

## A blended module design to engage new students

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### Background

This case study evaluates a blend of approaches used in teaching a first year, first semester module on systems modelling.

The module is taken by approximately 80 students studying for a variety of degrees, ranging from systems engineering to biomedical engineering. The students come from varied backgrounds, a significant number are from overseas; some have good A-levels in maths and/or physics, but by no means all. The components of the blend include: online assessment; an assignment to research and describe in 300- 500 words the importance of systems modelling; a second assignment that is a two-page case study of a system of the student's choice; peer-marking of those assignments; an online learning environment with a discussion forum; lectures, which include demonstrations of simple systems such as a pogo stick, and group exercises based on analysing toys.

### Reasons

One of the main drivers behind the approaches taken was the desire to encourage the students to adopt good working practices early in their university careers, with incentives for the students to work regularly and keep up to date with work between lectures. The tutor knew from previous experience that online assessment had been used with this aim elsewhere and that it has other advantages such as providing the students with timely feedback on their progress. Student feedback showed that the tendency to closed questions and rigorous marking with no marks given for "working" that online assessment tends to promote was perceived as a weakness in the balance of the module. Therefore open-ended elements to the assessment were introduced.

These were in the form of assignments that give the students the opportunity to research for themselves and reflect on the bigger picture of how what they have learnt about systems modelling fits with the rest of their degree and their desired career. The assignments are peer-marked by other students and moderated by the tutor in a way that introduces the students to the online discussion tools available. The aims of the peer marking are to give the students a chance to reflect on what constitutes good work at university level, foster discussion among the students and provide timely feedback, while maintaining a reasonable workload for the tutor.

### Lecturer's perspective

The mix of approaches used has evolved over time, as a result of ongoing evaluation and reflection, so that the mix of assignments and teaching styles reflects the varied needs of the students. The approach also reflects the tutor's interest in the potential of new technology and web-based support and his engagement in discussions of new ideas in teaching and learning. For example, the assignment on the importance of systems modelling was inspired by a similar approach taken in teaching English.

The tutor recognises that this is a module that can be difficult for many students. It is inherently mathematical and sometimes the algebra "can get a bit messy", for example, a model might result in many simultaneous equations, something with which not all students are familiar.

Similarly, some students won't have A-level physics and so basics, such as knowledge of Newton's laws, cannot be taken for granted. The challenge is to show that solving the equations is actually only a small aspect of the course; the bigger aim is to show how seemingly different systems can reduce to similar models. Furthermore, the module comes in the first semester of the first year, so students will still be finding their feet at university. The tutor tries to include things in the module to convince students that the topic is important to them, for example the assignments aimed at getting students to answer *for themselves* why the topic is important.

One weakness that the tutor has identified with the course as it is currently delivered is that it is divorced from simulation, which is taught in a separate module. This makes it harder for students to see the relevance of systems modelling than would be the case if they could derive the model and immediately see how it is used.

### Students' perspective

Student feedback was solicited through a questionnaire returned by 66 students (this being all the students present at the lecture when it was handed out) and an interview with a group of ten students, both of which were carried out before the second assignment, the case study. The general tone of the feedback reflects the diversity of students on the course, on very few issues was there anything like consensus. For example, many (approximately one third) of the questionnaires returned suggested that the pace of the lectures or the module in general was too fast, many also saying that the material covered was difficult. However, the majority of students did not raise this issue; a few even commented on the module being a bit slow, and in the group interview there was disagreement about whether the pace of the module was an issue.

While the students were broadly neutral on the question of wanting more information about their progress, the majority agreed with the statement that "I wasn't sure whether I had learnt as much as I was expected to" (in total 45 agreed, 21 of those strongly). Perhaps not surprisingly given this, the computer aided assessment was a popular element of the blend, 53 of the students agreed (26 of these strongly) that it helped them learn about the systems modelling only one student thought it was unnecessary. On the whole, students agreed that computer aided assessment increased their motivation to learn (32 agreed or strongly agreed; 19 were neutral) and encouraged them to keep up with their course work (32 agreed or strongly agreed; 20 were neutral). Asked about the essay assignment, students were broadly neutral on whether it had helped them learn about the systems modelling or increased their motivation to learn about it; most (47) students agreed or strongly agreed that marking an essay had helped them reflect on how they should write essays in the future. There was some degree of agreement with statements that it had helped them understand why systems modelling was important and that it helped them understand how they could learn by researching a topic (though most hadn't continued to use independent research to learn about systems modelling). A similar response was given to questions about the online learning environment available through the VLE: on balance student opinion was that it was helpful, that the discussion board was useful and that it encouraged or helped some to keep up with the course.

Many students appreciated the variety of approaches used in the module in general and in lectures, either because it helped them maintain interest and motivation or because it offered more options for learning. Typical student feedback being: "more interesting to use a range of teaching methods", "keeps things fresh", "I am more motivated", "allows me to look at problems in different ways", "tried out different methods and found out which suits me the most", "gives more choice in how we access resources/learn. [We] all learn differently." Specifically, students appreciated the use of props or demonstrations in the lectures, that the lectures were well planned and that notes were available as handouts.

## Issues

Some students find the material to be too difficult, or the pace of the module too fast. There are also problems caused by students who are still getting to grips with the transition from school to higher education and who find the concept of systems modelling difficult to grasp: for example one student said that it had taken him some time to realise that the point of modelling was to derive the equations that describe the system, whereas all his previous experience was in solving equations analytically.

## Benefits

Students appreciate the variety of approaches offered and the lecturer's enthusiasm and many find the approach overall helps with their transition to higher education: "[the blend of approaches] shows us it's a new teaching style, we've moved up from school to university and are being taught differently. It's shown us how he expects us to do a problem, what he's looking for, so when we get to exam time we know what he is looking for, how to approach a problem, what we need to do to get marks."

The individual elements that the students appreciate most seem to be the computer aided assessment, which they find helpful in monitoring their own progress, and the lively lectures with demonstrations, which they find motivational.

## Reflections

Many factors make this a challenging module to teach, including the diversity of students (especially in terms of mathematical capability), the difficulties associated with the transition from school to university, students' varied expectations associated with the range of courses they are studying and their background. Much of the student feedback reflects these issues: sometimes they don't realise that what they are asking for is already available or is not provided for a good reason; they are not used to learning that isn't targeted to a specific exam and not used to learning independently rather than being taught. Given these challenges the tutor has adopted a reflective approach to evaluating the module, analysing difficulties that students have with the module and using ideas garnered from engagement with other teachers in other disciplines to address these difficulties. While not every element of the resulting blend of approaches will please every student, the overall approach to teaching addresses many of the challenges posed by this module.

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