

OPINION: SMALL-GROUP TEACHING WITH MOOCS

The last few years have seen a steep rise in the use of videos, often interactive, to conduct online courses. Are they a threat to traditional engineering education and professional development? Dr Alastair Beresford and Dr Andrew Rice, lecturers at the University of Cambridge Computer Laboratory, argue that integrating online courses into traditional delivery can free teachers to focus on high-value small-group teaching.



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A MOOC, or massive online open course, is the latest development in distance learning. The numbers are impressive: hundreds of thousands of learners around the world have signed up and accessed a huge range of educational courses. Rather than being a threat to traditional universities, we think these developments provide an opportunity for us to change our practice and deliver better learning outcomes for students.

Distance learning has taken place for centuries via postal mail services, and more recently via radio and television broadcasts. MOOCs, however, differ in at least three important aspects from previous approaches, namely the number

of students per course (often in excess of 100,000), the price (typically free) and the widespread use of peer learning and peer grading. In the last couple of years, a multitude of platforms have appeared. Live Mocha is one, teaching 38 modern languages. Learning is initially driven by interactive flashcards and consolidated by the submission of written and spoken material. Assessment is carried out by native speakers who are themselves students on the platform.

Coursera is another popular platform offering over 400 courses, including several on engineering, which are produced by academics and educators at 70 institutions, mostly from the higher

education sector. The content is typically delivered through interactive video lectures where the video pauses regularly to ask the learner questions and ensure the material is understood. The student experience is augmented with online chat forums, in-person study sessions organised by students themselves, and computer-marked or peer-graded assignments.

Khan Academy is a US not-for-profit platform with 4,300 videos on a wide variety of topics, spanning such diverse areas as biology, maths, finance and history. Early content was aimed at teaching school children, but it now covers more advanced topics too. An interesting feature of Khan

Academy is a 'coach' interface which allows a teacher to use the material to augment classroom instruction.

MOOCs have had phenomenal success in reaching large numbers of learners all over the world. The core technology used in these platforms is surprisingly similar: interactive content is used to deliver new ideas or concepts which are then consolidated through informal tests, quizzes or coursework.

Despite the popularity of MOOCs, we don't believe they challenge the existence of universities. Indeed, the opposite may well be true: the availability of high-quality, free content may encourage new centres of learning to develop, particularly in areas of the world

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currently underserved by existing universities.

MOOCs have several challenges to overcome, which might be addressed by new institutions, local to the student. First, like earlier distance learning technologies, dropout rates are high and, in their current incarnation at least, MOOCs do not appeal to everyone. Second, plagiarism is a concern, and to address this MOOC providers offering formal course credit require students to sit a written test in a local test centre under exam conditions.

And perhaps most importantly, what is the quality of learning like on a MOOC platform?

A key feature of university study is the so called 'deep approach' to learning, in other words, empowering students to relate material across courses and apply knowledge to solve new problems and tasks. This requires learners not simply to acquire facts, but to understand the structure of the subject and how concepts fit together.

Previous research has shown that new facts can be acquired through many mechanisms, including lectures, books or videos. Promoting a deep approach to learning is harder. For example, small group discussion has been shown to be effective, whereas passively

taking notes in lectures tends not to be.

In the world of MOOCs, online content is interactive, with small group discussion often optional and the scale such that small group tutorials are challenging to deliver. In contrast, traditional university teaching involves passive lectures and interactive small group tutorials. Longstanding distance learning institutions, such as the Open University, are well aware of the need for student-student and student-teacher interaction and run regular in-person tutorial sessions and residential weeks.

Therefore, instead of replacing universities, we see MOOCs as a technology which traditional universities should employ to improve the quality of teaching for their own students, and as an effective mechanism to share their materials and expertise with other institutions around the world.

We explored the opportunity provided by MOOCs in our own teaching over the last academic year. We replaced lectures in a computer programming course with interactive video content delivered in a similar style to Coursera. Our aim was to reduce time spent delivering information, and redeploy this saving on improving learning

outcomes. Many of the key indicators came out in favour of our new approach: student pre-and post-course surveys, coursework and examination selection, as well as the analytic data captured by our website, demonstrated that information delivery via interactive videos was both popular and effective. Despite our best efforts, however, we don't think we improved small group teaching outcomes, and this is something we will focus on next year.

One of the major drawbacks of the current MOOC platforms is that the courses are all or nothing. It's not possible for a teacher to pull together small units of material from different platforms, create some additional linking content, and generate a course which meets the needs of their

students, taking into account background and available time. In this regard, Khan Academy is more advanced: content is delivered in smaller pieces, and high school teachers can link content together and access performance statistics of their students. Nevertheless, there remain huge engineering challenges in building a platform to support a more flexible approach to content delivery.

MOOCs won't replace universities; however, they will improve teaching by amplifying the power of the teacher. They can reduce time spent on content preparation and information delivery, freeing up time for the teacher to improving learning outcomes by working with individuals and small groups.

BIOGRAPHIES

Dr Alastair Beresford and Dr Andrew Rice are university lecturers in the Computer Laboratory at the University of Cambridge where they teach programming to first- and second-year students. In Cambridge they hold respectively fellowships at Robinson and Queens' College where they are responsible for the organisation and delivery of small group 'supervisions' to Computer Science undergraduates.

Dr Beresford's current research work explores the intersection of three areas of computer science: security and privacy, mobile computing, and programming languages.

Dr Rice has a research focus on understanding the energy consumption of smart phones and providing tools to help developers minimise energy consumption.