Work in Progress: Self Evaluation Through Monitored Peer Review Using the *Moodle* Platform

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Abstract - **We developed a module for the *Moodle* open-source eLearning platform through which undergraduate students can *Build*, *Answer* and *Evaluate by blind peer review* questions related to a course subject. In the first learning phase the students can build and submit questions. Selected questions are candidates for inclusion in later tests. After the test a reference solution and evaluation criteria is made public. The student's answers are then randomly distributed so that each student has to evaluate at least three of his peer's tests using double blind peer review. After all tests are cross-evaluated by the community of students, the system grades them by majority vote in each question. The need to i.) build meaningful questions, ii.) present a correct answer, iii.) state the evaluation criteria, iv.) answer to subject-related questions and finally v.) evaluate and vi.) justify a grade attributed to a classmate, is a powerful community-aware context in which students develop competences on the subject's topic while simultaneously have to reason about their learning process.**

Index Terms – Peer Review, Web-based Learning, Moodle.

INTRODUCTION AND MOTIVATION

Every learning process must involve some form of assessment of the knowledge, skills and/or competences achieved. In the more traditional learning contexts there is a sharp distinction between the student/teacher roles, such that the evaluation and learning assessment is an indisputable teachers' role. Nevertheless it is well known that evaluating someone else's work can be a very powerful learning technique.

On the other hand, the massification of formal education led to a growing number of students, such that the student to teacher ratio is constantly increasing. Thus, teacher's attention is increasingly becoming a scarce resource, either in high schools and in the University. This lack of resources, mainly teacher's time, may prevent the use of continued evaluation and feedback on an individual basis.

The only resource that grows proportionally to the number of students is not funding, number of teachers or staff, but the number of students itself.

On the other hand, despite being mostly ignored by faculty, student's organize themselves to learn together. This is motivated both by learning difficulties as well by the human need for social contact.

We work for a public University faced with systematic underfunding from the government and a growing number of students. Being from an Informatics Engineering Department. we firmly believe that computers can be used to support the teaching and learning activities. However, it was very clear for us that the individual and social aspects of using computers should be the main focus rather than using them simply as a platform for teaching the technical aspects of computer engineering. The opportunity came with the installation of the Moodle eLearning platform[1] to support some courses.

Since Moodle is an open-source course management system (CMS) designed to be portable and modular, we developed and integrated a module to support students' self-evaluation by using double-blind peer review. Below we present this module's main features.

MODULE DESCRIPTION

Moodle is a web based Learning Content Management System (LCMS) designed around pedagogical principles, namely a social construtivist philosophy using the collaborative possibilities of the Internet. Due to its flexibility it can also be used in more outcome-oriented classroom environments. Moodle has many features expected from an e-learning platform including Forums, content management (Resources), Quizzes with different kinds of questions and several activity modules. Moodle also has several contributed modules, including SCORM[2] WebQuest and the Document Management System. Our module was designed to be integrated with the standard platform.

After being integrated it appears as another activity available to the teacher. He or she can create a new 'cross-evaluation' activity that is scheduled to occur along a predefined time frame.

During setup the teacher can define the time frame, the students to be involved (select individuals from the pool of available students, the whole class, or selected groups) and the maximum grades to each question or phase. The questions to be presented can also be selected from a pool of previously submitted questions.

The tests appear to the designated students as an activity. It however only becomes accessible during the predetermined time frame. After the student enters the test he or she has a maximum time to submit each question before proceeding to the next question. Questions are selected randomly, i.e. two students can solve the questions for the same test in a different order. This is a teachers' option during setup ('questions presentation order: random/fixed'). The question is displayed as well as the remaining time and a text box is available to answer the question. Students can also draw figures using an external application (e.g. Paint, Visio) and upload the file together with their answers. We recommend the use of pdf format, but that is not enforced by the tool.

The remaining time is continuously displayed to the student and during the last minute the screen's background becomes an increasingly strong red until the time expires and the session is closed.

After the test's time frame is over a reference solution is made available for the students to consult and compare with their answers. Also, the evaluation criteria is displayed. Each student can access, in read only mode, its own test.

During the next step, which is scheduled independently, when the students enter the activity they are offered three of their classmates tests to evaluate. The number of tests to be evaluated as well as the grading scale to be used are defined by the teacher. We have chosen as default a coarse grained scale (A to E). This simplifies the grading task and favors a more uniform grading by students. Whenever a student doesn't feel confident about the grade to assign, he or she can 'abstain' and no grade is assigned to that particular question by that particular student. This is left as an option to the student since an incorrect grading can be penalized. Moreover, graders have a field to (optionally) justify their option. After the time is over the system assigns a grade to each question of each individual student based on the grades assigned. The most frequent grade is used in case of disagreement. Teacher(s) can also grade, and their evaluation is final.

Since students can answer questions and evaluate each others tests through blind peer review, we added an additional step in the platform: the opportunity for students to submit themselves questions to be used for evaluation. Since we had about 300 students is the course where the platform was being tested, the potential for interesting questions to come out was enormous. Thus, a 'Submit Questions' phase was added to the module. Simultaneously, in a face-to-face class we presented a topic on question development and the Bloom Taxonomy. We got about two questions per student with a varying degree of interest and quality. Every question should be accompanied by a reference solution and the evaluation criteria (so that it could be later included in the pool of questions to submit). The submitions can be edited by the teacher before entering the pool.

Thus we finally reached a system where the students could go trough the full evaluation process: they can build questions, answer them and evaluate each other by double blind peer review in a platform fully integrated into their web learning environment. The large number of students could thus be turned into an advantage, rather than a problem.

OBSERVATIONS AND DISCUSSION

We used this module in the second semester of 2006 in a Computer Architecture course with 291 second year students. This tool was used to support in-class activities. Every week the students performed a 30 minutes test on the topics debated of the previous week. Before the test the topics were discussed in class and typical examples were presented and discussed.

The test was than performed followed by discussion (about 15 min) and than the evaluation followed. This was the schedule for a typical 2 hour laboratory class. The topics ranged from developing assembly code programs, to indicating the state of a processor's internal pipeline, to calculations on computer speedup. Every student had its own computer to work in.

Undoubtely the most difficult task was to express the evaluation criteria: it was never complete enough and the number of special cases soon grew out-of-control. Later we adopted a much 'lighter' set of guidelines based on the competences to be evaluated, which was much better. Students, also, become used to the task of evaluating each others' work and most difficulties were overcome.

Clearly the most fascinating observation was the discussions that emerged spontaneously due to need to evaluate each others' work. The observation of students building their knowledge by themselves with only minor intervention from us teachers was a most rewarding experience. We had the lowest student drop-out figures observed ever (12%). Also, the fast grading feedback motivated students along the semester, as they saw their final marks gradually growing along the weeks.

There were many problems too: the tool is still in a 'beta' state and sometime weird behaviors were observed. Sometimes it locked into some undesirable state and we had to revert to pen and paper mode (we realized how much paper was being spared!). The use of computers, open to the Internet, also facilitated fraud (through email, instant messaging or blogger sites). The dependency on this platform also requires a stable network infrastructure and whenever the network was slow or unavailable the normal scheduling for a class was disturbed.

NEXT STEPS

We are now correcting the bugs detected in this beta version, improving the user interface, in particular to ease the automation of some tasks (e.g. import tests from a template) and solving some problems detected with the integration with Moodle.

Rather than the evaluation seen as an end by itself, what most impressed us was the potential for provoking relevant discussion and learning in an educational context. Despite teachers having the final decision, the blurring of the student/teacher roles when using this tool proved to be a valuable pedagogical approach, not as a mere technological solution, but rather as a social facilitator inducing learning.

REFERENCES

[1] The Moodle open-source course management system (CMS), web site at http://www.moodle.org

[2] SCORM is a specification of the Advanced Distributed Learning Initiative which comes out of the Office of the United States' Secretary of Defense. http://www.adlnet.org