

USING VIDEO SOLUTIONS AND “HI-SCORE-LIST” TO INCREASE AND TO MONITOR STUDENT’S HOMEWORK

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ABSTRACT

New method to study introductory engineering physics at Tampere University of Applied Sciences was presented in SEFI 2013 conference by the authors. The key idea is to engage students to study actively. The active engagement covers not only physics lectures, but also learning outside classroom. Significant part of the new method is to emphasize continuous assessment instead of only one final examination. Therefore, weekly exams form half of the course assessment. To arrange enough time for week-exams, peer instruction and other activities in the lectures, some routine-like activities, like exemplary calculations and answers to homework exercises are implemented using video streaming technology (YouTube). In the new method, the homework exercises themselves do not give any points for the course assessment. As the exercises themselves are not a part of the course assessment, there is a concern that students do not actively do them, or just passively watch the solution videos. To increase the homework activity, a concept of hi-score-list is introduced. In the concept, the students register their homework activity in the shared Google-docs spreadsheet document in which they can follow, not only their own but also the other students' homework activity. Students can compare their performance to that of the others. To collect data of the students' homework activity, the weekly backups of the hi-score-list are used together with Moodle's activity reports. By taking backup copies weekly, the accumulation of the homework accomplishments can be monitored throughout the course. As a result of this study, the watching activity of the exercise solution videos is presented. Data from earlier courses show that the video streaming activity is the highest close to week exams and the final exam. The accumulation of the completed homework assignments using the data from the hi-score-list is presented, as well as feedback-based students' opinions about the importance of hi-score list to form positive pressure towards better homework activity.

Keywords: Increasing homework activity; Hi-score list; Active engagement;

SUMMARY

Active engagement of the students is recognized as the key factor to enhance students' learning outcomes. In order to activate students also outside lectures and to monitor students' homework activity, the combination of solution videos and hi-score-list is used. Continuous assessment is applied implementing week-exams for every two weeks throughout the course. As the result, the week exams and the solution videos have the most impact on students' activity. Hi-score-list is not seen as activating by the students, but a valuable tool to monitor students' activity.

INTRODUCTION

Hi-score-list is the list of the best scores and the people behind them in a computer or videogame, which is shown on the screen after the game or between games. The key idea of the list is to present publicly the top scores achieved in the game. To be on the top of the list gives the player honor among other players. Player can benchmark his or her own result to the others. The same idea is now adopted in introductory physics homework activities. The goal is to increase and to monitor the students' homework activity during introductory physics course. Students are also encouraged to practice with homework problems using solution videos streamed via YouTube. Because students' post-lecture homework activity is not examined during face to face sessions and it does not give any points for the final assessment, monitoring high score list is a way to follow students' activity outside classroom. One aspect in this study is to find out, whether the hi-score-list enhances activity by raising positive competition within student group.

ACTIVATING STUDENTS

The active engagement during lectures is recognized as one of the key factors of successful physics education. The learning outcomes, especially if conceptual understanding is measured is reported to be significantly better with active engagement methods compared to the traditional lecturing. (Hake, R., 1998). The active engagement methods are methods that stimulate students actively process information towards the correct concept formation in lectures. The reported methods are for example Peer Instruction (Crouch, C. H., Mazur, E., 2001) and Interactive lecture demonstrations (Sokoloff, D.R., Thornton, R.K. 1997). Different kind of pre-lecture textbook reading assignments, pre-lecture assignments and tutorials is used to activate students prior to the lectures and to achieve sufficient prior knowledge to cope

with active engagement lectures (Crouch, C. H., Mazur, E., 2001). The pre-lecture activities can also be implemented with the help of video tutorials (Callens et al 2011). To support students' homework activity after the lectures, the homework activity or completed homework tasks may be recognized as a part of the final assessment.

The new method to study introductory physics at Tampere University of Applied Sciences in engineering education was reported in SEFI2013 conference by the authors and some of its results in other conferences (Tiili, Suhonen, 2013) (Suhonen, Tiili, 2014). In the new method the homework activity does not give any points to final score. The decision was made based to the earlier experience which shows that despite the extra points earned for the final exam, only a part of the students did the homework properly and plagiarism was common. The checking of the homework took also too much valuable lecture time. The continuous assessment is taken care with week exams during the course. The homework problems are recognized as valuable practicing method and therefore a system to encourage and to monitor the homework activity is a valuable tool to enhance students learning outcomes.

Increasing the homework activity using solution videos and high-score list

The aim of this study is

- To describe the idea of hi-score-list and solution videos to increase and to monitor the students';
- homework activity;
- Find out impact of the use of hi-score-list and solution videos as activators;
- To present the results of students' homework activity through 14-weeks introductory physics course.

Tampere UAS has strongly developed its introductory physics courses towards active engagement of the students. As a part of the development the activation is wanted to extent outside lectures in order to achieve better learning outcomes. The elements to support the development are:

- Week exams
- Solution videos
- High score list

The idea of week exams is to force the students to study actively throughout the course, not only a few days prior to the final exam. The weight of the week exams is therefore raised up to 50 % of the total points for the final grade. Week exams and the active engagement activities need a lot of valuable lecture time. In order to release the time, the homework activity is monitored using the hi-score-list, and the solutions to the homework problems are presented to students using unlisted (not

public) videos in YouTube. The solution videos raise the threat that students do not put enough active effort to find solutions to the problems, only passively watch the videos. Therefore, the score of individual solutions and the score of video-assisted solutions are presented separately in hi-score- list.

The implemented hi-score-list is a shared Google docs spreadsheet document, embedded in Moodle, which students can edit themselves. The key idea of the list is to provoke some competition in homework activity among students in a good spirit and enhance awareness of the activity of others. Students are asked to register the amount of completed homework exercises divided in two categories, the exercises made by themselves and the exercises made using the help of the solution videos. The cumulative percentage of the given exercises is presented as the score of the student. The registration of the exercises is voluntary but strongly encouraged. Because the score does not affect the final grade of the student, there is no reason to worry about cheating. Every lecture session begins with overall view of the list. During the course, backup copies of the list were taken, so the time dependence of homework activity can be presented. The other method to study students' homework activity is to monitor the activity of the YouTube channel using Google Analytics and the log files of the course's Moodle pages.

The study was implemented in a physics course named "Oscillation and Waves, Atom and Nuclear Physics, 3 cr", which had 38 participants, who were second year bachelor-level engineering students in Tampere UAS.

RESULTS

The hi-score-list was accessed 267 times by students during the course. The hi-score-list based, combined students' homework activity during the first 12 weeks course, when the lectures were held, is presented in figure 1. The figure presents the percentage of all possible homework done during every week.

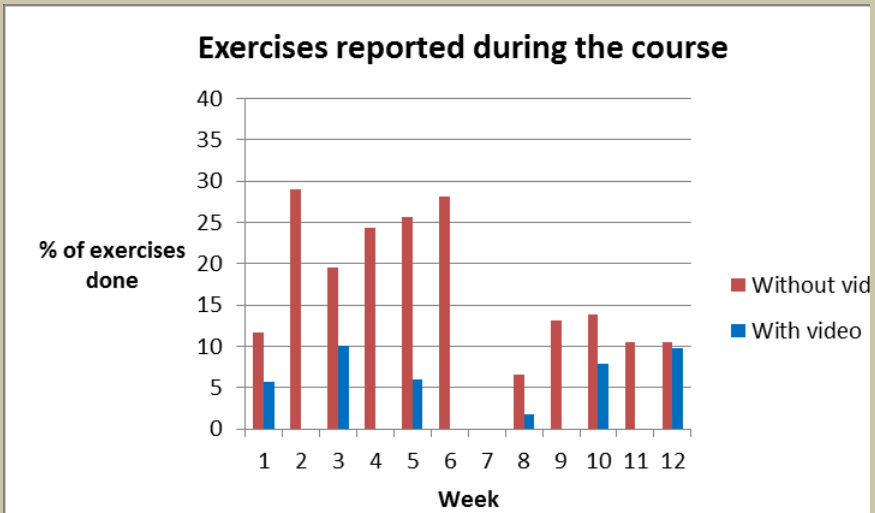


Fig. 1. Exercises reported weekly

The figure 1 shows that reported homework activity is close to 25 % of all possible homework during the first six weeks of the course. After the one week’s holiday (week 7), the homework activity drops dramatically. To compare the reported amounts of exercises completed without videos and with videos, the amount of exercises done without videos is about three times higher than amount of exercises done with videos.

The final exam was held in the week 14 and students were asked to continue to fill in the hiscore-list during the remaining two weeks’ time when they were practicing for the exam by calculating the previous weeks’ exercises. The final reported percentages of the weekly homework exercises are presented in figure 2.

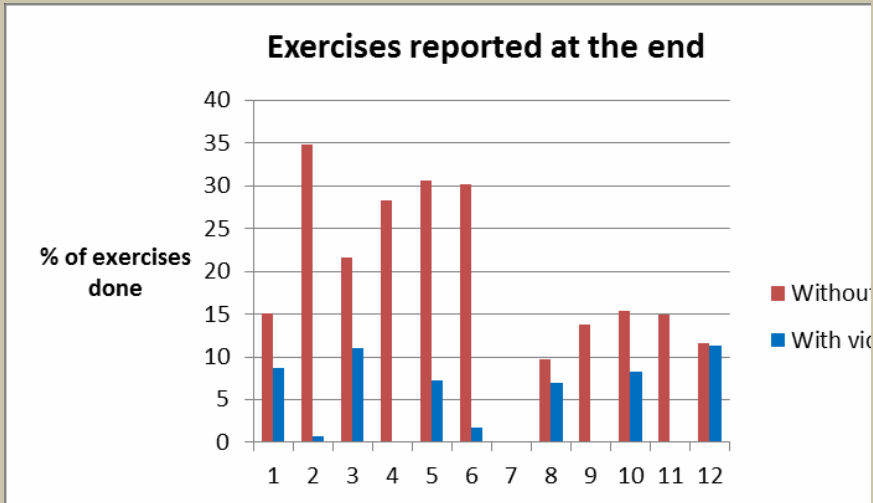


Fig. 2. Exercises reported at the end of the course

When figures 1 and 2, are compared, figure 2 shows slight improvement for every week on completed homework exercises. This is a result of students’ practicing for the final exam during the weeks between lectures and final exam. The difference between figures 1 and 2 also shows that the help of the videos have been used slightly more than earlier part of the course.

The students’ video watching activity was monitored using Moodle’s log files. The log files show that students accessed the solution video files 915 times during the course. The real watching activity is much higher than reported activity in hi-score-list. The daily video watching activity during the course is presented in figure 3.

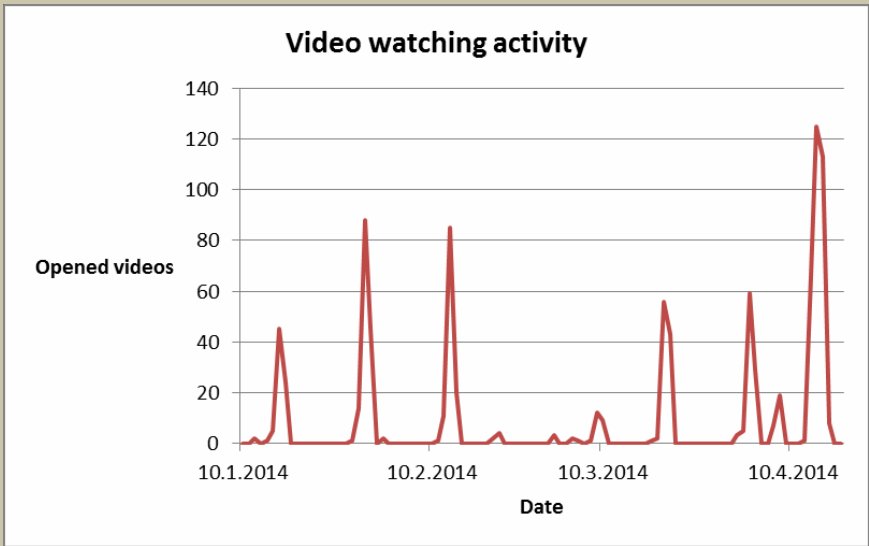


Fig. 3. Video watching activity during the course

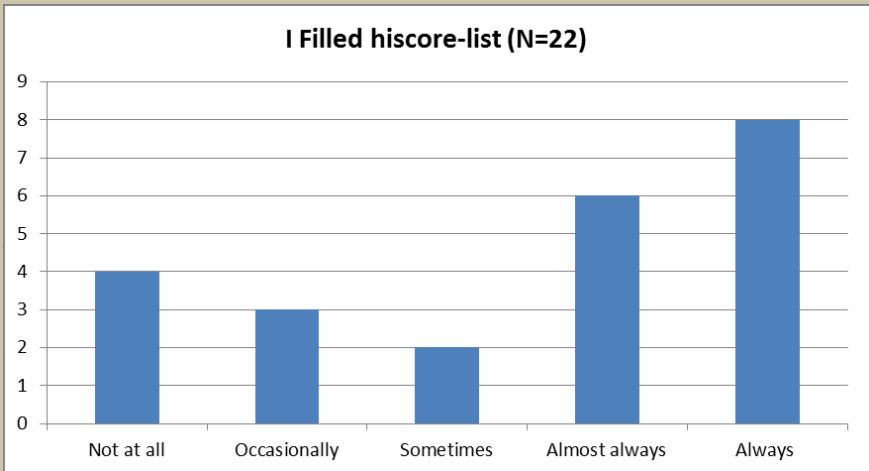


Fig.4. Hi-score-list usage, according to survey

Figure 4 shows that the hi-score-list is not always filled by the students. Therefore it gives only indicative information of the real activity of the students. The conclusion from the students' open text answers concerning hi-score-list shows that the list is mainly seen as a tool for the teacher to monitor the homework activity of the students.

Students were also asked about the activation effects of different methods used during the course. The question was stated that “How much did the following element of the course activate you to study during the course”. The answer distribution of the question is presented in figure 5.

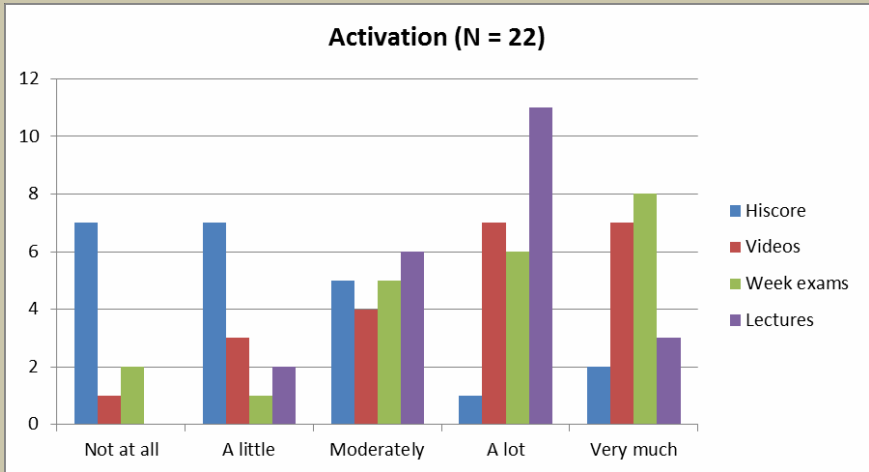


Fig. 5. Activation effect of the course elements

The distribution presented in figure 5 confirms the conclusion on the effect of assessment – studying for an exam seems to be the strongest motivator. The videos and week exams were reported to activate students as much or even more than lectures. In the open answers of the students, the solution videos got very positive feedback. They were seen as the help for the problem-solving, which is always available through internet. The videos were watched mainly because a student had got stuck in the homework problem.

CONCLUSIONS

As the conclusions of the study it can be said that assessment has very strong impact on student activity. Week exams held every two weeks activate students to study throughout the course. Student activity is strongly connected to the exams. The availability of solution videos is reported to be very activating by the students. They are seen to be very helpful aid for homework problems, if they are used wisely. Of course there is a temptation to just passively watch the video without student's own processing of the problem. According to survey of students' hi-score-list is not seen as activating item as solution videos or week exams, but mainly as teacher's tool of monitoring students' homework activity. As a teacher the hi-score-list is seen as suitable tool to monitor and to wake students' activity.

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