

Teaching via online video lectures – a new paradigm?

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The academic world has recently been rocked by the explosive growth of Massive Open Online Courses (MOOC), where teaching is mainly done via online video lectures. In the fall of 2011, Stanford University launched three such courses. The resulting enrolment numbers were beyond wildest expectations -- 160,000 students (from 190 countries) enrolled in “Introduction to Artificial Intelligence”, 104,000 enrolled in “Machine Learning” and 92,000 in “Introduction to Databases”. MOOC has been hailed as a new paradigm for higher education, allowing any person with access to the internet to take free courses given by professors from prestigious universities.

Over the years at the University of British Columbia, I have taught a course EOSC 510 “Data Analysis in Atmospheric, Earth & Ocean Sciences”, which mainly teaches machine learning and statistical methods to graduate students in environmental sciences. In the fall of 2013, I gave this course as a 13-week online video lecture course to twelve students. Twelve is a miniscule number compared to 160,000 achieved by Stanford professors, so what is the point in writing an article based on my experience? My point is that the benefits of online video lecture courses are not limited to courses with massive enrolment -- even for small classes, this type of teaching offers intriguing opportunities, e.g. future graduate students having a much richer selection of courses from many universities.

To understand why I decided to pursue online video teaching, one has to appreciate a fundamental problem in teaching environmental science students, and that is their math background is highly inhomogeneous. As the subject of my course required mathematical understanding, students with strong math background generally enjoyed it, while those with weak math background struggled with the equations and computer programming. Their frustration was reflected in their teaching evaluations, where the course was often described as “too mathematical” or “too technical” and the instructor rated as ineffective. There is no simple solution to this problem, because if the lecture material and pace are adjusted to suit the students with weak math background, then the others will find the course unchallenging. For comparison, I did not have this dilemma when I taught Physics courses, as Physics students have a much more homogeneous math background.

Curious about the new MOOCs, I watched the video lectures of two courses, and was impressed by a unique feature of video lectures. Whenever the math was hard to follow, I would pause the video, rewind and watch the segment again. It dawned on me that this technology would alleviate the frustration of the students with weaker math background, as it would allow them to slow down the lecture pace over the difficult parts. Hence video lectures allow students to learn at a pace tailored to the individual, whereas in a conventional lecture course, a pace suited for strong students is exasperatingly fast for the rest.

Although I was already an emeritus professor, the new technology tempted me to give my course once again. I prepared the video lectures using the Camtasia program on my Mac computer and posted the lectures online <<http://www.ocgy.ubc.ca/~william/EOSC510/>>. To my surprise, two students from the University of Alberta enrolled in my course under the Western Deans' Agreement (which was established in 1974 as an expression of co-operation and mutual support among universities offering graduate programs in Western Canada). I also offered an optional weekly tutorial in a classroom so students could meet me in person, and one student attended remotely by video-conferencing using Facetime.

A class “hour” was typically 40 minutes of video, given in several blocks of 12-25 minute duration, plus 1-2 simple questions for the student to answer. The questions were not graded but solutions were provided online. There were graded homework assignments involving Matlab programming, submitted by students in portable document format, a midterm exam and a final exam, both written under invigilation. The two students from Univ. of Alberta wrote the exams invigilated in Edmonton (arranged by the students’ supervisor). Unlike MOOCs where only a small percentage of the enrolled students actually finished, my course did not suffer any dropout after week 2 -- all twelve students who were enrolled at week 2 stayed to the end and passed the course. In the end, the teaching evaluations were very favourable, and my instructor rating was much improved.

From the student’s point of view, the main advantages of this way of learning are: (1) ability to tailor the lecture pace to suit the individual, and (2) freedom to schedule the time for learning (e.g. take a break or nap after 20 minutes of lectures). The main disadvantages are: (1) inability to pose a question to the instructor in the middle of a lecture, and (2) weaker interactions with fellow students than in a regular classroom. Whether the positives outweigh the negatives depend on the student – students who flourish by interacting with fellow students would probably still prefer the traditional classroom.

From the professor’s point of view, the main disadvantage is that it is very time consuming to make video lectures. Although I had taught the course before, converting a regular lecture class to 40 minutes of video (plus 1-2 simple questions with answers) took about 6-7 hours. I had to re-record often and spent much time video-editing to remove awkward pauses and the many “uh”s. The meticulous editing meant that my video lectures were more polished than my live lectures in a classroom. The other main advantage is that the videos can be reused in future years, thereby saving instructor time.

Having two students from a different university taking my course remotely brought to my attention a very exciting potential of this new paradigm of teaching. In a typical university department, the number of professors in meteorology or oceanography is usually small, hence the number of graduate courses offered is also quite limited. If professors give their courses online, then a graduate student will have a much broader choice of courses since the student can take courses from many different universities. The main logistical problem is how to invigilate written exams for students from other universities (some in different time zones), though this is not a serious obstacle if the universities are willing to cooperate.

In summary, while there are many articles promoting the benefits of online video lectures in teaching classes with humongous enrolment, this new paradigm of teaching can actually enhance classes with small enrolment. If universities are willing to cooperate, future graduate students will benefit from a much richer choice of courses taught by professors from many different universities.