CASE STUDY

Reluctant Mathematician MOOC: refreshing approach to stressed maths learners

Institution & Institutional Context

The University of Wollongong developed a new eLearning Strategy in 2012-13, and its mission was: "To connect technology-rich learning environments with transformative curriculum renewal to contribute to UOW's goal of being a top 1% international university by 2025." Open-Education was a significant new focus area of this Strategy. A new role Manager, Open Education was created, focusing on building capacity for open-education at the University, and working with the Open Education Resource University (OERu) to develop full length and accredited open subjects. The University also moved to pilot MOOCs or shorter open online courses. 2 MOOCs were developed with external partner Open2Study. To test internal capacity and use of existing eLearning tools for Open-Learning a decision was made to develop one in-house MOOC using up-cycled OERs addressing maths skills issues. This became The Reluctant Mathematician.

Keywords and OEP themes

Module based on OER; Student voice.

What is the case study about?

The University of Wollongong's first locally developed and hosted Massive Open Online Course (MOOC) "The Reluctant Mathematician" was run in the last 4 weeks of our summer holiday, prior to Autumn session in 2014. It was developed to lift maths skills at our university and also in the community – where maths skills continue to be a challenge and in some cases a source of stress. Internally the MOOC provided an alternative online way to support students who struggle with mathematics at university level, as a complement to the existing face to face small group workshops and individual consultations. The evaluation showed that the MOOC enabled a range of learners to succeed, including those who were stressed about learning maths.

What is the issue or need you are addressing?

The lowering of maths skills in our students and the community, and the removal of maths pre-requisites for university entrance are all part of a 'maths skills crisis' which has been on the national education policy agenda for some time.

The implications of this maths skills crisis for universities, is that there is an increase in the number of students enrolling in university courses who are short on maths skills, and who struggle in the classroom across a wide range of disciplines including nursing, economics and finance, education and even engineering.

Staff in Mathematics and Statistics at the University of Wollongong have been proactive and innovative since at least 2005 in progressing maths education to support students transition to university maths, and to lower failure rates in maths-related subjects at the university. There has been a chain of internal and then externally funded and collaborative grants that have built on this experience.

One of the outcomes of the grants has been the development of a collection of peer-reviewed maths video resources ie that can be freely shared. All resources are licensed under creative commons (licence: Attribution-NonCommercial-Share Alike 3.0 Australia) to enable lecturers and educators to use and adapt the resources with the permission of the developers but with recognition.

How was the initiative implemented?

The Reluctant Mathematician MOOC was build in 2 months using a University supported instance of Wordpress. The core set of resources were video maths lessons and related PDF worksheets and solutions which already existed. A casual maths tutor with IT skills was hired to create an additional set of video quizzes which stepped a student through a problem, but made them attempt part of the calculation before the video continues. This was to deal with the common concern notes by maths educators with regards to video lessons: students overestimate their ability to workout the problem when passively watching. This essential component in the scaffolded learning sequence provided an up-to-date and engaging video resources that was harder than watching the video lessons, but not as hard as attempting a sheet of 50 maths questions on your own.

We wanted students to leave the MOOC with the ability to successfully complete 4 types of mathematical problems that are foundational to further study in numerous university disciplines. The MOOC URL is http://blogs.uow.edu.au/reluctantmathematician.

The MOOC was designed for the non-expert and/or stressed maths learner/reviser and provided a highly scaffolded and structured learning space to help deal with the situation of low self-efficacy and stress in the learners. However, the design and resources were also flexible enough to allow experts to dip in and choose the more challenging material.

Our university and local council-run library were contacted to look at the possibilities of students studying the MOOC in the library – with outstandingly positive responses. A call for volunteer online coaches was put out, and 7 coaches – a blend of staff and students – were recruited. However, despite promoting synchronous online coaching sessions in different timezones, (using a text chat and whiteboard tool) no student took up the offer. In fact, the simple pull-down menu navigation of the Wordpress MOOC website seemed to cause the students no problems at all. This was a stand-out observation in comparison to what you would normally expect for students new to a Learning Management system for example.

The MOOC was evaluated looking at both student performance and satisfaction, and staff perception about re-use potential in the curriculum. The evaluation methodology involved reviewing a range of analytics data showing student use and engagement with the online learning materials matched to demographic data and student rated levels of stress around learning maths. Qualitative feedback was collected from students when they submitted the weekly assignments. Staff feedback with regard to potential re-use in different curricula was also obtained via series of meetings. Interested staff who were unable to attend provided feedback via email.

Outcomes

The evaluation showed that the MOOC enabled a range of learners to succeed, including those who were stressed about learning maths.

By collecting a range of data from students at the time they enrol we have been able to have a deeper understanding of the type of student we have been able to attract and what their concerns are. We found plenty of students providing personal insight into the maths stress issue – some expressed with very strong language. Below is a representative sample.

"It's been a while since high school and I wanted to brush up on my Maths and depending on how I go, possibly look at studying again."

"Recommended that I do this before taking Engineering statistics by the subject co-ordinator [name deleted]."

"I am planning on being a great teacher. To do that I need to be able to completely understand maths to be able to find different ways for different children to learn"

"I want to pass math 283 (compulsory course), and I know a few people that are repeating it."

"I fxxxxing hate maths. I don't think this is unusual. I have a lot of trouble following basic mathematical instructions. It really undermines my self-worth especially as a woman. I love science but holy sxxt do I ever hate maths."

"I always seemed to struggle with mathematics at school, my siblings were always good at it. I found it just didn't click. I would love to give this a go, hoping my maturity helps with patience to learn. If I can succeed in this then it could be the beginning of more learning. Excited and anxious at the same time."

We were also able to compare the demographics of the overall cohort with that of the subset of students who submitted an assignment. This enabled us to see if the MOOC was more or less successful in motivating different types of students. We found that recent school leavers and mature age learners of around 38 years or higher were more likely to do the assignment. More than half of the assignment cohort claimed to be 'a bit stressed' about learning maths, slightly higher than the overall cohort. It was pleasing to see that their stress levels had not prevented them from working through the module to the point of submitting the assignment.

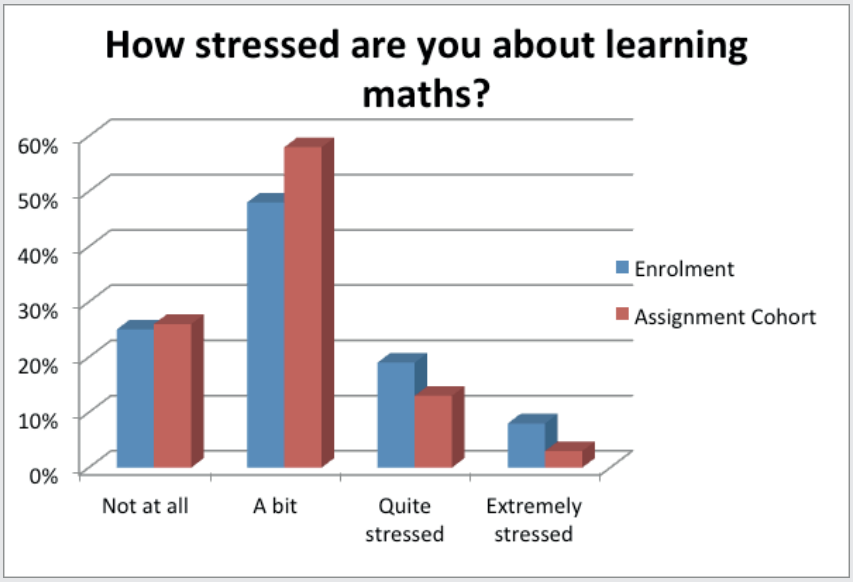
By collection feedback on the course at the time of submitting their assignments, we have been able to gather a good sample of qualitative data about how students found the course. We found the MOOC to also be popular with maths lovers and experts (around 20% of the cohort)- their use the MOOC to practice and maintain skills and provide encouragement for others was one of the surprise outcomes of the MOOC. As previously noted, it also addressed the needs of those who were 'a bit' stressed about learning maths, and some who were "quite stressed". Below is a representative sample.

"I like the video tutorials, Also, I like the fact that the working out is broken down into a very simplistic form. I am finding it easier to understand now and I can't wait until the next module."

"So far so good. Enjoying the challenge. The presentation videos are very helpful and the layout user friendly."

"I have been pleasantly surprised. The videos are good and I find it better than face to face when I can pause and think it through for myself before continuing."

"Videos, emails from fellow students great. Maths is a kind of meditation, being engrossed in it for hours enables me to enjoy other activities more. Your program is fabulous."



"Learning materials enable any set pace through the module."

The outcome of the evaluation was to re-purpose the Maths MOOC for use in the Workplace Health and Safety Masters level program. Staff in the program decided to set a compulsory quiz assessment of key math skills early in the semester of a core unit. Students who fail the assessment will be required to re-sit a similar quiz at the end of the semester, and will be provided with the revise Maths MOOC as a resource to help them achieve a better outcome. The staff have been so happy with the rapid development and the quality of the video tutorials, they are now seeking to find a similar MOOC to support gaps in students chemistry skills.

Issues & challenges

Because the MOOC was developed centrally in a learning and teaching unit, we were somewhat isolated from teaching staff, even though we had the full support from the Maths academic who had authored the original set of maths video OERs. Not being part of a teaching faculty meant we had no access to student records and email and no direct link to Faculty planning. Therefore it was difficult to get the word out to potential students.

To overcome this we contacted Faculty staff who organise student/academic guidance during enrolments, and found 2 Faculties in particular who were very keen and embraced the opportunities for their incoming students, and allowed us to provide their academic/enrolment advisors with fliers about the MOOC. In some other Faculties, there were concerns by Faculty management who were planning their own face to face workshops and feared students would be confused by mixed messages or competing service offerings. Offers to discuss how that could be managed, and how the MOOC could be promoted as an extra or alternative service were in some cases politely rebuffed.

Electronic signage direct to students on campus was used to good effect, as was the use of mainstream media to appeal to parents of students. We also managed to get an "all-academic" staff email sent out headed "Do your students need Maths to succeed?" just prior to autumn session. We were amazed at the rapid and positive responses from academics in support of the initiative, and they again told the tale of their increasing workloads each year and their various individual attempts to deal with the increasing numbers of students with huge gaps in their maths skills in their technical classrooms.

There continues to be a long held perception within the University that those students who are at extremely low maths skills level and/or with very high levels of maths learning stress can only be supported by one-on-one consultations. However, only small numbers of students typically elect to join holiday bridging type courses. While this MOOC only attracted a small number of highly-stressed students, and only around a third of them attempted an assignment, the fact that a handful of students even reached this point is heartening and the question of to what degree a highly stressed learner can be supported by a MOOC is something requiring additional effort and research.

Insights and Recommendations for National and/or Institutional Development

- task and resource-based MOOCs are useful designs for learning outcomes in foundational skills based courses
- fully online learning opportunities can work to engage the non-confident and non-expert learner and help them work towards skills mastery
- use of open technologies such as Wordpress and Youtube video clips which use standard/recognized website navigation methods are so well received by students that they require hardly any support to use the websites
- providing sound evaluation data to academics who are planning new curricula, in the context of supported curriculum transformation conversations, can be effective to stimulate embedding of MOOCs and open-learning resources and sequences into curricula
- it is important in campus-based institutions to balance MOOC services with existing face-to-face services and promote these as supportive and complementary
- University and community/council run libraries very keen to support the initiative, open to community/library support model where students learn using library computers and with the aid of library roving help staff to navigate website and resources.

Contact person and details
Sarah Lambert, Manager, Open-Education,
slambert@uow.edu.au