ENHANCING LEARNING BY UTILISING STUDENTS IN CREATING COURSE MATERIAL AND COURSE GRADING EVALUATION

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Abstract — *In many cases one of the essential problems in university education has been following: more students, equal number of teaching resources. This trend leads to situation in which courses have only one teacher per up to 50 students. Therefore teachers do not have enough time per student and the students are lacking personal feedback and guidance. In this paper we present the ways how we turned this challenge into advance and utilized the student mass to increase the teaching resources. Two of our four cases are related to organizing the assignments and the other two for using peer assessment in evaluation of examinations. According to our experiments and to the student feedback the use of our methods enhanced also the learning results and learning phenomenon but it also created change resistance among students. This is because students have to work harder and be more motivated for learning - hence they truly learnt.*

Index Terms —Active Learning Methods, Peer review, Self-assessment, Students as a Teaching Resource.

INTRODUCTION

During our teaching work experience we have got lot of feedback from our students about the importance of the personal feedback of their examinations results and assignments. In most of the cases students get only numeric grading without any verbal feedback. This working method is not very rewarding for the students. The challenge about the personal verbal feedback is that it requires great amount of resources when the population of a course is close to 50 or even more. Therefore we have a need to utilise students in assessing the other students participating the course. This on the other hand requires new ways of teaching compared to the traditional lecturing-examination. The students' utilisation also gets them more involved and motivated to the topic.

In this paper we presented four different kinds of cases and our experiences that how we have solved challenges mentioned. We have tried to see the student mass as unutilised teaching resources instead of more general opinion that the student mass would be a negative matter in the courses.

CASE 1 FROM INNOVATION COURSE: USE OF THE JIGSAW METHOD

Innovation course is one of the courses belonging to the Product Development study blocks for the students studying in bachelor's degree. The course includes lectures, two assignments, weekly exercises, and an examination. The Innovation course is valued for 5 credit units and yearly the roughly 80 students pass the course.

The innovation course has been lectured for several years now, but in the academic year 2008-2009 the assignments and the examination were revised. In this paper we present how one of the assignments and the examination were revised aiming for better learning, more efficient usage of teaching resources, and for more active learning. Previously the content of the assignment was a book summary and to have a seminar presentation about the book. The book list covered dozens of books and the main topics of the content of these books were presented by the students at the seminar days. Due to the large number of students at the course the participation at these seminars was very low. Students mainly presented their own work and after that left the seminar. The revising of the assignment is presented in details in this chapter. Before the revising the course examination there was a traditional essay examination, and the only feedback to the students was the grading. Evaluation of these examinations was also very laborious. Revising of the examination is described at chapter "Case 2: Use of the Peer Review in Assessment of Examination".

Learning Methods in Innovative Assignment

The objectives of the Innovation course are to get familiar with the literature dealing with innovativeness in companies and innovation management. In the implementation of the assignment designed for fulfilling these objectives multiple different teaching methods has been merged: Students as teacher, the Jigsaw working and peer review. These methods are described briefly next.

In the Students as teacher method the students act as teachers to each other at the course. In this method the students study and prepare presentation about a topic given to them by the teacher and at the end of the course they teach it to other students. The aim is that the student learns her/his

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own topic so well that she/he can teach the essential matters to own study group. By this method the students are forced in active learning since the responsibility of others learning is in their hands. Then the students really have to understand the topic so well that they can teach it also to others and can answer their specified questions. The method develops the teamwork skills, abilities as a public performer, condensing of the essential and acting as the expert. [1]

The Jigsaw working method is one kind of group working method which utilises efficiently the Students as teacher method. In this method students are divided into two to four person groups. Every group will have a text which is as divided many parts as there is members in a group. The students become acquainted with their part of the text and analyse the text by drawing up for example a mind map or illustrate the subject with the help of examples. After this, the students look for those persons who have read the same sector, in other words they establish the so-called expert group. In the expert group they together make sure that everybody has understood the central matters of the topic. After this experts working in the original groups are assembled together and each member of the group teaches the central matters of his own subject to others. Finally the groups put the compaction of a few sentences together from the wholeness, draw up connection with the subject of a few questions or draw an illustrating picture from the subject. [2]

The peer review method can be also combined to the Jigsaw working method. The peer review is the means to critical and systematic evaluation and developing the work between the ones working among the same task, problem, and challenge or like and/or belonging to the same occupational group. Peer review in the context of the learning means the students' mutual evaluation. In the peer review the teacher returns the learners themselves the responsibility for the learning. Both the more free-form giving of the feedback and more formal evaluation of the work which is based on the agreed evaluation criteria, can be called peer review. [2]

It has been stated that the practice of the peer review will promote at least the development of the skills of critical thinking and time control, and increases self-confidence, responsibility taking, and consciousness of the group dynamics and develops the meta cognitive skills of the students. The practicing of the peer review develops the skills of the giving and receiving of the feedback and at the same time makes students for the similar challenges of the working life. Furthermore, the peer review is a method which is utilised in generally scientific publishing activity and the practice that is related to the study learning is an important part of the university studying. [3]

The success in the use of the peer review method requires good preparation. From the point of view of the usability and usefulness of the peer reviews the challenges are:

- the students' ability to give feedback
- the students' ability to receive feedback
- organising of the peer review process
- objectivity and impartiality
- evaluation criteria
- distribution and look through of the feedback
- form of the feedback
- appreciation of the peer reviews
- reliability and benefit of the feedback [3]

These methods give a good opportunity for the more efficient utilising of teaching resources. The time will be released from the introduction of basics from the teacher for example to steering of the groups, for drawing of discussions and for the presenting of questions [1]. Furthermore, the studying and the learning are more profound than that of the mere traditional lecturing at least to one topic. The peer review will save teaching resources in the mass teaching when carried out in right way. With the help of the peer review the students get the feedback which was said to be important from the learning point of view. [3].

Implementation of the Learning Methods in Innovative Assignment

At the academic year 2008-2009 the weight value of the assignment of the course from the total grade was 25%. Book summary and seminar presentations were drawn up as an assignment in the four person's home groups. The home groups enrolled to the seminar presentations so that four home groups participated in one seminar group. When the seminar groups had been created, the teacher specified to the every four home groups of the seminar group a separate book which they had to study. The books were the same to all the seminar groups so the big expert group consisted of the groups which study the same book. The figure 1 illustrates the operation of groups that have been used in the assignment of the course.

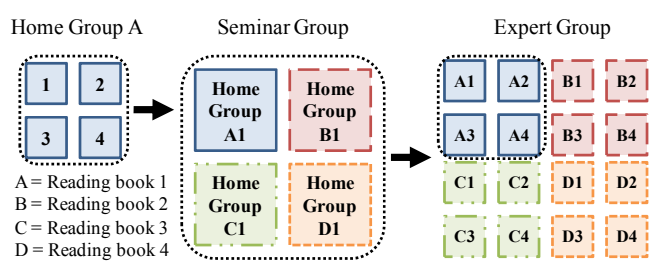

FIGURE 1
GROUPS USED IN THE INNOVATION COURSE.

In the expert groups the students were allowed to secure that they had learned and understood the contents of the book at the same way, to agree on the translations of terms, and they got also a chance to have peer support for the writing of the book summary and for seminar presentations. The operating in the expert groups was a volunteer. The students taught the most important contents of the book to their seminar group with the help of the illustrating example. One seminar presentation took max 20 minutes. The home

groups gave written peer reviews (3 reviews per home group) from the seminar presentations where they were supposed to assess. Students also gave the grade on scale 1-10. The weight value of seminar presentations from the total grade of the course was 5% and the grade was given based on the peer reviews.

Furthermore, every home group wrote up a book summary the size of the 15–20 pages to their own seminar group. The book summaries became a part of the students' course and examination material. The weight of the summary from the total grade of the course was 15%. The home groups gave the second written peer reviews (3 reviews per home group) related to the book summaries of their own seminar group on the basis of the predefined criteria and they also gave the grade on scale 0-30. The peer reviews were utilised in the final evaluation made by the teacher. In the peer reviews students considered which the most important doctrines of the book were and how they could utilise the tools in practice. This forced the students to become acquainted with book summaries and to repeat the subjects before going to examination. There was one question in the examination from every book. The home groups were motivated for the doing of peer review (altogether 6 reviews per home group) with the fact that 5% of the total grade of the course consisted of them.

Experiences and Feedback from Innovative Assignment

The teaching method operated well from the viewpoint of the active learning. The learning materials which had been created as a result of the method were the better and more versatile than the materials of average lectures. Furthermore, the students had invented good new examples to illustrate the use of methods. However, the concentrating of students during the seminar presentations was varying because many distinctly strained their oncoming own presentation and did not have the patience to concentrate on to listen to the presentations of the others. However, the presentations were well drawn up and the students were able to seal the most essential matters.

From the viewpoint of the more efficient utilising of teaching resources the experience was promising. On the other hand, the planning of the method's practical realisation and the reading of book summaries and peer reviews took time moderately. But on the other hand this time that was reserved for the keeping of lectures and for the preparation of lecture material was now used for the organising of the exercise. With teaching methodological choices, in addition to the contents to teach, it was possible to practice many other skills which are useful to the engineer.

From the use of the peer reviews was received both good experiences and something to develop. Some of the students underestimated the peer reviews received - advantage of the received feedback was neither understood nor not taken in earnest because the feedback didn't come from the teacher. But there was also an advantage from the peer reviews, at least for the teacher. In their verbal evaluations the students were critical and paid attention to many disadvantages which would not have been noticed otherwise from the teacher. However, the grades which were given in the peer review by the students were mainly higher than the final grades given by the teacher.

There are few things in the application of the method that should be restructured before the next course implementation. Now working in the expert groups remained minor because it was a volunteer task. However, working of expert groups gave extremely encouraging experiences. Those groups which utilised expert groups in their work also got the best grades. It is difficult to say was this merely the income of the use of the expert groups or just better motivation and commitment for the course. Furthermore, all the students did not understand that the contents of books also were an important part of the contents of the course - the exercise was considered only as training. With the following course implementation more operating in the expert groups will be emphasised, so that the operation in the expert groups will be compulsory and the expert groups will prepare only one common book summary.

CASE 2: USE OF THE PEER REVIEW IN ASSESSMENT OF EXAMINATION

Method and Background of the Peer Review in Assessment of Examination

The peer review can be utilised also in examinations. In that case the examination will turn into a real opportunity to learn and the time of to checking of the examinations shortens considerably. In the used method the actual examination resembles otherwise a traditional examination but the students are used as preliminary readers of the examination. The evaluation criteria have to be clear so that the students can be utilised as preliminary readers.

The examination event proceeds so that first there will be given enough time to answer to the actual examination and after this the answer papers are collected away. The answer papers are mixed and they are redistributed to students. The objectivity of the checking is secured with the fact that the examinee of the examination puts only his student number to the identifier information. If a student gets his own examination paper or otherwise identifies the examinee, for example from the examinee's handwriting or from student number, the student exchanges papers with the neighbor. Also preliminary reader puts his own student number to the identifier information of the answer paper so that, if necessary, preliminary reader can later be identified. At the second stage the right answers will be talk through together after the division of papers and the students check each other answers. Hence the examination will become a real learning situation when the student hears the right answers and he can estimate his own know-how in the examination. In the problem situations which are related to

the preliminary checking, the students can ask for help to the evaluation from the teachers. [4]

This examination form reduces considerably the time which is used for checking the examination if the examination questions have been well drawn up and the evaluation criteria are clear. If this has been done succeeded, the teacher can only do some random check to a few papers and one can get the outlook of the reliability of the peer evaluation. Furthermore, the teacher must check all the examination papers which are almost to pass the examination, in which case the pass of the examination will not be depend of the peer review. [4].

Implementation of the Peer Review in Assessment of Innovation Course Examination

The first examination of the Innovation course was arranged by using the method mentioned above. Stress of the examination in the total grade of the course was 50%. In the examination there was two essay questions a' 6 points and six more detailed ones a' 2 points. Furthermore, there was possibility to get one additional point from the course feedback in which case the maximum score of the examination was 25 points. The essay questions were by nature "Explain and illustrate the stages of the method with an example" or "Compare methods" tasks. Among the more detailed questions there was for example word explanations and describing of the progress of the method stages. The examination paper was drawn up so that on the first page there were places for the student numbers of the exminee and the peer reviewer, the examination instructions and the summary table for the points given. On the following pages there were the actual questions, room to the answers and a small table for the peer review.

There was arranged an information lecture for the students related to the examination of the course. From the student point of view the beginning of the examination was similar to a normal examination. For the second stage of the examination students had to return to the examination hall 15 minutes after the first part of the examination had ended. The students were given also an instruction to take a red pencil in addition to the tools needed in the normal examination.

The right answers were talk through supported by a Power Point presentation. The six more detailed questions were handled first as they were easier to review than the two larger essay questions. The front page of the examination had a table in which the students recorded the points given by them and their estimation of their own answers.

The minimum requirement of the examination was 12 points. The examinations which had received all 9-11 points in the peer review were checked automatically again by the teacher. Furthermore, spot checks were made to some examination papers which had enough points for passing the examination. The preliminary examination results were published during same day that the examination was held. On the basis of preliminary results five students wanted their examination to be checked by the teacher. Students' own estimates of their own answers were very realistic and corresponded to the peer review. All together 55 students participated the examination.

Experiences and Feedback from the Peer Review in Assessment of Innovation Course Examination

The experiences of the utilising of the peer review in the evaluation of examinations are mainly positive. The examination was checked in record time and the students were allowed to know the right answers and evaluation criteria. From the point of view of efficient use of teaching resources this method seem to be extremely promising. The biggest challenges and the criticism which came from the students were related to the contents of examination questions. It is very challenging to create the examination questions which do not only measure the rote learning. At the same time the questions should be, however, of such nature that the evaluation criteria are clear enough. An interesting teaching experiment could be in connection with this challenge a method in which the students would draw up a few alternative examination questions based on the book summary for example in the method that has been presented in chapter 4.1. The objective is that the students would draw up questions which apply to the most important matters of the book summary to be learned. Furthermore, the students' task is to define to the examination question drawn up by it, good and "the right" answer. A summary can be made up of the questions and answers to the students for the preparing for the examination. It remains for the teacher to estimate the suitability of the questions and answers to the examination.

CASE 3: PRODUCT DEVELOPMENT PROJECT COURSE ASSIGNMENT

As the name of the course describes the students assignment aim is to form product development group, choose the roles inside the group, and develop a project plan with all the details form the requirements to the final project scheduling and budgeting. For making the assignment the students use MSproject software and Design Structure Matrix method. The assignment groups consist of ten students, which make the individual assessing extremely challenging.

Students determining the grading by them selves

The assessment in the Product development project course is party performed by the students and partly by the teachers. The groups have to return multiple intermediate assignments during the course. These assignments are evaluated by the teachers, but the students have to define the percentages of each group member's participation to that assignment. The final course grading is based on the calculations summed up from the intermediate assignments grading and the personal

percentages. The calculation gives grading by the activity level of the student and also at the same time it gives better grading to student if he/she has been active in making those intermediate assignments which has got good grading.

Discussion about the method

The peer assessment inside the group has multiple advantages: it reduces the teachers evaluation work, teaches the group members how to evaluate others, and it excludes the stowaways from the group. In addition the students evaluate the final presentations and results, which is the last intermediate assignment, of other groups. And the winning group gets the highest grading. In our opinion this way of forming the grades to each person is more equal than trying to estimate the activity of each students, especially because the number of the students is so great that a personal contact to all students is purely impossible.

CASE 4: ON-LINE EXAMINATION AND PEER EVALUATION SYSTEM IN PRODUCT DEVELOPMENT COURSE

The idea in the On-line Examination

The project began with the idea that the students would evaluate the examinations by themselves. The examination has two main phases: 1) answering the questions, 2) peer evaluating other students' answers. The examination system is fully open during these two phases, so students accessing to the system is not limited anyway. This creates great challenges to the formulating of the examination questions as they need to be analytical or otherwise applying the different topic taught at the course. Basic explanation question cannot be asked as the answers would be found too easily from the web search tools.

To pass the on-line examination one has to participate on both phases, because 50% of the total points come from grading of own answers and 50% from the evaluation of the peer reviews. The peer review points are half of the answers points. At the moment all of the answers and the peer reviews are also review by the teachers, but an algorithm for calculating and weighting the value of students peer review is developed. [5] By this algorithm student who answers better to the first phase, get better weighting in the peer reviews. This algorithm is needed because part of the students do not go to town on the peer reviews and are more likely to give too high or on the other hand too low scores.

Benefits in the Learning

One of the greatest benefit of the on-line examination is large scale of topics that the students have to get acquaint with. The questions are divided into three different categories and in the first phase of the examination one question from each category is randomly selected to the students. So they answer to three questions, but in the second phase they have to peer review six answers which are not the same questions as in which they answered. This way the students need to study altogether nine different topics from three different categories. To make the peer review a better learning event, students do not get any question specific instructions to the reviewing. Only general guidance about a good peer review is given.

The opinions of the students are divided into two different trends. Firstly they comment that they truly learn the topics in our on-line examination, but secondly at the same time they say that this kind of examination is too laborious. But compared to traditional paper examination, in on-line examination there is no need to prepare for the examination and in addition the on-line examination is more equal to a real life problem solving situation where all the information in the world is available. The students just need to find the right source material and utilising that create a good answer and peer review for the examination.

CONCLUSIONS

The utilisation of students on teaching and peer reviewing is saving the teachers resources, but it also enhances the learning event because students need to focus more in to the taught matters. Even though our experiences have been good the methods we have experienced need further development. Yet the current feedback from the students is mainly positive what encourages us to use the methods also in future implementations of the courses.

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