

In-time teaching through videos in practical Electrical Engineering

Faculty of Engineering | Department of Electrical and Electronic Engineering

Modules: Design Engineering 344
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Learning activity:
 Assistance with practical

Learning technology:
 Videos

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Context

Background

Design Engineering 344 is a third-year course in Electrical and Electronic Engineering. All students receive the same assignment at the beginning of the semester. They have to make their own unique design, which includes the process, analysis, simulation, building, testing and documentation of the design.

Subject area

Design Engineering 344 is a design course in Electrical and Electronic Engineering. The students are expected to use the knowledge of their undergraduate courses to design, analyse, simulate, build and test a prescribed electronic circuit.

Intended learning outcomes

The students have to design a practical circuit for specific non-ideal effects of electronic components. They have to develop software and learn the concept of version control and software testing. A microprocessor is used to set and read parameters from the practical circuit. The students have to develop the microprocessor software and learn the concept of version control and software testing.

Established practice

The design course is a practical module that gives the students the opportunity to apply the knowledge that they gained over the first three years of their engineering degree. Different aspects of design, component characteristics, analysis tools and software are applied to a real-world electronic circuit.

The challenge and possible advantages associated with the integration of technology

The main challenge was the fact that the students struggled to use their undergraduate knowledge in practical problems because this is usually not explained by the theory of ideal systems. It is important that students be shown these possible problems in a practical manner; the measurement setup for such a demonstration is relatively complicated, however, and entails a great deal of electronic equipment. The amount of information is

such that they watched the video more than once to grasp the idea. The information was then available in the moment that the students struggled with the problem and not beforehand in an information session.

Measurement results of practical electronic circuits have to be conveyed to students while the difficulties that may be encountered are explained. If videos are used to demonstrate these practical measurements of non-ideal electronic circuits, the students see results that are very difficult to explain in theory.

Student overview

The course had 101 third-year Engineering students in their second semester.

Other relevant role-players

Competent master's and doctoral students with experience in analogue electronic circuits and computer programming assisted during the practical sessions of the course.

Learning and assessment activities

Learning and assessment activities

The students have to create an open-ended design with more than one solution and write reports as they progress with their design. Every week, a topic is discussed to assist them with their progress. The videos were related to that week's discussion on possible problems. During their design of a specific electronic circuit, the students encounter unexpected results because of the non-ideal nature of the circuits; the videos provided information that enabled them to understand the measurements and how to adjust their design for the correct outcome. After each assessment, the students write a report on their findings.

Feedback practices

The students' written reports are graded and returned to them. They are graded by looking at the general design of the circuits and the presentation of the results. This is a simple 1-to-4 scale of grading. The reports do not count for the final mark but give some idea of what is expected. The turnover time is less than a week.



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Learning environment

Learning setting

The practical section of the course takes place in an engineering electronics laboratory that can host 180 students. Each student's electronic station is equipped with an online computer, power supply, signal generator and oscilloscope. The videos were posted on the SUNLearn website and the students could use the lab computers to access them.

Collaborative setting

The students work in the laboratory at the same time and are welcome to discuss problems with each other but they all have to do their own assessment activities. The tutors are available to assist with any theoretical or practical questions.

Content resources

All relevant information is available on SUNLearn. The students are required to access the content of all previous courses.



Figure 1: Students working on electronic circuits in the lab

Support challenges

Each student has a unique design and the tutors first have to understand each circuit before being able to help the student. This is a time-consuming process.

Student experience

Student feedback on the learning experience

The student feedback was collected at the end of the module. Students who encounter practical problems with electronic circuits normally think that their problem is unique and unexplainable. They were therefore surprised to find that the video explanations solved most of their problems. The feedback was mostly positive; 85% of the students said that the videos saved them time when doing the assessment activity. The students also advised that the videos be used in future courses.

Assessment impact

The videos enabled the students to obtain the knowledge that they needed to deliver a better electronic design. Both the students and the tutors were able to assess problem areas effectively where there was a lack of knowledge.

General Opportunities

The design course has a new topic each year. Each topic has its own new set of problems. There is the opportunity to create videos each year until there is a large set to choose from for a new topic.

Challenges

Good videos need the correct balance of information, script and audio, which is difficult to obtain if one is not a professional video designer. The videos made by the lecturers, however, were still more than sufficient for the purposes of teaching and learning.

Other concluding thoughts

It is worthwhile to try new techniques in teaching and learning but it is important to obtain early feedback from students on the value of the effort.

