

An Online Tool to Manage and Assess Collaborative Group Work

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Abstract: For a long time collaborative work has been seen as an important pedagogical methodology. Lately there has been an increased interest in creating tools that allow and foster collaborative work in online and web-based environments. However, despite these efforts most of the available tools today only allow students to participate in a collaborative work. Issues like helping the teacher to create the whole collaborative activity and, helping the students to collaborate with each other are usually left out from the automatic tools. Interestingly, one of the main difficulties that hamper collaboration between students during a course work is that they do not know how to do delegate tasks, how to set deadlines and how to control the colleagues' contribution's in a democratic way. This later issue is particularly important because most collaborative systems do not offer a mechanism to differentiate the group participants in order to assess and grade them individually.

In this article we propose and describe a system capable of creating group tasks while providing information that would help to individually assess each group member. The system can be configured in order to leverage the collaboration between students and guiding them in this sort of working methodology. The proposed system features two operating modes: the sequential and the simultaneous activity. It also includes the possibility to establish time limits for each assigned task; an automatic forum for mandatory comments upon referred drawbacks on a colleague's work; a versioning system associated with the simultaneous activity, and the retrieval of all logged interactions, provided in the form of a report which we believe ultimately would help the teacher to differentiate group participants in order to assess their work and grade them individually.

Keywords: group work; collaborative work; Moodle module; individual assessment; group assessment.

1. Introduction

In many European countries the student / teacher ratio has been continuously increasing in past couple of years, mainly due to a more rational use of resources, as some would say; or measures to cut off public expenses, as another might say. Apart from the reasons, there is a clear need for the use of other pedagogical resources and pedagogical means in order to promote a more decentralized education. This article presents a tool to promote, and help to assess, collaborative learning activities. Our view is that those activities would be increased because they surely are a possible, simple solution, to circumvent the ratio problem.

The interaction between students, while undertaking a joint project, provides them not only an opportunity to have a more active role in their learning, but also a way to develop their social skills. In fact, the "collaborative work" is a teaching strategy that makes the students become responsible for their learning and for the learning of their group fellows. This inherent responsibility, when used with care, is also a clear add-on to the development of the student's "soft-skills".

Although the concept of "collaborative learning" is quite attractive in the first instance, it appears that it presents certain difficulties for the teacher, especially at the time of evaluating the students. We recall that it is not always easy to have the perception of the contribution of each student to the whole group work. Accordingly, the adoption of this kind of pedagogical activity justifies the need for reliable instruments and techniques to provide a greater accuracy (and legitimacy) when assigning the student's final grading.

The most common difficulties (Swan et al, 2006) associated with group work are:

- A largely unequal contribution of the group participants
- An inability of the students to manage the different ideas and opinions while progressing
- A decentralization of the objective of the work due to the requirement for increased autonomy and control over the choice of information and its processing
- An individual assessment of each group participant

And, despite the obstacles referred are focused primarily on the student role in the development of group work, teachers themselves feel some difficulties, namely to evaluate, assess and grade each individual group participant. Together all these difficulties may actually hamper the accomplishment of activities involving collaborative approaches. The most well-known learning management systems (Blackboard, Moodle and

Desire2Learn) at this time of writing do not provide in their features portfolio a tool to distribute work among group participants and to individually assess them.

In this context we propose a new tool to help the teacher in the process of creating, maintaining and assessing collaborative online work, with emphasis on the assessment of the individual participation.

In the following sections we describe the problems and perspectives related with group work (section 2); we present the conceptual design of our tools, which is based on events, alerts and conditions (section 3). In section 4 we describe the configuration aspects of the tool illustrating with screenshots. Section 5 is devoted to the assessment in the two operating modes and we conclude the article (section 6) with a brief description of our tool, presenting its weaknesses and directions for future work.

2. Group work

Completing a work individually or in a group with other students typically influences the learning outcome, the learning of others and, of course, the final grade of the student. In the next sections we discuss the merits of group work performed collaboratively, the problems associated with this learning strategy and the recent approaches to deal with it.

2.1 A simple dichotomy: group work vs. individual work

As described in Hoffman & Rogelberg (2001), one of the advantages of group work is that it provides students with an opportunity to improve their "social component", which is essential given that we are in the "social networks generation". Other more objective aspect of the group work is the fact that every student has the opportunity to acquire new learning, according to their knowledge / experiences and the knowledge / experiences of the colleagues, which otherwise would not be possible.

In 2007, Strijos and Fischer (Strijos and Fischer, 2007) presented a study about the challenges related to collaborative learning, its effects in the learning process and the benefits taken from it.

However, there are also disadvantages in conducting group work strategies. The main disadvantages can occur due to the large discrepancy with respect to the workload, or the engagement of each of the participants. In particular, it is related to the difficulty in assessing group work. The second drawback, taken from Kagan (1995), is according to the author, the common knowledge that determines the choice of this type of activities. More than often, not only the teacher but also the students prefer individual work situations to avoid large discrepancy in the assessments. To minimize these disadvantages some tools are used to analyze the development of the work, and record the interactions that are made (Chyng, Steinfeld, & Pfaff, 2000). This concern is also expressed in our proposed tool.

2.2 Assessment of group work

Assessment is many times one of the most influential aspects when creating a new pedagogical activity. The way the work is evaluated and assessed largely depends on the purpose of it (Boud, Cohen, & Sampson, 1999). Taking into account the characteristics inherent in group work, it is essential to take into account not just the final work but also the contribution of each element in the preparation of this work. As there is probably a consensus on respect to the need for differentiation of grades in a group work, the same is not true when we are stipulating how this differentiation should be made. In general, it is considered that there are three aspects that should be taken into account in any collaborative activity: the distinction between individual and group accomplishments, the transformation that will occur throughout the duration of the collaboration and, the social, motivational and cognitive aspects (Strijos, 2011).

There are many objective suggestions, for instance through auto and hetero evaluation (Gilies, 2007); through creation of individual portfolios (Lee and Aalst, 2006) and even through the use of basic level generic log-files, trace data, and "digests" to determine the interactivity degree in the course of the collaborative activity (Schummer, Strijos, & Berkel, 2005), or it may even be included an extra individual task can be made that distinction.

Knowing which the best strategy to adopt is still an open question, since every task has its own characteristics, which makes it difficult to find a way that can be considered advantageous to all the different cases.

Despite the relevance of each of the aspects mentioned, it is important that the assessment should be as objective as possible. The problem is that some of aforementioned parameters are inherently subjective.

Therefore, our view was to create a tool which could assist the creation, management and evaluation of group work, with emphasis on the distinction of individual contributions of group participants, but also considering the changes that occurred during the accomplishment of the work itself.

2.2 Online group work

The Moodle system is perhaps the most well-known and most-used worldwide, open source, learning management system. In Moodle there are different resources and activities that can be used during a course. In general, a resource does not require the intervention of the student to manipulate it. On the other hand, an "activity" does require the intervention of one or more students, and require the production, or participation in a given task. The Moodle standard package provides the following activities: Database, Chat, Forum, Glossary, Survey, Lesson, SCORM Package, Survey, Quiz, Assignment, Wiki and Workshop. There are activities which can be performed simultaneously by several students, whereas activities such as Test, or Survey, typically require individualized participation, although there may be some interaction with colleagues. It is curious to note that while it is possible to monitor the students' work in most Moodle activities, in none of them (except the Wiki) the teacher is able to monitor the participation of each student individually. There are other LMS which feature collaboration tools, but essentially the problems are the same (Burnett and Roberts, 2005). Hence, we may state clearly that there is missing one activity where students may work collaboratively and be assessed individually, that is open source, freeware and associated with well-known LMS.

3. Conceptual description of the tool

Our concern is then to design a computer application that assists teachers in creating, managing and evaluating group activities. Conceptually the tool should provide the infrastructure needed for any normal activity that can be performed in a group through a web-based system. Thus, disregarding the specific design and programmatic principles, we assemble the following guidelines for such a system:

- Be able to distinguish between a task and different sub-tasks, i.e. between a final product in which there is no specification of intermediate steps, and also the opposite situation. In this sense we created two different modes of operation: the "sequential activity" and the "simultaneous activity".
- Be able to establish deadlines for submissions of the final product, and also for the assessment phases
- Be able to establish intermediate milestones associated with tasks
- Allow group participants to discuss, comment and evaluate their processes along the work
- Allow the retrieval of data automatically collected to understand the contributions of each group participant regarding the final product submitted.

Based on these guidelines we developed a tool that can be used in Moodle as a new module. The tool allows the creation of batch jobs, automatically, managing the group's actions and helps to conduct the evaluation of each work group. Specifically, the system's interface allows the teacher to follow the interventions of each individual student, as well as the group as a whole. Accordingly, from this information the teacher can also make comments and feedback on the work.

Regarding the evaluation, the tool allows the teacher to give an individual grade to each group member, based on the computed amount of work and on the automatic report created, as well as on the contributions made to help other group participants. Also, since this is a group activity, the teacher also has the opportunity to submit a grade to assess the performance of the group itself.

We expect that with the use of this tool the teacher would observe the performance of each individual student along the proposed resolution of the problem and, along with other information provided by the system, would have more insight in assigning a score to each group participant.

3.1 Sequential activity

The first type of the activity we propose is called the "sequential", or "linked", activity, whose main characteristic is that it allows a job to be divided into several tasks distributed by the various elements of the group, each participant responsible for a particular task.

This activity is conceptually described in the diagrams shown below. As illustrated in Figure 1, there is a deadline represented by a dashed line (1), for the work itself. That is, the whole set of tasks should be completed within a period established by the teacher during the activity creation. When a task is completed, the system will provide automatically the next one in the list (provided it is not the last one). After the completion of the last task assigned, some final (and optional) improvements are allowed, and it terminates the activity.

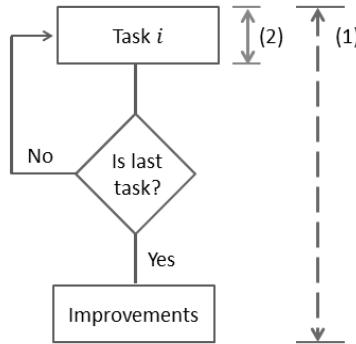


Figure 1: Generic diagram of the sequential activity.

In Figure 2 we describe what happens within each "task". One of the deadlines, represented in Figure 1, labeled as (2), and also on the left hand side of Figure 2, as an arrow, is the duration within which the student must complete task j assigned to him. The teacher sets the deadline, and if the student does not finish it in time, the task will be assigned to student $j+1$. The second deadline concerns the evaluation period. The group members must evaluate the submitted task within a certain time resulting in the group approval (or not) of this task. The approval may take place within one of four criteria set by the teacher: unanimity, majority, minimum and teacher assessment. Unanimity is a mode in which the work is approved if all group members approve it. If the criterion is set to approval by a majority, then a task is approved if the majority of the group approves it (in case of a tie, the teacher should intervene to break it). The minimum value is a mode in which each of the group participants assign a grade to the submitted task, and this will be approved if the average grade is greater than or equal to the value set by the teacher. Finally, if established by the approval of the teacher, a task will be approved regarding only the teacher's opinion.

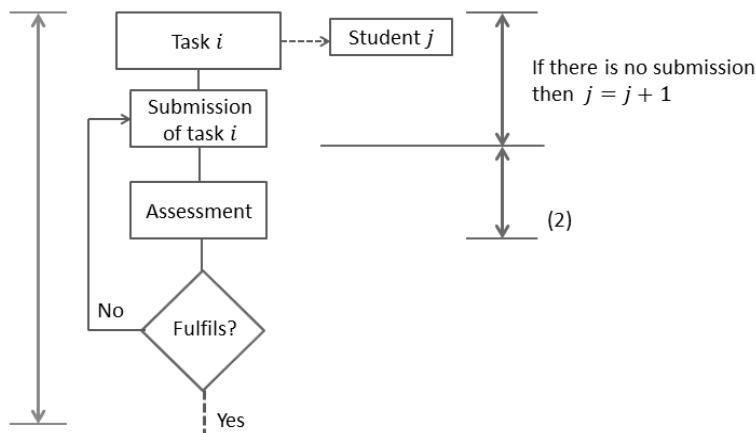


Figure 2: Generic diagram of the sequential activity with focus on the task.

3.2 Simultaneous activity

The second type of activity assumes that all group members can freely interact with each other and simultaneously changing the product of their group work. While the interaction of group members with the resulting product is controlled by the system, the interaction between group participants is not. However, all changes that are made in terms of the final product are registered in system. That is, our tool creates in Moodle a "store" for each group, which then houses their set of data / files. Along with time this set is incremented, changed, or simply manipulated until the moment it is considered in a satisfactory state by all group participants. From the general agreement of the group it may then be submitted as the group "final product". This process is illustrated in Figure 3.

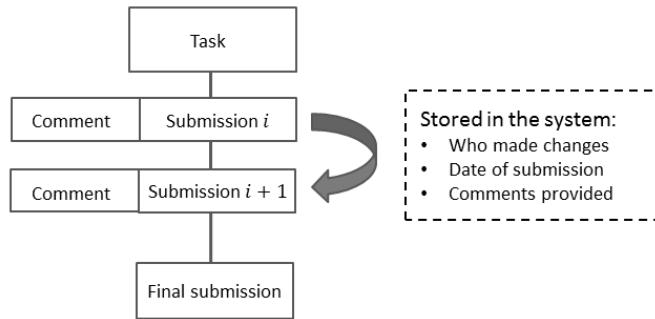


Figure 3: Generic diagram of simultaneous activity.

4. Description of the tool, its configuration and use

According to Moodle standards, the creation of an activity begins by setting its title and description. Then, the teacher selects one of the two possibilities: "sequential" or "simultaneous" activity type, and establishes the initial and final deadlines for the completion of the activity, as illustrated in Figure 4.

The screenshot shows the 'General' tab of a Moodle activity configuration form. It includes fields for Name*, Description (with rich text editor), Activity type (set to Sequential), Start date (May 27, 2013), and End date (June 12, 2013).

Figure 4: Creation of a collaborative group activity – selecting sequential mode.

4.1 Sequential activity type

This format has as main characteristic the fact that the tasks are distributed among all group members, ie, each student will work in a different part of the whole group work. All student get access to the general description of the work, but the student responsible for the first task will be the only to have access to the description of that task. As suggested in Figure 5 and Figure 6, during activity configuration, the teacher sets the number of tasks that are appropriate, taking into account the number of group elements and the characteristics of the whole job to be undertaken by the group.

Tasks

Number of tasks	<input type="button" value="1"/>
Group	Group A
T1	<input type="button"/>
T2	<input type="button"/>

Figure 5: Distribution of tasks among group participants.

The teacher must also assign a deadline for the completion of tasks, which may be the same for all of them (first option shown in Figure 6), or set specific deadlines for each task (second option illustrated in Figure 6). If the teacher chooses the second option, the system will present a list of tasks which will then have to be filled with the respective duration (in hours). This last option may be used in situation where the expected duration of a task is not proportional to the effort needed to complete it. For example, finding a good set of references usually takes much more time than compiling them in a web page, to give just an example.

Tasks duration

<input type="radio"/> Same duration on all tasks (hours)	<input type="text"/>
<input checked="" type="radio"/> Select duration for each task	
T1	<input type="text"/> hours
T2	<input type="text"/> hours

Figure 6: Setting task duration.

When any task is submitted all other group participants will have access to the work of the first participant, and must approve or disapprove it. Note that the teacher can set a deadline for that assessment to avoid spending too much time with the evaluation of submissions. The grading takes place according to four possibilities (Figure 7):

Grading method

<input type="radio"/> Majority
<input type="radio"/> Unanimity
<input type="radio"/> Teacher
<input checked="" type="radio"/> Threshold <input type="text"/> %

Figure 7: The grading criteria.

A negative opinion on a colleague's work should be associated with a comment of how to improve it. This comment is then made visible to all group participants. If the submission is approved and submitted within the due time, the next task will be assigned to the next student. This process is repeated until there are no more tasks to assign. If the work of a student is not approved, even after its redesign, the teacher should intervene and help the group to move forward with this work.

If student j does not submit the job within the due time, it will be assigned to student $j+1$. The group participant that has not fulfilled his task will be assigned to the last task (eventually having a penalty established by the teacher) and there will be a "rotation" of tasks.

Associated with the submissions engine there is an automatic type of forum that students and teacher use to register comments to the work done by each group (separately).

If one or more tasks are unfulfilled, they will be available to all members of the group who have completed their tasks, to allow the group to conclude the proposed work. In the end, there is also a period of time to make specific improvements in each of the tasks submitted.

4.2 Simultaneous activity type

The second format is what we call “simultaneous work”, meaning a joint activity. In this mode group members are allowed to build together the final work. Basically, the principle behind this mode is that the interaction between students is a “black box”, and the only visible actions of the group are changes made to a set of files that in the end will be the submitted product of this group. In Figure 4 we presented the configuration screen of this activity. This mode is chosen basically by selecting a different activity type.

Once assigned a task to a group, the participants can submit new files and/or change files already submitted. The system saves all submissions made to the respective versions of each file, the author of each submission, the date of the submission, and the comments given by the student who made the changes. This is reflected on the table presented in Figure 8 (visible both to the teacher and to each participant of this group).

For each file submitted, it is possible to access all of its versions through the respective link in the text (the dates), which has indicated the date and time of that submission and, who made that submission. It is possible to access the latest version of each file by clicking on the leftmost link (date). The upload button (with an arrow pointing upwards) is used to perform an upload of a new version of the respective file. There is also the possibility to view all comments made by students on each file by selecting the button with the letter “i”.

biography.html [24-05-2013 @ 12:41] Elizabeth Moore	 24-05-2013 @ 11:24  Michael Harris		
bbking.jpg [24-05-2013 @ 12:15] Peter Miller	 24-05-2013 @ 12:11  Michael Harris		
jazz.wav [24-05-2013 @ 13:21] Michael Harris	 24-05-2013 @ 12:55  Elizabeth Moore	 24-05-2013 @ 12:13  Elizabeth Moore	 24-05-2013 @ 12:12  Peter Miller
text.doc [26-05-2013 @ 18:13] Elizabeth Moore	 24-05-2013 @ 12:46  Elizabeth Moore	 24-05-2013 @ 12:45  Elizabeth Moore	

Figure 8: Table illustrating file versioning during a collaborative activity.

Basically, the simultaneous collaborative activity unfolds like this: a task is presented to each group of students, eventually requiring them to confront their ideas, to reach a consensus with the aim of ultimately submitting a set of file which express and describe coherently the group ideas. To reach this end, the group participants are expected to save in the group online repository files that are continuously being manipulated by them until they reach a ready state to be submitted. Hence, there is a virtual place where students submit temporary files to which the rest of the group has access. During the progress of the work, the changes to these files are logged by our module, which is therefore used as a versioning system.

In Figure 9 we show a possible interface display for student "Elizabeth Moore". As the figure suggests, she may submit a new file to the group repository, which should be accompanied by a commentary (in field "description").

On the right hand side of Figure 9 the interface presents the “Allow submission box”. As the group works collaboratively and simultaneously, it is important to know at which stage the current work is able to be submitted. Clearly, this is a decision to be taken by all group participants. Accordingly, the system provides a democratic mechanism in which every participant must grant permission for the submission of their group work. Only after permission has been granted by all group members, the “Submit work” button is displayed. The moment all students have grant authorization for final submission, all names listed are followed by “OK”, and the “Submit work” button will be available. In Figure 10 we can see that students Michael Harris and Peter Miller have not yet authorized the submission of the work.

The screenshot shows a 'Submit a new file' form. On the left, there's a rich text editor toolbar with options like Font family, Font size, Paragraph, and various styling buttons. Below it is a text input field for 'File name*' and a larger area for 'Description' containing a detailed toolbar. A 'Path' field shows 'p'. At the bottom, there's a file upload section with a 'Choose a file...' button and a note 'Maximum size for new files: 2MB'. A dashed box indicates where files can be dragged and dropped, with a large downward arrow icon. On the right, under 'Allow submission', three users are listed: Michael Harris, Peter Miller, and Elizabeth Moore. Each user has a dropdown menu next to their name. For Michael Harris, the menu shows 'Grant' and 'Deny'. A 'Submit work' button is at the bottom right.

Figure 9: submission of a new file and the granting permission for final job submission

5. Assessment using the online tool

Given that there are two distinct modes for the activity -- sequential and simultaneously -- we define some basic rules for the evaluation of each.

5.1 Assessment of the sequential activity

In this mode, as we saw earlier, the idea is that students perform a task individually, which will be evaluated by all members of the group. After the work is validated by all students, the system launches a new task to be performed by another group participant, following a previously established ordering of the pairs (student-task), set by the teacher. The final grade is assigned using the same weight to each task, so that all students have the same conditions (recall that the need to set a duration for a task is related with the difficulty or amount of work for that task. For that reason it is important to have this parameter as fair as possible). On the other hand, the final score for each student should take into account the following parameters:

- Quality and appropriateness of the work submitted
- Capacity to meet the deadlines
- Capacity of evaluation of the tasks carried out by colleagues and respective comments
- Final score of the work

These parameters intervene in the final assessment using the Moodle's well known 20% variable offset for grading. I.e., the teacher may adjust the final score up to 20% from the computed grade.

Depending on the type of work request, the teacher can even decide if the evaluation is done individually (which is what is intended with this type of activity) or is given the same grade to all group participants.

5.2 Assessment of the simultaneously activity

In this type of activity students perform tasks that they consider appropriate, rather than having a set of assigned tasks. As the teacher has the opportunity to see the development of the work, the evaluation should be more in line with the performance of each individual member of the group, since they can see what has been the contribution of each student to the resulting product.

Thus, the final grade of each student must take into account the submissions of each of the students as well as the justifications given for these submissions. This activity requires the teacher to assess all students' submission and comments throughout the completion of the work. Of course, the final work must also be taken into account, but in this case it would be to differentiate between groups.

6. In conclusion

In this paper we propose a web-based system that allows the execution and administration of collaborative activities.

Sometimes the group assignments are merely a set of individual tasks, which later on are joined and, moreover, there is often only the contribution of part of the group to perform the work. Our system can help overcome these difficulties, with its tools that allow the teacher to distribute tasks, analyze drafts and verify

the participation of each student, since, even working in a collaborative way, the work that makes each element will always take into account its characteristics as a student and a member of a group. The fact that it has two types of activities is a distinct advantage for the teacher, since it can choose the type of activity according to the task that is to be performed within the course taught.

The fact that the teacher is able to follow the progress of the work is also a benefit, as it can give your opinion and unlock if necessary deadlock situations.

Future work will involve the assessment of the system in a real learning and pedagogical situation, in order to prove the functionality of the tool as well as the expected benefits that would derive from it.

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