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Discover Dentistry: Encouraging wider participation in dentistry using a Massive Open Online Course (MOOC).

Christopher W. Stokes BMedSci MEd PhD*
Ashley C. Towers BSc*
Paul V. Jinks BA MSc*
Anna Symington BSc†

*School of Clinical Dentistry, University of Sheffield, Claremont Crescent, Sheffield, S10 2TA;
†Projects and Support Team, Learning and Teaching Services, 285 Glossop Road, Sheffield, S10 2HB

Correspondence to: Dr Christopher Stokes (c.w.stokes@sheffield.ac.uk)

Abstract

This paper describes how a relatively new style of online learning, a massive open online course, may be used to raise aspirations and widen participation in dental professions. A massive open online course (MOOC) was designed and run with the aim of engaging prospective students of dental professions in learning and discussion. Over Over 4,200 learners signed up, and 450 learners fully completed this first run of the course. The course attracted a significantly younger demographic than is typical for MOOCs, and nearly a third who responded to the pre-course survey reported they were doing the course specifically as preparation for a dental degree.

The approach also provided a platform for public engagement on the subject of dentistry with participants, both dental professionals and members of the public, contributing to discussion around the learning materials from around the world, providing a unique, internationalised perspective of oral health care for learners.

This study shows that here is genuine potential for MOOCs to involve people from disadvantaged backgrounds in higher education by offering free, accessible, enjoyable and engaging educational experiences. The data gives us cautious optimism that these courses can play a significant role within a platform of other WP interventions.

Introduction

Massive Open Online Courses, or MOOCs, are a new approach to online learning first popularised in North America in 2008 (1). Unlike conventional online learning courses, MOOCs are designed to be able to support large numbers of learners, often in their thousands, with the technology supporting the educator(s) in facilitating the learning at this large scale. The learning materials can be text, audio, video, interactive exercises or derived from the activities of the learners themselves. Support on the course will come from peers through online discussion (which can be within the course or using social media), formative assessment feedback, and limited interaction with the lead educator and/or course teaching team. While very different in scale to conventional online learning courses, certain similarities exist, such as the course having a defined start and end date, and learners may be assessed in some way. Assessment of satisfactory completion of a MOOC is usually simple and not instructor-led, often either by automated multiple choice

questions (MCQ), learning analytics, peer assessment or a portfolio.

To date, another defining feature of MOOCs is that they are usually free to join - with learners only being asked for payment if they want to request a certificate (or statement) of their participation (or achievement) at the conclusion of the course. In this format the MOOC has reached significantly higher audience numbers than conventional e-learning courses, and platforms such as Coursera, edX, Udacity and FutureLearn have grown large and diverse course offerings.

Computer and internet access is increasing across all socio-economic groups, with home internet access increasing for children in C1 (lower-middle class) households from 92% in 2010 to 96% in 2011 and in DE (working class or out of work) households from 74% in 2010 to 80% in 2011 (2). Internet access at home in AB (upper and upper-middle class) and C1 households is now almost universal (98% and 96% respectively) but for children in DE households internet access is lower than for all other socio-economic groups.

MOOC-type courses have the potential to offer learning on subjects such as dentistry to people who might not normally consider them for study. The learning experience is essentially accessible to anyone with motivation and an internet connection. There is clearly an opportunity here to explore the possibilities of MOOCs as part of the 'widening participation' agenda. MOOCs could also find a use as 'taster' courses for those considering a career, or as a means of gaining further insight to prove a commitment to the subject in order to impress a university admissions tutor. In particular the low (or no) cost to enrol and the flexibility of delivery of MOOC-type courses means that a much wider demographic is able to access them, and there may be some use in these course for widening participation in very selective subjects such as dentistry.

Widening Participation in Dentistry

Entry to higher education dentistry courses is highly competitive; in 2013 UCAS reported 11,490 applications were made for approximately 1,190 places on dentistry courses (3). Applicants can make up to 4 applications, so the applicant pool is at least a quarter of this, but it is 9.7 applications per place when the HE sector average across all courses was 5.5 (3). Typically many of these applications will come from students from high achieving schools, well-rehearsed in preparing their students both for A-Level examinations and the competition of obtaining university places. Alan Milburn's report 'Unleashing Aspiration: The Final Report of the Panel of Fair Access to the Professions' (to which both the British Dental Association and Dental Schools Council provided evidence) acknowledged the problem in 2009:

"We welcome the progress many professions have made to widen access, and we believe they deserve praise for their efforts. But we believe that a step-change has not been achieved. Initiatives and programmes to widen access remain on the margins not in the mainstream. They are piecemeal not universal. The default setting in the professions is still to recruit from too narrow a part of the social spectrum. That all has to change." (4)

To support such work, the UK Government put in place policies and funding, such as AimHigher, to encourage universities to widen participation in UK higher education, particularly among students from non-traditional backgrounds, and minority groups (5). With the introduction of fees for higher education in 1998, and substantially higher university fees in 2012, some of this funding to universities has to be used to support students with the potential and ambition to succeed in higher education, whatever their income or background, through schemes, activities and bursaries.

The approach of the University of Sheffield and the School of Clinical Dentistry has been to target students who would be classed as being under-represented in HE, in accordance with the Higher Education Funding Council for England (HEFCE) targeting guidelines and in line with the Access Agreement to the Office for Fair Access. This includes a number of specific target groups (e.g. care leavers, disabled students), and is reflected in Sheffield's Access to Dental

Occupations: Practice and Tutoring (ADOPT) scheme, that has been running since 2006. ADOPT supports approximately 30 students a year in preparing to apply for a dental course at university. The University-funded scheme actively recruits from schools within South Yorkshire, Nottinghamshire and Lincolnshire and supports students from under-represented backgrounds who are aiming to apply for a place in Dental Surgery or Hygiene and Therapy. Students who complete the programme are guaranteed an interview, subject to meeting minimum academic criteria. Students on the ADOPT scheme have regular contact with the staff and students of the Dental School. The core curriculum over the two years of the programme includes taster days, mentoring, team building, A-level support and preparation for applying to university.

Widening participation activities such as ADOPT provided by universities do appear to be having an effect as evidenced by HESA analysis and research which shows that in 2004 advantaged UK 18 year olds were 4.4 times more likely to apply to university than disadvantaged 18 year olds, but in 2014 this ratio fell for the tenth consecutive year with advantaged UK 18 year olds being now only 2.5 times more likely to apply than disadvantaged UK 18 year olds However, compared to the sector average, highly competitive entry courses such as dentistry and medicine still show the lowest participation rates in the HE sector from low participation neighbourhoods (4.3%, compared to 10.9% sector average) and from lower socio-economic groups (16.7%, compared to 32.3% sector average) (6).

As the size of widening participation schemes such as ADOPT are limited by time, geography and budget, increasing their impact requires looking at new ways of inspiring and engaging potential dental professionals to both prepare and apply to study the subject. There is often an issue of aspiration, where large schemes such as ADOPT are not as influential as there is a significant level of commitment required on behalf of the student (and their carers) to take part in such a scheme if they are not yet sure if the subject is one they want to pursue.

Yuan and Powell's 2013 white paper for JISC's Centre for Educational Technology and Interoperability Standards (CETIS) state that MOOCs offer institutions opportunities to "expand access to HE for all" (7).

The expertise and experience was in place at Sheffield to both support students considering a career in dentistry nationally, and to offer an opportunity for students of any age and any location to engage with ADOPT-like activities online. A combination of the scale and accessibility of a large online course in the style of a MOOC and the support of fellow learners who are dental professionals, would seem to offer a means of increasing the impact of widening participation in an engaging, accessible and cost-effective manner.

The 'Discover Dentistry' MOOC

The original vision for 'Discover Dentistry' was that it would be an online course, free and open to all, with a curriculum that would cover the basics of dentistry, dental research and public health, concluding with information and advice on working towards an application for a dental course (Dentistry or DCP). The course would be completely online, over 6 weeks, require around 2 or 3 hours engagement per week and when completed would provide evidence showing that the learner had successfully participated in the course which they may use as proof of researching a dental career. The course would be presented as a Massive Open Online Course (MOOC) and similar in structure to typical higher education courses (structured, often modular) but not offering any academic credit (just the learning and evidence of completion).

At the time of development, MOOCs were aimed almost exclusively at the higher education level. Despite a large audience of potential learners at secondary education level (who are IT and social media literate, and often able to access a computer at home), MOOCs had not yet found widespread success in this domain, which provided a challenge to the Discover Dentistry project. FutureLearn's published data in 2014 confirmed their learner demographics as predominantly 36+ year-old graduates with learners under 18 making up only 4% of the total learners. (8)

For Discover Dentistry, a MOOC-type course offered a significant number of benefits:

- Learners (including the target widening participation learners) can access the course nationally
- Lower barrier to participation and engagement than a conventional on-campus scheme (as learning is flexible around other commitments)
- Learners can enrol on the course when they become aware of it, in any year of study
- By being a course, completion of a MOOC will show *sustained* engagement with career exploration (as opposed to trying to evidence reading a book or website).
- The course is relatively cheap to host and provide (the curriculum is flexible to what can be reasonably provided, and the nature of a MOOC means the learners numbers can be large with comparatively little impact on teaching support)

Outline of Curriculum planning process

From an educational design perspective, designing for a MOOC is a unique challenge as any learners may choose to sign up for the course, but at any point learners may quit the course with no penalty or stigma. Designing a course that learners will want to finish and that is fit for purpose is the goal, and to achieve this means striking a balance between course length, challenge and content that will keep learners engaged each week, and that provides a tangible sense of achievement and progression for the learner. Tone is also important: 'difficult' learning using new vocabulary or complex ideas need to be presented and practised in accessible, and where possible, entertaining ways for a lay audience.

Learning outcomes for the course were established at the start of the curriculum planning process. These learning outcomes were then iteratively developed during the course development process, with some being dropped for practical or time reasons and others being added as the design of the course became increasingly collaborative. The learning outcomes were focussed on being prepared for general interview questions at a university dental course interview. This was defined as being only the 'dental' topics (omitting interview preparation and skills) and for reasons of internationalisation the learning was not specific to the host country (UK) and the National Health Service system. Removing overt references to applying for dental courses and the UK's specific healthcare system was intended to make the course accessible to anyone, regardless of where they are accessing the course from, and for personal learning, career enhancement or preparing for study. In order to ensure that the course would be accessible to learners new to dentistry, the curriculum design was continually checked by a 'reality checker' - a lay person to dentistry (but not course design) who was able to question each concept or jargon introduced and have the authority to question the course design if they thought it was too great a challenge to the learner.

The guiding principles for the Discover Dentistry course were:

- Make it suitable for a broad audience
- Make it fun, and full of interesting facts that people will want to share
- Not to show how to 'do' dentistry
- Not to show anything that may be upsetting to younger learners (the age limit for FutureLearn enrolment is 13)
- Should be mostly self-contained (i.e. within FutureLearn)
- To have a linear narrative as much as possible, to avoid many references to 'later in the course', or to state 'don't worry about this'
- Should be presented in such a way that skills and knowledge learnt could be used later in the course (this could be knowledge directly related to the course, but also skills such as information literacy).

To deliver a course adhering to these principles, the course: focussed on the basic principles of dentistry (including the mouth and teeth), introduced the dental team and dental specialities, explored the wider cultural and historical significance of dentistry, gave the basic concepts of dental materials and technology, introduced oral pathology and dental public health, and taught about current research into dentistry that may one-day have an impact on the learners.

Course development refined the topics into a narrative that allowed for a building of skills and knowledge; for example teaching the basic structure of teeth before meeting the dental specialties (where this knowledge is a given), and starting online conversation early in the course with a 'fun' task, and building on this throughout until finally tackling controversial topics that would require more informed and sustained debate, such as water fluoridation. At the conclusion of most weeks was a short multiple choice question assessment, with a longer 'final assessment' in Week 6 covering content from throughout the course. Table 1 shows how this curriculum was fitted into the 6 week course structure.

The curriculum design was approved in October 2013 by a project steering group comprising of senior dental professionals and related experts covering expertise in information literacy, social media, information technology and distance learning. This group would be involved again later in the project for the quality assurance of the completed MOOC course prior to launch.

Course evaluation

The FutureLearn system provides a summary of learner analytics, such as enrolment numbers, active learners and the number of comments made on each learning 'step' throughout the period the course is live. Further information on the performance of questions in the assessments and the progression of learners through the course were made available to the course team by FutureLearn at the conclusion of the course run.

To capture demographic data about the learners enrolling onto the course, a pre and post-course online survey was used. Both surveys were presented as a learning 'step' in week 1 and 6 respectively of the course, with a reminder sent out to learners via course notices. The survey categories included learner location, age, interests and highest education level, and were standardised across the FutureLearn platform to allow for easy course to course comparisons.

In order to assess the impact of the course from the learner perspective, ethical approval was obtained to identify if learners were using Discover Dentistry to prepare for an application to a dentistry course. Predefined keywords ("discover dentistry", "online course", "futurelearn", "future learn", "mooc") were used to identify possible mentions of the course in anonymised personal statement texts from UCAS applications to the BDS at Sheffield in 2014. Where these words were found, the context of the match was then determined manually to confirm if it related to Discover Dentistry.

Results

The course was open for enrolment in September 2013, and ran from March 3rd to April 13th (6 weeks). Prior to the course starting, its novel approach gained it national and local press coverage, increasing enrolments up to 4,224 learners. Of these, 1,961 joined the course and 1,638 actively participated. Over 66,200 'steps' were completed with nearly 5,000 text comments made by learners (an average of 5 per learner). 496 learners (25.3% of those that started) completed the course and were eligible for a Statement of Participation.

The following course demographics were obtained pre-course (n=1228), and so are representative of engaged learners:

The learners:

- Were from all continents and 79 countries, but were mostly from the UK (77%)
- 29% were under 18, 17.5% were 18-25 (46% <age of 25)
- 70% female, 30% male
- 38% were in full time education, 30% worked full time, 5% unemployed, 8.5% retired
- 28% of learners in the exit survey stated they were using the course to prepare for HE study

Analysis of the data shows that Discover Dentistry recruited a substantially younger cohort of learners than the platform average, with 46% being <25 compared to the 16% for this category on the FutureLearn platform. (8)

An analysis of the UCAS statements for the BDS programme at the University of Sheffield (n=839) showed that just under 10% of the applications explicitly mentioned Discover Dentistry in their UCAS statement as evidence of exploring their intended career choice.

Discussion

Compared to other MOOCs, the 25.3% completion figure is high, with most MOOCs have completion rates of less than 13% (9) although what defines 'completion' varies between MOOC platforms and means these figures are only broadly comparable. Due to the open nature of the course, and that there is no credit for completion (and no penalty for not), completion statistics cannot be a sole indicator of the successfulness of a course. For Discover Dentistry it would be better judged in the short-term on the demographics of the learners it enrolled, who completed the course, and in measurable impact related to its aim of widening participation. Gathering and analysing information regarding the MOOC learners' widening participation grouping would be a beneficial avenue of further study, this information may be gleaned through future runs of the course or through further analysis of the UCAS data.

The course's penetration into intended demographic groups implies that the recruitment process (advertising, the teaser trailer, press coverage) worked to support the project's aims and identified the target group. The numbers enrolling were also appropriate - and would represent a large proportion of the number of students applying for BDS in the UK annually. [9]

The cohort was split quite evenly between potential students (the <25 years old group), older learners (i.e. those taking the course to learn about the subject), and dental professionals who were taking part to either engaging with the public on their subject (evidenced by 1st week comments), completing the course to recommend it knowledgeably to others (e.g. dental work experience students), or learning more about *clinical* dentistry (being a dental technician, practice manager, nurse etc). This balance meant that many questions presented in the discussions were answered by other learners with that expertise, especially in weeks 2 and 4 where clinical dentistry and dental technology respectively were at the fore. Some of the international learners made it clear within the course that they were completing it to improve their English skills specifically related to dentistry, seeking to learn terminology. This level of communication between potential dental students and dental professionals is very rare, and a strength of the MOOC format.

A cohort divided broadly into 3 groups (students, dental professionals, engaged public) meant that the course provided a unique experience for a student considering a career in dentistry. A broad analysis of the discussion throughout the course showed that the learners were able to learn from the dental professionals, who enriched the

learning materials within the MOOC with their own experiences and provided more detail where required. The learners were also able to call upon the increased dental 'experience' of the engaged public who had experiences of their own dental care they were willing to share. This combined to make an extremely rich learning experience for a student wishing to explore their intended career, which was further enhanced by the international nature of the learners. While the cohort was predominantly UK-based (77%), there was sufficient international participation that learners were able to learn about the experience and provision of dentistry in other countries. This was mostly apparent in the questions about why learners were doing the course (learner discussion in week 1), and later when they were asked to recount a memorable dental experience (learner discussion in week 3).

An unexpected group discovered on the course were patients anxious about dental treatment, using the experience to increase their understanding of dentistry in a friendly and safe environment. Anecdotal evidence seen in the closing steps of the course did seem to indicate that some learners in this group had found benefit in completing the course. This use for the course requires further exploration, however, to understand how effective it was in helping anxious patients, as it was not designed or perceived as a cognitive behaviour therapy tool, but was being voluntarily accessed for these purposes.

The initial aims of the course in retrospect appear to have been quite narrow: to provide an online alternative to an existing widening participation programme. Following the completion of the first run of the course, a number of unanticipated benefits of the course and the MOOC format mean that Discover Dentistry stands in its own right as a unique experience for potential dental students and for engaging with dental patients.

Conclusion

A massive open online course (MOOC) was designed and run with the aim of engaging prospective students of dental professionals in learning and discussion. Over 450 learners completed this first run of the course, with over 4,200 signing up. The course attracted a significantly younger demographic than is typical for this type of course, and nearly a third reported they were doing the course specifically as preparation for a dental degree, with evidence of it being used in supporting their applications to university. Over 25% of learners who started the course completed it to a standard that made them eligible for a Statement of Participation. Is difficult to assess the immediate impact of the course in the short term, but further work will investigate if and how it is preparing students for application to dental courses in higher education.

We feel that there is genuine potential here for FutureLearn and MOOCs in general to involve people from disadvantaged backgrounds in higher education by offering free, accessible, enjoyable and engaging educational experiences. The data gives us cautious optimism that these courses can play a significant role within a platform of other WP interventions. Consideration should be given to how MOOCs can be integrated within the WP area to create a bridge between HE and people to whom university remains another world.

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Table 1: Outline structure of the curriculum of Discover Dentistry

WEEK 1 'Discover Dentistry'	**WEEK 2** 'Teeth and their care'	**WEEK 3** 'Oral disease and trauma'	**WEEK 4** 'Restoring and replacing teeth'	**WEEK 5** 'Caring for a population's teeth'	**WEEK 6** 'The future of teeth'
Welcome Perception of dentistry Dental history Dental team	Tooth shape and function Saliva Dental checkup Tooth brushing	Dental specialties Soft tissues Dental pathology Mouth stories	Dentures Crowns/Bridges Dental Materials Kitchen science	Dental public health Fluoride debate Diet Ethics and law	Research case studies x3 Review of the course
ASSESSMENT	**ASSESSMENT**	**ASSESSMENT**	**ASSESSMENT**		**FINAL ASSESSMENT**

Figure 1: The course landing page, showing the weekly structure (numbers across the top) and 'steps' for learning activities vertically.

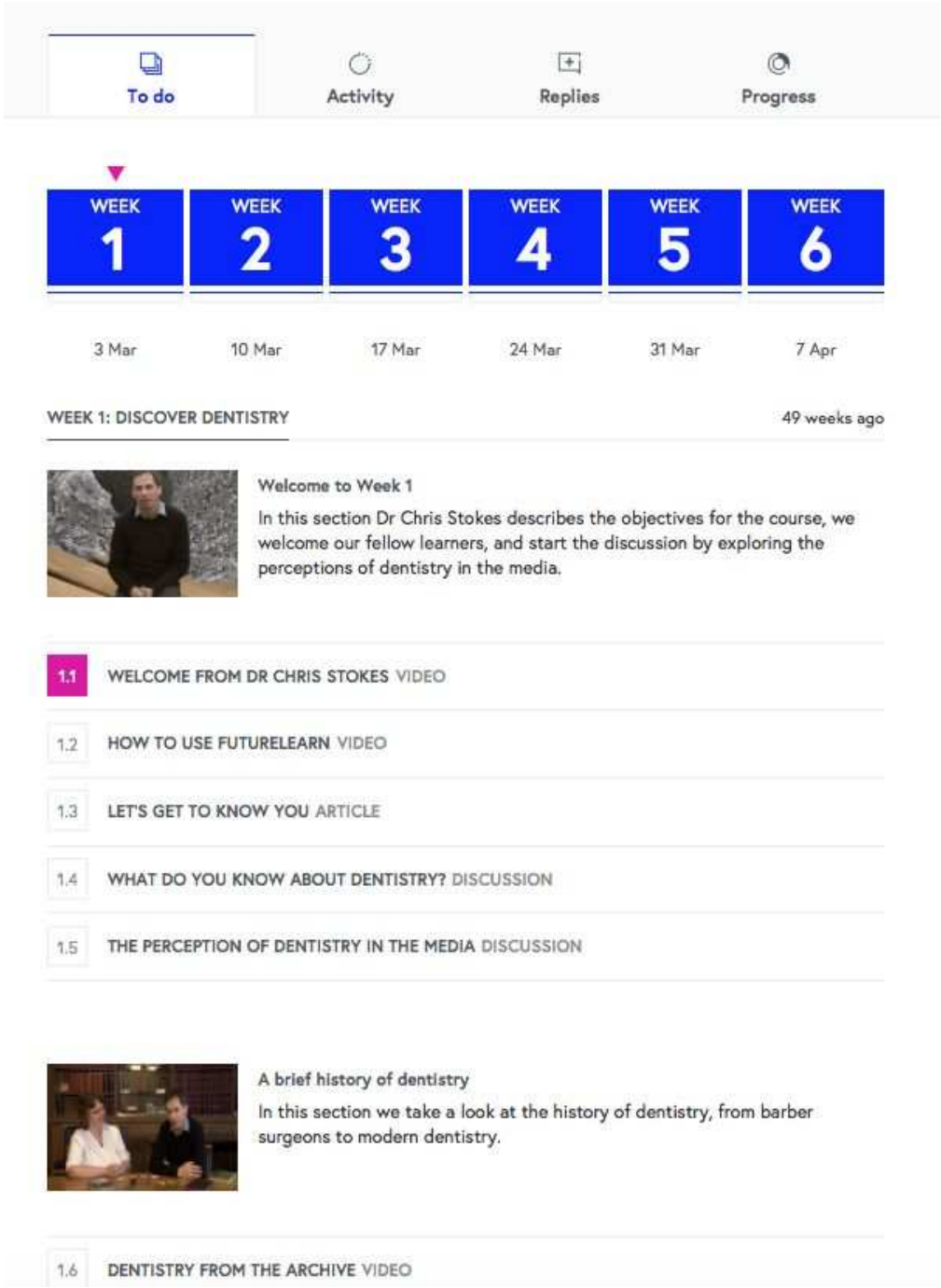

Figure 2: A sample course page, in this case containing a video, supporting text and a transcript. All steps such as this have the capability to accept learners' comments, so discussion happens throughout the course.