Teaching programming to beginners in a massive open online course

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Teaching Programming to Beginners in a Massive Open Online Course

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Abstract

The University of Reading's first Massive Open Online Course (MOOC) "*Begin Programming: Build your first mobile game*" (#FLMobiGame) was offered in Autumn 2013 on the FutureLearn platform. This course used a simple Android game framework to present basic programming concepts to complete beginners. The course attracted wide interest from all age groups.

The course presented opportunities and challenges to both participants and educators. While some participants had difficulties accessing content some others had trouble grasping the concepts and applying them in a real program. Managing forums was cumbersome with the limited facilities supported by the Beta-platform. A healthy community was formed around the course with the support of social media. The case study reported here is part of an ongoing research programme exploring participants' MOOC engagement and experience using a grounded, ethnographical approach.

Keywords

Massive Open Online Course, MOOC, Teaching Programming

Introduction

The Course

Begin Programming: Build your first mobile game (#FLMobiGame) is a programming course for new programmers, offered by University of Reading. This seven week MOOC ran on the FutureLearn platform in October 2013. As a pilot-course on the Beta version of the platform, the number of participants was capped at ~10,000. The demand for this course was high; within 24 hours of launching the first run was full and a waiting list was maintained for the next run, which is scheduled for Spring 2014. Any participant successfully completing the final week quizzes, along with the weekly steps was given the opportunity to register for a statement of participation from the FutureLearn.

Background

When the University initially partnered with Futurelearn, faculties and schools were asked to submit expressions of interest for suitable courses to be developed in to MOOCs. The School of Systems Engineering proposed this course based on materials originally authored by Dr Karsten Lundqvist and used in extra-curricula courses and tutorials. The use of games in teaching occurs elsewhere in the School with excellent outcomes (McCrindle, 2013). The use of a simple Android game App was conceived as the vehicle to teach the fundamentals of programming to beginners. By providing a framework with a working simple game, FLMobiGame facilitated learners enhancing the game with their newly acquired programming skills in a fun way providing an exciting learning experience. This radical idea of providing

participants with a framework of the game and supporting their exploration of it as a learning activity was selected as the University of Reading's first MOOC.

Deterding et, al. (2011) defines "Gamification" as the use of design elements characteristic of games in non-game contexts. In designing this MOOC, the course design team used elements of the game to create visual appeal to learners. With this approach, learners are able to apply the concepts they learn on the course to the game framework, to develop their own game over the duration of the MOOC. However, this approach carried high risk because it required complete beginners to install and setup several software components on their machines, thus having the potential to lose learners on the first week itself.

The course went live on 28th October 2013 and on the 4th Week of the course participants were invited to provide feedback on the course in a discussion entitled 'The Good, Bad and the Ugly'. This discussion was initiated to identify possible improvements for future instances of the course.

Lessons Learned

Opportunities

Learners in MOOCs are diverse and make progress at different rates. Participants in #FLMobiGame was varied with some unable to meet the challenge of unzipping and installing the software, while others appear to have become addicted spending many hours improving "their" game. This experiment has shown that a modified form of gamification can be used in a MOOC and that it could potentially be a good way to introduce difficult concepts to a wider audience spanning across cultures, ages, ethnicity, and prior educational backgrounds as shown by McCrindle (2013) and Dale (2010).

The pre-course survey (with 3606 responses) showed that 3% of the respondents were 18 years or under and 5% were over 66 years old. However, it is worthwhile noting that only around one third registered for the course responded to the survey.

Age Distribution

- 18 or under
- 18 - 25
- 26 - 35
- 36 - 45
- 46 - 55
- 56 - 65
- 66 and over

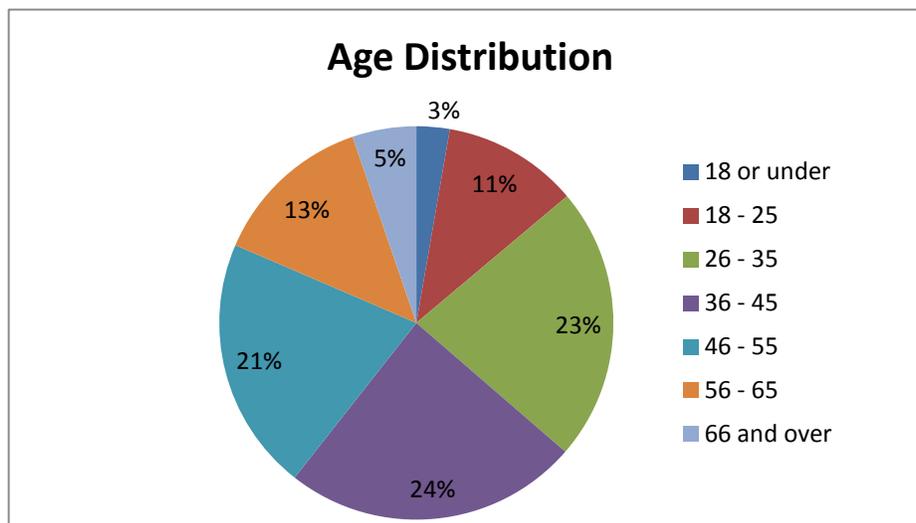3%, 11%, 23%, 24%, 21%, 13%, 5%

Figure 1. Pre-course Survey Responses FLMobiGame - Age Distribution

Engaging elderly

Despite being a programming course, #FLMobiGame attracted a sizable proportion of leisure learners with various intentions for participating in the course. Some of their thoughts at the end of the course reflection were:

> Thanks very much for an interesting course...Not sure that I will do much more but at least I have a game on my phone that I can show my grandchild and say "I did some of that!"

Figure 2. Mature Participant-1

> I daresay more eye rolling and tutting from my son who's studying programming at Uni in Brisbane. He's of the opinion that 'old people' should leave technology to the young people forgetting of course that it was old people who developed the technology when they were young people!

Figure 3. Mature Participant-2

> I still am a complete novice - but understand more than I did. Somehow can't see me breaking into the big time programming wise, but it is great to have a little knowledge and so hopefully be able to converse with my son who is doing this type of course full time. I have really enjoyed it

Figure 4. Mature Participant-3

Grandparents and parents who took the course were delighted to see their offspring inspired by the little game 'they' had developed.

Inspiring the young

A group of sixth form students (16-17 year olds) from Ousedale School in Newport Pagnell and Olney along with their computing teachers had taken part in the MOOC to strengthen their university applications and are very positive about their experience (FutureLearn Blog, 2013). The #FLMobiGame team plans to work with more school groups in the second run engaging potential students and reaching out to the broader community around the University. It was also seen that a few enthusiastic primary students along with their parents[i] registered and completed the course. For example, this was a reflection from a 10 year old and his father.

> I learnt a lot about coding in the last few weeks from Karsten and team. Me and my dad think that it would have easier for us if the videos were easier to access and if we could have gone a week ahead

Figure 5. Young Participant

Programmers and Software Developers are in 'shortage occupation list' for the UK (UK Border Agency, 2013). Introducing the young to programming in a fun no-risk environment such as this could help inspire more children to develop their interests and skills beyond just being 'users' of software, in keeping with the current UK "Computing" curriculum for schools.
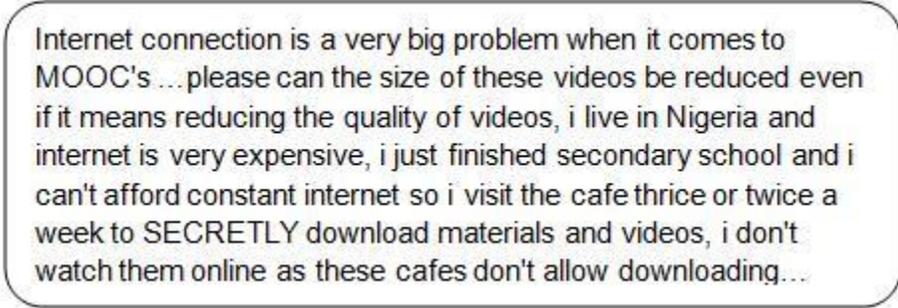
The use of a game that reflected instantly the changes made in code and the promise of having a working game at the end of the course may have motivated at least some of these young participants.

Challenges

#FLMobiGame presented challenges and some of these may be barriers to learning. The open, online, nature of a MOOC means that learners can come from a wide range of backgrounds, including differences in culture, access to IT, prior skills and with a range of language and learning skills.

International Audience

Participants from at least 103 territories were registered in the course and this included students from developing parts of the world where internet access and bandwidth can be scarce. As described by Liyanagunawardena, Williams and Adams (2013), it was seen that some of these participants were struggling to access the high quality, high bandwidth, videos provided by the platform (See Figure 6 quote for example). At the same time, a few participants were complaining about the videos, suggesting that they could have been higher resolution. The course was designed for an international audience by a team of educators (2 native and 2 non-native English speakers).The use of simple English to describe concepts was not well received by a small minority of native speakers while the international audience applauded it. This shows the complexity of addressing expectations of a diverse group of people representing the global population.

> Internet connection is a very big problem when it comes to MOOC's ... please can the size of these videos be reduced even if it means reducing the quality of videos, i live in Nigeria and internet is very expensive, i just finished secondary school and i can't afford constant internet so i visit the cafe thrice or twice a week to SECRETLY download materials and videos, i don't watch them online as these cafes don't allow downloading...

Figure 6. A Participant From Nigeria

Digital Literacy

Although #FLMobiGame was a beginner level programming course, the team anticipated some level of digital literacy from the participants, for example being able to unzip a compressed file or install software. But as the course progressed the team had to support many learners lacking these skills. During the first week the course team composed and published a list of Frequently Asked Questions to deal with the technical issues arising from installing on a variety of different machine configurations. In order to accommodate learners lacking skills to unzip files (or similar) detailed document guides and blog posts were created as and when required to supplement the course materials.

Misuse of Forums

As in most internet forums there were trolls that attacked both other participants and mentors. In these few and far apart instances, the lead-educator himself addressed the issue and in one instance the comments were removed by the moderator. The mentors and educators used back-channel email communications to inform each other of such situations.

Platform Support

The asynchronous nature of the communication posed a huge challenge to educators especially due to the limited tools and facilities offered by the Beta-platform. The then Beta-platform did not provide a search facility, which made it very difficult to filter posts to help handle the scale of contributions being submitted by learners. The FutureLearn platform was developing at the same time as the course, meaning the course team had to be agile in adapting to functionality.
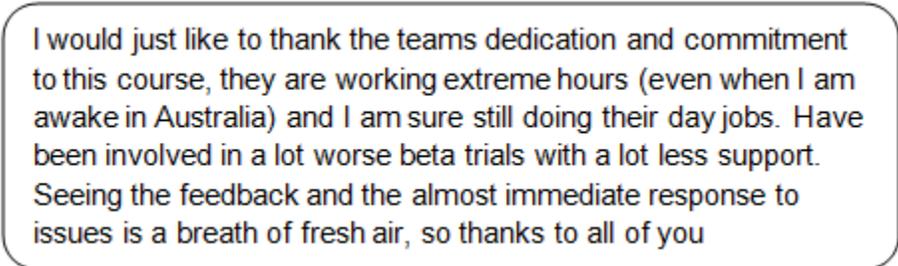
Listening to Feedback

Teaching in a MOOC was very different to authors' previous teaching experiences. Educators in FLMobiGame were responsive to participants' feedback to support their learning. They used a variety of methods to support the learners by providing additional materials. First author used her blog to address some of the difficulties expressed by students that were not directly relevant to the course; for example guides on using FutureLearn platform were created as blog posts. Where the participants felt the material was rushed, additional materials were created and uploaded to the platform. For example Pythagoras theorem was used to detect collisions in the game, which some participants could not recall from their school mathematics lessons. The team created new learning materials to scaffold the learning and uploaded to the course as support material.

Community Formation

As the course progressed the team identified champions among the participants who were able to help others in the community. This community formation required building trust and it was actively supported by the course team. Learners developed social media presence for the course on various popular social networking sites without any involvement or encouragement from the course team.

Facilitating a MOOC

Week 1 of the course, which consisted of installing and setting up software, was a challenging week for most. The course team had the support of seven student mentors who provided help in forums. Most believed the team provided exceptional support for a MOOC. For example (Figure 7):

> I would just like to thank the teams dedication and commitment to this course, they are working extreme hours (even when I am awake in Australia) and I am sure still doing their day jobs. Have been involved in a lot worse beta trials with a lot less support. Seeing the feedback and the almost immediate response to issues is a breath of fresh air, so thanks to all of you

Figure 7. A Participant from Australia

The course team believed FLMobiGame would require a high level of educator and mentor intervention in the initial weeks until the learner community was able to take-over as a support

network. Moving on to the third week of the course, there was an active community of learners supporting each other.

Completion

As reported in many MOOC case studies, in FLMobiGame too, a small proportion of the initial registrants completed all steps in the course. A recent study of data from the first 17 MOOCs offered by EdX (Ho et. al, 2014, p2) argues that "[c]ourse certification rates are misleading and counterproductive indicators of the impact and potential of open online courses", while Grainger(2013, p5) summing up the experience of University of London's MOOCs suggests that "completion may not be a useful measure of success". The feedback from learners indicates that the FLMobiGame had positive learning outcomes, and there is analysis to show that registration in a MOOC should not be directly compared to registration in traditional courses (Liyanagunawardena, Parslow, & Williams, 2014; Ho et. al, 2014).

Conclusion

FLMobiGame was an effort to introduce programming concepts to beginners in a Massive Open Online Course. The course was one of the first on the FutureLearn platform and attracted wide interest. The first run of FLMobiGame in Autumn 2013 provided the opportunity for the course team to experiment with a modified form of gamification as the vehicle to teach programming to a diverse group of learners from various backgrounds around the world.

There were a number of challenges posed by the levels of skills learners brought into the course. The limited amount of support provided for educators by the beta-release of the platform was another hurdle. Although the FLMobiGame required a high level of educator and mentor intervention in the initial weeks, with the formation of the learner community this burden was lifted from the course team.

The second run of the course is scheduled for Spring 2014 and as of 20th February, 2014 there were more than 31,000 participants registered on the course. Although only a small proportion of the initial registrants completed all activities in FLMobiGame, feedback from participants indicates of positive learning outcomes. The popularity of FLMobiGame is shown by the number of enrolments in the second run and suggests that similar approaches of modified gamification could be applied in MOOCs.

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Notes

i.   FutureLearn terms of use only permits the registration of users 13 years or above

According to the licensing conditions of FutureLearn forum posts, the post authors of the posts are listed here

Mature Participant-1 – Yasmin Simpson

Mature Participant-2 – Trevor Ward

Mature Participant-3 – Penny Pringle

Young Participant – Ronald Macintyre

A Participant from Nigeria – Justice Chidi

A Participant from Australia - Paul Goode

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