IMPROVING LEARNING RESULTS WITH PEER EVALUATION

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ABSTRACT

The purpose of the university level education is to encourage individuals to think and solve problems by themselves. The learning process includes also measuring aspects in a form of an exam. However, the traditional methods for measuring students knowledge are found to be inefficient for masses in a higher-level education and do not provide nearly the best possible learning experiences. Large education groups e.g. in basic level courses are already oversized and personal aid is often unavailable. Current approach will cause students to study only by reading and remembering the facts. From the evaluator point of view a written exam after the lectures is only measuring the short-term memory instead of actual understanding of the topic especially in the engineering sciences. For professors and lecturers this approach will cause a huge amount of work first creating and then checking the exams without possibility to really improve the students' learning process.

This paper will introduce a novel method to improve the learning process by establishing an online-exam and peer evaluation process. The methodology, the tools and finally the results are introduced in this paper.

Keywords: Learning elements, measuring at problem-solving, on-line exam

1   INTRODUCTION

Finnish Ministry of education has stated that the purpose of university studies is to give students abilities to use scientific methods and also abilities to produce and processing knowledge [1]. Based on this statement, the use of a peer evaluation process is well justified and even recommended. Originally the peer evaluation has been meaning external evaluation of articles in science or in other publications [2]. High quality is top priority in scientific research [3]. Therefore the peer evaluation is considered as the most important and usable method for quality assurance [2,3].

In the peer evaluations, the number of the evaluators is usually two or greater and their identities are kept secret from the author. Also the author's identity is kept secret from the evaluators to guarantee objectivity in the evaluation.

In this paper, the peer evaluation is considered as the evaluation between students and education in this level has the same principles than in scientific publishing. The peer evaluation in the education is a method that activates the students to give and receive feedback. [4]

The peer evalations are said to increase the critical thinking, reference evaluation and skills of time-management, self-confidence and team dynamics. Also, it will support

development of students metacognition skills. [2,4]

The evaluations are purposed to guarantee the context and the scientific importance. Also, the methodological analysis to evaluate e.g. structure and presentation technique are following the guidelines of scientific publishing. [3]

One possible solution for reaching the higher efficiency in the education is to enhance the traditional exams to be more learning focused exercises. Instead of forcing the students to read and remember thousands of pages, it would be more preferable to enhance the whole learning process to require more problem solving skills. This kind of activity can be supported by the peer evaluation methods and an online-exam tool by allowing students to take their time, think the topics and propose the better answers.

2   ENHANCING THE LEARNING PROCESS WITH PEER EVALUATION

The experiences from past five years have shown that an online examination supports the learning much better than a written exam done in haste. In order to improve the learning process, a method of computer aided peer evaluation was developed. This methodology contains randomly per student chosen assignments, which are valued in the same scale. This will push the students to re-think and evaluate the solutions and put their skills in test. To enhance the learning more, after the first part of the exam students are given the answers of the others students to be evaluated. By reading others' answers the students will learn more and might find another perspective into subject in study.

The assignments the student evaluates are different from those the student has answered. This guarantees better orientation into the topic. When evaluating fellow students' answers the student will study the topic from another point of view. Based on the evaluations the professor or lecturer can make conclusions about course's efficiency. The process itself is rather standard compared to normal examination except the time and place dependence is overtaken by using online assignments that allows examination where ever the internet connection is available. The time scope of the examination is also widen to cover more bigger timeline.

The aim of the peer evaluation in the final examination of a course is improving the learning results but also in reducing the amount of work sacrificed to the assignment development and exam evaluations.

2.1   Logical Steps in the Online Examination and Peer Evaluation Process

The complete online examination has three steps, but can be extended when needed. The first step is the basic examination. The second step is the peer evaluation and the final part is from the professors' and teachers' point of view the final evaluation of both; answers and peer evaluations.

The first phase for the students is a normal set of assignments. In this step students are independently answering to the assignment that is randomly chosen from a course specific assignment library. The assignment library is a collection of similar assignments for the course. The assignments are divided into categories based on the area of the assignments. This way most of the students will have a bit different assignment but the amount of work is equivalent when evaluating.

The second phase is the peer evaluation. As well as in the first phase, students are given assignment randomly from the assignment pool. The difference is that each student will evaluate some other students' answer. The given assignments are different from students own in order to widen the study area a bit further.

The third and the final phase of the method is for the teachers. In this phase there are few options to perform. The first of those is a manual check-up of assignments and peer

evaluations, which will take a huge amount of work, but also provides better view on results. The second option is to use automatic evaluation tool. The tool calculates the "trust-factor" for the students based on the grades they have proposed and received. The "trustworthy" algorithm has several phases and limit values for making sure that the results are correctly given. As a safety switch all the high-end and the low-end results are given to the teachers for the manual evaluation. Based on these given ratings, the final grades from exam can be calculated.

There is a possibility to have an additional step in the peer evaluation process, which is the feedback about the peer evaluation and the contents' course. This information is used to develop education further.

2.2 Avoiding too close team work

The freedom of the examination does not necessarily cause problems such as plagiarism or too close teamwork. Of course it has to be noted that depending on the course the students are allowed to solve problems together, but the written explanation has to be done independently. There are few cases out of 300 online-peer's.

Nevertheless, these problems related to "copy-pastes" are not seen as a major concern and can be avoided or detected most of the cases. There are available in-house systems which are used for analysis of the similarities in the student works. Such software tools are well known also from the student point of view. One of the tools feasible for the task is Nalkki, developed in Tampere University of Technology [5].

3 TECHNICAL APPROACH TO THE PEER EVALUATION – A CASE STUDY

The technical side of the online examination -system was built to serve the both of the areas of the examinations: students' part and professors' part. The professors' part allows the maintenance of the system and courses information. The students' part allows students to register to the courses and choose available online exams or practise works, see Figure 1.
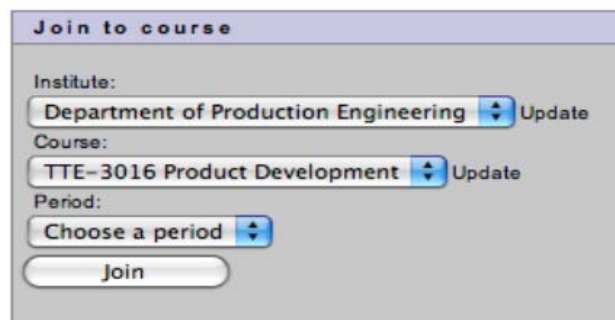

Figure 1 Example of figure

The online examination system was built as an internet-application to support as many as possible clients available. The server end of the system is normal web-server with php support. The solution for data storage is a normal relational database by mysql.

When creating a new exam, professor may choose whether the exam has a peer evaluation process or not. When the peer evaluation module is chosen, the amount of assignments included in to the examination is needed to be chosen. Also the rating scale

for each assignment has to be determined.

These exams are challenging to professors because the assignments should not be derived straight from the theory but should combine different aspects of the theory. This helps students to form a solid picture of the theory and the study. In this process, use of the case examples from the real-life has been proven to be a good solution because they combine different parts of the theory.

During the setting-up the assignments, the management of the scheme will include the balancing between the length or wideness of the assignment and the proposed length of students answers.

When evaluating peers' assignments the student will see the original assignment, additional rating guidelines and finally the answer to be evaluated. The student will write his/her reply to peer's assignment anonymously, see figure 2, and also give a rate to the answer. The guidelines for the peer evaluation are seen tricky, since students may start to look for the keywords during the evaluation instead of the whole context. One option is to let students figure out the correct answer or guidelines by themselves.

Figure 2 Peer evaluation view

3.1   The case study

During the course on the TTE-Product Development the peer evaluation method has been practiced over the five years. The product development is a course worth of five credit units, and it has lectures, practices, a bigger assignment and the examination. The examination can be taken as a regular exam or as online exam with the tool developed.

In the online examination, the first category of questions is related to the assignment in the course. The other categories are to cover the whole field of study. In 2007, 220 students attended to the course, whereas five years ago the amount was 50. During this time the system has been improved by developing guidelines, assignment descriptions and by adding more challenge on the questions.

Each year the results have been discussed among the online examination and course staff. The results from the peer evaluation are also compared to the results from the normal exams. It seems that the students are preferring the online exam and they also are getting better results.
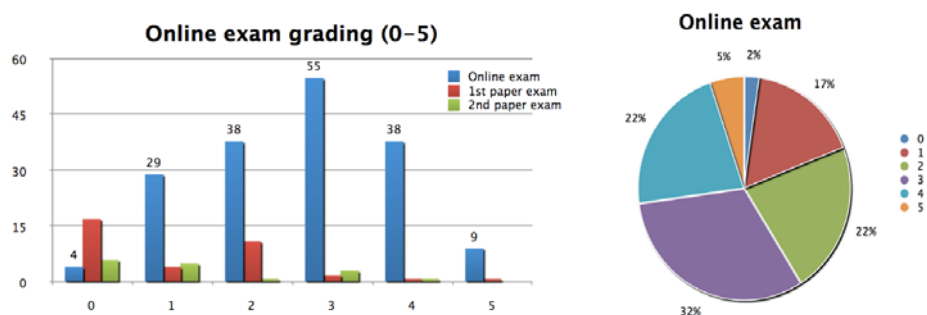

Figure 3 Examination results from the year 2007

4   CONCLUSIONS

The peer evaluation method and tools have become popular among the courses using those. The major challenges, however, are not in the technical side but in the creation of the reasonable assignments and instructions as well as in the training the students to be able to do the peer evaluation.

In the students side the clear instructions are needed, since this kind of an examination is very different from what they have learned in the past 12-15 years. This examination requires the students to obtain more critical viewpoint and forces them to reason with the questions and answers. The peer evaluation also requires the students more mature approach to the subject.

From the teachers and professors side the challenge is in the modification the assignment in such way that it forms a complete set. The question in this type of exercise cannot be too shallow focusing on details. If the exercise is too detail oriented the answers are also too similar between students and the evaluation process does not bring the most out of the students. In order to achieve results is this kind of examination process the focus has to be in the questions asked. Those questions have to be suitable to reason with it.

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