A Framework for the Assessment of Wiki-Based Collaborative Learning Activities

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ABSTRACT

This paper discusses the pedagogical and technological aspects of assessing wiki-based collaborative learning activities. The first part of the paper presents a general framework of collaborative learning assessment. The framework is based on four aspects of assessment, characterized by four questions: who, what, how and by whom. The second part of the paper concentrates on the analysis of the applicability of the assessment framework in wikis. A systematic analysis of MediaWiki's reports is conducted in order to discuss the requisite information required for a well-balanced and effective assessment process. Finally, a few suggestions are raised for further improvements of the wiki's reports.

Keywords: Assessment, Collaborative Authoring, Collaborative Learning, E-Assessment, Wikis

INTRODUCTION

Educational institutions and individual educators are adopting social software tools (often called Web 2.0 tools) such as wikis and blogs to support learning and teaching (Alexander, 2006; Downes, 2005; Franklin & van Harmelen, 2007). Although there are several examples of the effective use of social software tools (e.g., Minocha, 2009), there is currently little (formal) guidance for educators to assist them vis-à-vis the design and assessment of learning activities. Furthermore, designing assessment can be extremely challenging (see Cubric, 2007; MacDonald, 2005). On the one hand, counting the number of students’ contributions may not be an effective indicator of their students’ work if the contributions are not insightful enough. On the other hand, ignoring the interaction and collaboration within the group as indicators for assessment could overlook an important goal of collaborative learning: achieving collaboration between the learners.

Wikis are considered to be suitable for collaborative authoring activities. Wikis enable the co-production of content at a distance (Aguar et al., 2004; Bruns & Humphreys, 2005; Lamb, 2004). However, in educational settings, the assessment of wiki activities is quite challenging from both the technological and pedagogical perspectives. From the
technical perspective, wikis are designed and configured around the content rather than the users (Bruns & Hamphreys, 2005). The content created by a particular student is fragmented and distributed; therefore tracing a particular student’s contributions in a wiki can be challenging and time-consuming for the assessor. Pedagogically, being a collaborative learning activity, the assessment of the activities involves several considerations. These include having a balance between the assessment of the group work and the students’ individual contributions, and between the assessment of the product of collaboration (the outcomes) and the process of collaboration itself (MacDonald, 2003; Tal-Elhasid & Meishar-Tal, 2009). This makes the task of designing criteria for assessment and evaluation of student performance quite onerous for the assessor or educator.

This paper reveals the complexity of designing assessment criteria for online collaborative learning activities in a wiki and proposes pedagogical and technological solutions for overcoming obstacles related to the assessment of collaborative wiki assignments.

THE CHALLENGE OF ASSESSING COLLABORATIVE LEARNING ACTIVITIES

Assessment is a key component in the design of a learning activity. Effective assessment can enhance learning satisfaction, and it helps to set expectations of the students and to shape their learning process accordingly (Angelo, 1995; Shepard, 2000). Therefore, the assessment criteria should be clear to the students from the outset. The criteria should be related to the learning outcomes and reflect the goals of the task or learning activity (Angelo, 1995). The assessment should also include feedback and guidance and not just marks or grades (Shepard, 2000). Assessment should be related to the skills and performance of the students, instead of just measuring the learning products (Huba & Freed, 1999).

The assessment of online collaborative learning activities is even more complicated and hence, more difficult to design, as stated by Swan et al. (2006):

The assessment of collaboration requires a radical rethinking of assessment methodologies. Three issues are involved: the variety and kinds of goals for online collaboration, the complexity of assessing both individual and group behaviours, and collaboration on assessment itself (p. 46).

Another way of describing the three issues stated by Swan et al. (2006) is by asking three fundamental questions:

1. **Who** is the entity which we ought to assess? Is the entity the group or the individual within the group?
2. **What** is the object of assessment? (that is, what is being assessed?). Is the object of assessment the product/outcomes of learning or should it also be connected to the collaborative process itself? One of the goals of collaborative learning activities should be to achieve collaboration among the group members. If learning is achieved but in a non-collaborative way, would we be able to say that the activity was fully successful?
3. **By whom**? Who should be the assessor? Should the assessment be conducted by the educator or maybe the students themselves can conduct peer assessment?

The assessment of collaborative learning can be based on several factors, some of which are quantitative, such as the number of contributions, while others are qualitative, such as the quality of the contributions. Thus, a fourth question should be asked:

4. **How** should we conduct the assessment? Qualitatively? Quantitatively? Related to this are considerations of which tools are available to help us assess the final product, and to assess the learning process if
collaboration is taking place at a distance and asynchronously.

We will now address each of these questions in turn.

**WHO TO ASSESS?**

The assessment of collaborative learning activities can be related to either the group or the individual within the group. When the assessment is based on individual performance only, and does not take group work into account, there is a risk that collaborative activities will turn into competitive activities (Johnson & Johnson, 1989). On the other hand, when the assessment is based on group work rather than on individual endeavour, the students are unsatisfied with the assessment method, as ‘they would have preferred more marks for the individual contribution to collaborative work’ (MacDonald, 2003, p. 387).

Therefore, a good collaborative learning activity would have to assure each individual within the group that he would have the opportunity to express himself and contribute to the group. At the same time, the group will need to work together as a ‘unit’ and not as a collection of individuals. Therefore, the assessment of collaborative activities should be designed in a way that values both individual and group effort (Swan et al., 2006).

**WHAT TO ASSESS?**

The problem with the assessment of the collaborative activities in online learning is that some of the process that contributes towards collaborative activity may not be visible to the assessor. Unlike a real-time synchronous setting of a physical classroom, the students learning online are working from different locations and most likely at different times. They may be using different and diverse communication tools such as a discussion forum, instant messenger, Skype, or phone calls to plan the process of collaboration. If the communication is spread over different tools and if there is no formal record of the discussions or group decisions, the assessor will only be able to see the final product of collaboration and not the process of collaboration. In such a situation, it will be difficult for the assessor to separate each individual’s contribution from the final product and to understand how well that individual had participated and contributed during the process of collaboration.

There are some ways to overcome this problem, for example, by keeping a diary of the group work or maintaining an e-portfolio of the individual’s learning process which logs their contribution in the collaborative work (Swan et al., 2006). Students could also be asked to reflect on the collaboration process and their personal experiences, and report these reflections as part of the formal assessment. There are examples in the literature where reflective accounts have been part of the assessment (e.g., Mason et al., 2004; Minocha & Thomas, 2007). The problem with these solutions is that they might be biased and would not reflect the true situation. Students tend not to be critical in the case of self-assessment or peer assessment (Pimentel et al., 2005).

There is another way by which an assessor can keep track of the process of collaboration. The individual groups could be asked to keep all the discussions in one place such as a forum within the virtual learning environment for example. The assessor will then be able to look through these discussions and gain some insight into the process of collaboration and even track down the decisions, individual workloads and actions performed by individual participants (MacDonald, 2005). Such discussion records are authentic, first-hand accounts of what actually happened and are not reflective or perceived descriptions.

**WHO IS THE ASSESSOR?**

Online learning environments are the appropriate place for implementing alternative assessment methods, such as self-assessment and
peer assessment (Luca & McLoughlin, 2002). Self-assessment is a process in which students are involved in and responsible for assessing their own piece of work. Self-assessment can be used for the sake of helping students to develop their ability to examine and think critically about their own learning. Peer assessment is where students are involved in the assessment of the work of other students. It can be employed in order to develop students’ ability to work cooperatively, to be critical of others’ work and receive critical appraisals and feedback on their own work (Swan et al., 2006).

The problem with self-assessment is that unskilled people tend to hold overly favourable views of their abilities in many social and intellectual domains, and therefore tend not to be critical (Kruger & Dunning, 1999). In the case of peer assessment, as Pimentel et al. (2005, p. 498) explain, ‘learners fear criticizing other learners’ work and this can lead to ‘inappropriate behaviour’ in which reciprocal favours of high grades are expected.

Therefore, educators, more often than not, utilize self-assessment and peer assessment as methods of learning, but not as a method of marking, namely, self-assessment and peer assessment are embedded in the activity, but these activities are assessed by the educators and not by the students themselves.

HOW TO ASSESS?

The assessment of online collaborative learning activities should preserve balance between qualitative and quantitative measurements (Pimentel et al., 2005). The qualitative assessment criteria should be related to the quality of the materials, which have been submitted to the learning environment; for example, the quality of content of messages submitted to discussion forums. In addition, the assessment can also contain some quantitative requirements, such as the number of contributions or the length of the final product (number of words).

The quantitative assessment can encourage active participation and collaboration. Providing the rubric (assessment criteria) in advance can shape student behaviour in the learning environment and lead to more interaction and collaboration among the students (Swan et al., 2007).

Quantitative assessment can serve as a way to balance the activity among students, and to ensure that each student has an equal opportunity to express himself. By setting expectations, indicating clearly what amount of work is expected from each student (in terms of minimum or maximum number of contributions), the educator can attempt to reduce the likelihood of one student taking over the activity and not leaving any opportunity for others to contribute (Tal-Elhasid & Tal-Meishar, 2009).

Quantitative assessment can also be used to measure the intensity of collaboration within the group (Meishar-Tal & Tal-Elhasid, 2008). The intensity of collaboration reflects the process of collaboration between the members of the study group. The number of interactions between members of the group can indicate whether or not the group worked collaboratively. If each member of a group participated only once, the level of interaction would be suspected to be low, but if each member had participated many times, in editing peers’ work or commenting on peers’ work and in reacting to feedback from peers, then the intensity of collaboration among the group members would be higher. For measures such as this to be accurate it is essential that all interactions are documented online and for there to be no ‘invisible’ interactions (for example by e-mail or by telephone) that are not visible to the assessor.

The problem with quantitative assessment is that it could be subject to manipulations by the students. If the students know that they are assessed based on quantitative measurements only, for example, by the number of contributions they provide, they can manipulate their records by submitting more contributions that are lacking in quality content. To prevent this, additional qualitative assessment is therefore important.

Qualitative assessment should be based on evaluating the quality of the content that has
been uploaded to the learning environment by the learners. This information is open-ended and therefore more fully reflects the knowledge constructed by the learner or the group, especially when constructivist pedagogy is employed (Kendle & Northcote, 2000).

Qualitative assessment has been frequently considered impractical and time-consuming, because it places a tremendous burden on the assessor, who has to read all the students’ contributions in a fragmented and non-linear way (Fujitani et al., 2003). To reduce the burden on the assessor, online reports that accumulate and organize the users’ contributions and the group work are invaluable. A combination of quantitative and qualitative approaches can help make assessment of the individual’s and the group work more practical and feasible.

**ASSESSMENT CRITERIA FOR COLLABORATIVE LEARNING ACTIVITIES**

The educators who design collaborative learning activities should design the assessment criteria in a balanced way: by combining process assessment with product assessment, individual criteria with group criteria, using qualitative methods of assessments with quantitative methods, and by engaging the students themselves in the assessment, either by using self-assessment or peer assessment as part of the process. Such a design process also needs to be aligned with the learning goals of the assignment to ensure high levels of participation and collaboration among the learners.

Designing assessment criteria is a work of combination and aggregation. Each criterion contains the four aspects of assessment discussed above. For example: consider an activity which aims to develop a glossary through collaboration. This activity should be assessed in several ways. The first is the group’s product: assessing the content of the final glossary. It should use qualitative measurements, evaluating the content of the terms in the co-built glossary, but it should also use quantitative measurements, counting the number of terms in the glossary (the size of the glossary) that the group has built, and the extent of collaboration among the group members. The second way is the individual level. Here the assessment should concentrate on quantitative measurements, connected to the level of individual’s participation and involvement in the process. In this case, the number of contributions to the final product, in relation to new terms or the extent to which learners took part in the improvement of existing terms in the glossary, should be counted for each participant. The individual’s contributions can also be assessed qualitatively, by reading all the contributions related to an individual. The individual assessment can be enhanced by self-assessment, in which the students would have to write an account, by way of reflection on their own learning processes, about the group work they participated in.

This example above can be translated into a table (Table 1). The table that we have developed can serve as a tool for the course designers to plan the assessment criteria and to assure the checks and balances of the assessment framework. The number of combinations possible for assessment criteria is 24: 2x (who) x 2 (what) x 2 (how) x 3 (by whom).

**ASSESSMENT OF COLLABORATIVE LEARNING ACTIVITIES IN WIKIS**

A wiki is one of the best online tools to facilitate collaborative writing assignments. A wiki enables the creation of collaborative documents from a distance, by enabling all the users not only to share, but also to edit a shared document together, adding to it, deleting parts of it or rephrasing it. All previous versions of the document can be accessed and thus, any unwanted changes in the wiki can be reinstated and every change that was made can be related to a specified user (Schwartz, Clark, Cossarin, & Rudolph, 2004).

Wikis are often provided with ‘Talk’ pages or ‘Comments’ in which the collaborators can
discuss and negotiate changes they make in their co-edited document. This feature enables the collaborators to concentrate their work in one environment only, without needing to use more communication tools for their collaboration. From the assessment perspective, this feature guarantees that the process of collaboration is well documented.

Another advantage of wikis lies in the fact that the environment is organized thematically, as distinguished from chronologically, as online discussion forums are. This feature ensures that important information that was uploaded to the wiki will stay accessible for a long time and would not be ‘buried’ under the new information that is added to the environment (Bruns & Hamphreys, 2005). These are some of the reasons that explain the fact that most higher education institutions are adopting wikis as a platform for collaborative learning (Aguar, Reitman, & Zhou, 2004; Parker & Chao, 2007).

Some wikis have useful features in the software that provide the assessor with the important information for assessment. In the following paragraphs, a detailed analysis of the features of MediaWiki will show how the information accumulated on the server can be utilised for assessment purposes.

### QUALITATIVE ASSESSMENT (GROUP AND INDIVIDUALS)

The qualitative assessment of the group produced final product is the easiest and most time-efficient approach. Instead of reading ‘more of the same’ individual assignments, the assessor has to read only the final version of the co-authored article and assess the content: Is it relevant for the task? Does it cover all the relevant issues? Is the content accurate or are there any mistakes and misconceptions? Some quantitative measurements can be relevant as well: Is it long/short enough? Are there enough references or links to relevant websites? This information can be obtained from the server, but it is not presented in such a way that is best suited to the needs of the assessor unless a specific report is designed for this purpose.

The qualitative assessment of the individual contributions is also available through the ‘Compare Versions’ screen (Figure 1). Each page on the wiki has a history page, which contains all the old versions of the page; thus, by choosing ‘changes’ on the history list, the assessor can compare two versions of the same page. The differences between the versions are highlighted, and it is easy to identify the changes.
that were made by a specific user in this page. This tool is a powerful one for assessing the individual’s contributions qualitatively. The ‘Compare Versions’ screen allows the assessor to connect changes in the shared documents to specific users; this being so, this option enables instructors to assess each contribution separately and with relation to a specific user.

**QUANTITATIVE ASSESSMENT (GROUP, PROCESS)**

The advantage of wikis is their ability to provide the assessor with valuable quantitative information which can support the assessment of the process of learning. All actions in the environment, including views only, are documented and can be analyzed for assessment purposes. All actions are related to users and therefore can assist in separating individual work from group work.

The ‘History’ view of a page is one example of a report that can support quantitative assessment of group work (Figure 2). This provides an abundance of information about the collaborative process that has or has not occurred on it. It reflects the most important components in the measurement of collaborative work: the number of collaborators and the number of versions.

The number of collaborators can be easily detected, since every version is related to a specified user. By counting the number of contributors and dividing this total by the number of potential contributors (number of students on the course), the level of participation can be measured (Meishar-Tal & Tal-Elhasid, 2008).

The number of versions or edits should be treated carefully and critically. It can indicate the amount of work and the attention invested in a specific page, but it depends on the way in which the students are used to saving their work. If a student saves their work every minute, as opposed to once at the end of the work, then the list of versions will be very long. Versions that are created sequentially by the same editor should therefore be considered as one (Meishar-Tal & Tal-Elhasid, 2008).

Furthermore, by looking at the history report of a page, it is possible to analyze the extent of collaboration. The meaning of extent or intensity of collaboration in this setting is not just the number of edits in the page, but the number of times a user returns to, and adds or edits information on a page in response to changes by others (Meishar-Tal & Tal-Elhasid, 2008). Assuming all interactions between the learners are conducted on the wiki and not by other means of communication, if a user edits a page once and never returns to see what other students have been doing, collaboration is considered to be ‘weak’. However, if a user edits a page, then another user changes his version and the first user returns and continues to change the page in response to the former change, it
may be a sign that a more intensive form of collaboration has occurred.

Another way of looking at the process of collaboration is through the types of actions that have been taking place in the wiki. If the users only add to each other’s work without deleting or rephrasing, it can reflect a lower level of collaboration. If there are many deletions and revisions, it might indicate that an ‘edit war’ has taken place (Viegas, Wattenberg, & Dave, 2004); conversely, if there were many instances of rephrasing, formatting and changes in content, it might signify a high level of collaboration.

**QUANTITATIVE ASSESSMENT (GROUP, PRODUCT)**

Quantitative data can also support the assessment of the group product of learning. By providing statistical data about the number of words/lines or links added to a page, the assessor can get some preliminary information about the adequacy of the assignment to the formal requirements. This information is not generated automatically in MediaWiki and the assessor must calculate it manually.

**QUANTITATIVE ASSESSMENT (INDIVIDUAL PRODUCT AND PROCESS)**

Since every change in the wiki is recorded and related to a user, a user report can be produced easily. MediaWiki’s user contributions report provides information for quantitative assessment, by presenting a list of all the activity relating to a specific user (Figure 3).

Simply counting the number of contributions is a misleading action as it was explained...
earlier. The way to overcome this at the level of the individual is by counting ‘clear’ edits – only counting those edits on the same page if the time between the edits is greater than a decided time interval. For example, if two edits occurred sequentially, but in a time interval of two hours, then they should be counted as two actions; however, if the two occurred within five minutes of each other, then they should be counted as one (Voss, 2005).

Further information provided by the user report relates to the number of edited pages by user. This can serve as an indication for the level of engagement in the assignment. By counting the number of edited pages the user contributions are not biased by the number of edits and this can better reflect the amount of work invested in the in the final product.

These two numerical measurements are not available in the standard reports that MediaWiki provides, and they need to be calculated manually by the assessor. Choosing the right measurement for the user contributions depends heavily on the nature of the task and the structure of the wiki. If the students were asked to add pages or to edit existing pages in a wiki, then the number of the pages that they have edited would be a satisfactory measure. However, if the students were asked to work on a specific page and edit it together, then the number of clear edits would reflect more accurately the amount of work the students have invested.

WHO CONDUCTS THE WIKI ASSESSMENT AND HOW?

The question of who conducts the assessment is closely related to the architecture of the permission system. MediaWiki is an open system in which all the information is open and accessible to all users, including the users’ contribution reports. This is a pre-condition for peer assessment. The educator can use the wiki not only for summative but also for formative assessment (Cubicr, 2007) by leaving his comments and feedbacks in the ‘Discussion’ page. In this way, s/he provides opportunities for improvements and corrections by the individual students and by the group as a whole.
BACK TO THE GLOSSARY

EXAMPLE

Returning to the glossary activity example that was described earlier in this paper, the MediaWiki Reports assist the assessor in a number of ways. The ‘History’ report provides information on the number of editors per page and the intensity of collaboration between the participants. This report therefore supports the assessor in assessing collaboration between the group members.

The ‘User Contribution’ report organizes all the information on a particular learner in one place, making it possible for the assessor to get a full picture of the learner’s work during the activity. Used in combination with the ‘Compare Version’ view it supports the assessor in evaluating the quality of each learner’s contributions.

Needless to say, the assessor will have to read the glossary terms at the end of the activity in order to assess their quality.

Some crucial information is still difficult to retrieve from MediaWiki: summative information on the group work (number of pages in a wiki, total number of participants, intensity of group work etc.) as well as on the individual (number of active days, number of pages edited, number of ‘clear edits’ etc.). This information is not provided by the reports and the assessor will have to gather it manually.

CONCLUSION

This paper suggests a framework for assessing collaborative learning activities. The framework contains four aspects of assessment that are characterised by the questions: who, what, how and by whom. These four aspects can formulate all kinds of combinations; moreover, they can be translated into assessment criteria. The educator should design the assessment criteria in a well-balanced way and refer to all aspects of assessment in order to achieve effective assessment.

In this paper, we have applied the framework and evaluated it in the MediaWiki environment. MediaWiki offers the assessor diverse information that can be helpful in assessing the learning activity from a wide range of perspectives and cover the four aspects of collaborative learning assessment. The reports that are provided within MediaWiki are powerful and support most of the requirements of collaborative learning assessment. They offer the assessor a wide variety of information that can help to assess both the learning process as well as the end-product from a wide range of perspectives in addition to covering the four aspects of collaborative learning assessment. Educators who are using MediaWiki as an environment for collaborative learning activities should be aware of these tools and try to utilise them for assessment purposes.

Nevertheless, some information is still not easily or automatically available for the assessor: the analysis of the ‘History report’ and the ‘User Contributions report’ that were described in detail in this paper show a lack of fundamental summative information, such as the number of editors, the number of edits, and the number of participation days. There is a need for developers of educational wikis to design more ‘assessment oriented reports’, in order to ease the work of educators who have to cope with complex sets of assessment criteria within distributed learning environments.

REFERENCES


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