, and view in real time the contributions that the others have done. Also the 86% of the students selected that it would be very helpful to have a control awareness of the different contributions done in an answer, distinguishing each student with different colours.

Finally, on one hand the 64% of the students valued positively the experience of responding collaboratively a test using the Wiki-Test space. They stressed that answering questions in groups facilitates the emergence of new ideas and concepts. Also they commented that in their opinion they learnt more using this method that resolving individually a test. On the other hand, the 14% of the students commented that it was a bad experience for them using the Wiki-Test. But they clarified that it was because they do not feel well with their group because the communication between them was bad.

Lessons Learned and Conclusions

After analysing the experience of using the Wiki-Test space in a real situation, we detected some aspects that have to be improved in the future in order to create an effective collaborative space for answering a Test.

I. *About the Wiki-Test space:* The majority of the students used the tools in the Wiki-Test space without problems. But there are some points that we have detected that can be improved: (1) The forum can be deleted. It is in not necessary because only two students used it to add a new topic related with the questions. The students preferred to use the chat because they can use it to discuss in real time with their team. (2) The chat should be added inside the same context of the question (in other words, inside the wiki). (3) The next generation of wikis should provide new functionalities for enabling synchronous edition and group awareness features. These aspects would help students in the collaborative work. (4) In the future it would be necessary adding new options for managing properties and conditions regarding the questions. Now the content of a question is represented using simple text. When closed questions are used in a test, part of these questions is an option or a blank space to fill (e.g. Multiple Choice or Fill in the Blank question). The Wiki-Test should provide the possibility of selecting some parts of the text in the content of the question and adding properties like "option-a, option-b, or blank-space". Another useful functionality would be to add conditions, for instance "If *option-a* is selected the answer is correct, else the answer is incorrect". This function would enable the automatic assessment of the test.

II. *The visualization of computed log files:* (1) regarding the point exposed previously about *properties and conditions*, the logs should have to capture the information related with the actions of: select an option or filling a blank. In the case that logs would capture this information, the teacher could know how many times the members of a group have changed their opinion about answering a question. Finally another aspect that would be necessary to improve in a future Wiki-Test is (2) a module for computing the data saved in the logs. This module would automatically generate the graphics and statistics to assess the collaborative work done by the groups. Using a spreadsheet tool, a set of mathematical formula has been used in order to generate the graphics and statistics. These formulae can be applied to create a software application which receives a log file as an input a (with the information of a wiki-question) and generates the graphics and statistics selected by the teacher.

This case study has allowed us to detect the tools and functionalities that a future Wiki-Test space should offer. We have confirmed that the collaborative process of answering a test using a wiki can be captured computing the information saved in the log files. In the future the information saved in the log files should be extended with more actions in order to do a deep evaluation of the behaviour of the group when answering a test. Our future work considers using the results obtained from

this experience to create a new Wiki-Test tool with an automatic module to facilitate the evaluation of the collaboration performed for answering tests in groups.

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