

Online communication platform for mathematics instructions

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1. Background and justification

Many courses at TU/e, including courses of the mathematics service education, have a classic setup of lectures and guided self-study meetings. This also applies to the mathematics part of the major course 4AC00 Signalen of the bachelor Mechanical Engineering.

Although this setup seemed to be a tested concept for many years, we have observed that the participation of students in the guided self-study declines dramatically during the course of a quartile. This means that the instructors' time is not well spent and space is not used efficiently.

How come? After all, twenty five years ago the situation was different...

In discussions with a Mechanical Engineering student panel, several reasons were mentioned why students make less use of guided self-study. Students indicate that working at assignments can be done at home as well and in that way they can spend their time more flexibly. Moreover, from the course evaluations of the 4CA00 Signalen course, it appears that the theory is being explained very clearly during the lectures, which makes it possible to work on the assignments independently.

Also the noisiness during the guided self-study, the scheduling of the meetings and the sometimes long waiting time before an instructor can attend a student are mentioned by the student panel.

Lecturers know that modern students use all kinds of sources of information through a variety of digital media. Students can consult the web every moment of the day or can contact fellow students for consultation or for making an appointment. This enables students not only to spend their time flexibly, digital sources also allow students to find answers for their questions easily and instantaneously. Many syllabi with elaborations of the mathematical problems can be found online. Because so many problems can be solved instantaneously, students seem to not save their questions for the guided self-study. So, what is the value added of the instructor at the guided self-study?

A minority of students still appreciates to work on assignments during the guided self-study, but many students prefer to do it on a self-chosen time and location, alone or with other students.

So, should we abolish the guided self-study all together? We don't think so. What is missing in the process outlined above (self-organised, online) is that the input of an expert on the subject is missing. Students can come up with the wrong answers in the self-organised process. The surprise during the exam can be unfortunate. This means that some guidance in the self-study is still necessary.

We want to explore whether online guided self-study, in the form of a communication platform, can be a replacement for the regular guided self-study meetings. Within learning management systems, like Moodle, platforms exist in which students can communicate with each other, about the assignments for example. These platforms are managed by the lecturer or an assistant and they can also contribute to the discussion. We will keep the lectures, because students highly appreciate this, as can be concluded from the course evaluation. Moreover, we believe personal contact is important to not increase the distance between students and lecturer.

This proposal was discussed within the team of lecturers of the 4CA00 Signalen course and was received enthusiastically. The program director of the Mechanical Engineering major, Corinne Jongeneelen, supports the proposal.

2. Objectives

- An online communications platform is designed and implemented in OnCourse¹ to support the practice of mathematics in the major course 4CA00 Signals in quartile 2 of academic year 2015-2016. This platform allows students to weekly discuss the exercises and help each other. The platform replaces the guided self-study.
- The platform generates data so the lecturer can monitor the progress of the students and can react on it during lectures. Also the use of the platform is monitored and evaluated.
- The success rate of the course and student satisfaction remain at least at the same level as in the course setup with guided self-study meetings.

3. Outcome

Educational principles of the design and implementation of the platform

Implementing an online communication platform is an innovation that is consistent with the advice on blended learning formulated by TU/e taskforce on IT in education², e.g. advice 14 on offering online training materials, advice 7 on learning analytics and advice 8 on making education more independent of time and location.

To make the communication platform a good alternative for face-to-face instructions, the redesigned course will have the following elements:

- Theory is explained in weekly lectures.
- Students will practice individually.
- The training material is offered in OnCourse.
- Parallel with the training material, the communication platform is set up in OnCourse.
- The structure of the platform is made in the sequence of the exercises, so it is clear that the discussion is connected to a specific exercise.
- The platform is used by students to give feedback to each other
- It must be easy for students to post their questions (i.e. no advanced processors for mathematical formulas), for example by uploading photographs or pdf documents.
- Student assistant instructors give general feedback in case the same questions are asked by several students.
- The platform provides information to the lecturer about the activity on the platform and which exercises are difficult for the students. And also, a weekly poll is done in which students indicate

¹ OnCourse is a learning management system within Moodle developed by the Mathematics and Information Science Department of TU/e

² "Advies Blended Learning TU/e", Taskforce ICT in het Onderwijs (ICTO) 2.0, 23rd of January 2015.

what are the most difficult assignments. The 'top 3 of most difficult assignments of the week' will either be discussed during the next lecture or the elaboration is posted on the platform.

- There will be a weekly hour for questions, so students can still have face-to-face contact with the lecturer or with an instructor about the exercises.

Evaluation of the use of the platform

The use of the communication platform will be monitored and evaluated, to see if the functionalities of the platform meet the expected benefits. Evaluation criteria will be, amongst others: the number of students using the platform, the number of times students give feedback, the number of times the lecturer adapts the content of the lecture to the needs of the students .

The analysis will be done using methods for collecting quantitative and qualitative information. This will be done both during the quartile and at the end of the course, by weekly student panel meetings and questionnaires.

The results of the course on student satisfaction and success rate will be compared to the situation without the platform.

Results of the innovation on room capacity

When this platform is successful and it can function as a replacement for the self-study for mathematics instructions, this means that less lecture rooms will have to be used in the next years. So it is beneficial for the room capacity at the university. When the platform is implemented in more courses, this effect will increase of course.

Dissemination of the results

The following dissemination activities will be executed:

- Presentation at a (3)TU session of the 3TU.CEE
- Inspirational video for the 6 steps to blended learning intranet pages of the TU/e
- Publication of the experiences within the TU/e community and maybe outside.

4. Project design and management

The project works according to a 6 steps to blended learning approach for redesigning courses using blended learning:



The blended learning team consists of Rik Kaasschieter (content, didactics), Jan Willem Knopper (technical advice and implementation), Harry van de Wouw (didactics advisor), Suzanne Jacobs (project support).