



Department
for Education

MOOCs: Opportunities for their use in compulsory-age education

Research report

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Cairneagle Associates

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Executive summary

Despite the level of excitement in the higher education sector, and speculation that they form the “future of education”, there has been very little research on Massive Open Online Courses (MOOCs) at the secondary or K-12 level. Debate has been polarised – some very excited and positive, others dismissive or hostile.

This report describes the findings of an eight week study into the opportunities from MOOCs for UK secondary-age learners (11-19 years old), drawing on three resources – a literature review, c.50 primary interviews, and a survey of teachers.

Various uses of the term “MOOC” cover a wide range of learning technologies, and we have taken an inclusive view of different approaches. In fact the practical gaps between MOOCs and Open Educational Resources (OERs), practice aids, supported e-learning (less scalable than MOOCs) and blended learning (mixed online and classroom learning) are shrinking.

We review the structure of MOOCs and the choices (and implications of these choices) inherent in their construction, recognising in particular:

- that the needs of a particular target group will define the approach to every aspect of MOOC design;
- that the technology platform can (and usually will) impose constraints on content, assessment and student support components;
- that content spend (and video content in particular) is by far the largest element of investment in a MOOC;
- that assessment is beginning to mature, and that good automated capabilities are beginning to become available;
- that recognising and rewarding participation (in all ways from informal badges to formal qualifications, and which is often collectively referred to as “credentialisation”) is still in its very early stages;
- that every MOOC needs a commercial model and that there are many alternatives (none of which have yet been proven).

Notwithstanding the high volumes and drop-out rates in MOOCs for lifelong learning, and the greater success of blended programs in higher education, we have seen a number of interesting deployments in the school space (mainly in the US):

- to deliver advanced studies courses, at a level beyond those taken by most students
- to deliver additional courses (that can’t fit into school timetabling), taken by advanced students
- to teach low take-up subjects
- as a supplementary resource or as the content anchor for blended learning
- as foundation courses, to prepare students for higher education

- to teach independent learning skills
- as remedial courses, to give students a chance to catch up
- to broaden exposure / experience (multicultural, interdisciplinary)

There are a handful of school-age MOOCs currently operating in the UK, although mainly these have been funded by the government and social enterprise (OCR's Cambridge Computing GCSE MOOC being a notable exception), and mainly focused on niche key stage 5 objectives.

Combining the views of teachers (both generally and those who have direct personal experience of MOOCs), headteachers and MOOC experts yields surprising enthusiasm for MOOCs in UK school-age learning – and in particular for a model of MOOC that can report participation and progress to a classroom teacher.

We surveyed teacher attitudes to and assessment of particular challenges in the education sector, mapped 14 MOOC or MOOC-like proposals against these, and asked what impact each might have. In particular, there was enthusiasm for:

- supplementary support for gifted & talented students
- exam preparation courses
- teacher CPD
- e-learning courses for subjects with low student take-up

We analysed the different needs of three age groups (11-14, 14-16, 16-19) and measured teacher views on the suitability of MOOCs for each group. Unsurprisingly, there was a strong sense that MOOCs, especially those that rely on self-motivation, are more suitable for older students.

We recommend a number of measures to develop and realise the benefits that might be gained for schools, teachers and learners from MOOCs, in particular:

- including MOOC experience in teacher training and CPD
- directing the next tranche of any funding for MOOC development towards mainstream key stage 3/4 initiatives, to help prove the commercial model (and unlock private sector investment)
- promoting teacher-built MOOCs and mini-MOOCs, through better facilities for sharing video content
- carrying out research in one or more of the specific high-potential areas (as listed above)
- establishing a common framework for participation “badges”.

Introduction and methodology

MOOCs (massive open online courses) are becoming established in higher education as a means of increasing participation, enhancing student learning and improving outcomes on existing courses. There is considerable potential for MOOCs to play an important and valuable role in the education of secondary school and 16-19 students. Yet the market for MOOCs is far from mature and is rapidly developing both in terms of what is on offer (technologies, new models of teaching and learning, for example) and the market (emerging opportunities and new players and services, for example). The Department for Education wished to develop an informed as well as strategic analysis of the issues which can inform future policy-making in this area.

Objective

The objective of the research was to provide the Department with a clear picture of:

- what MOOCs (or similar online courses) relevant to 11-19 year olds are currently available in the UK, or could be developed for the UK market in the next 3 years;
- what schools and colleges that currently use this style of course can demonstrate about the value they add, or where they think they could add most value, to pupil achievement in the 11-14, 14-16 and 16-19 age ranges;
- what the barriers to take-up and completion of these courses are and how these can be overcome;
- how MOOCs here, and in other countries, are funded and how they are included in accountability measures where they are used for students in compulsory or further education.

Author and advisory board

The author, Ian Koxvold, leads the education practice at Cairneagle Associates, a business consultancy which helps its clients with strategy, organisational and performance improvement challenges. He has carried out over 100 projects in the sector for businesses that include educational establishments (schools, school groups, universities, colleges), individual training providers and providers of educational technology, textbooks and a broad range of services.

This report has been strongly supported by an advisory board whose members have helped to define the scope and direction of the research and have provided introductions to leaders in the online learning space as well as carrying out interviews. The members of this board include:

- Hugh Davis is Professor of Learning Technologies at the University of Southampton, where he is also Director of Education, and directs the Centre for

Innovation in Technologies in Education (CITE) and the Professional Development Unit (PDU).

- Gavin Dykes is an independent consultant and advisor on innovation, education and the use of technology for learning. His clients have included the OECD, the World Bank, UNESCO, governments and commercial corporations. Among other roles, he is Programme Director for the Education World Forum.
- Patrick Hayes is Business Development Director at TSL Education, publishers of TES and Times Higher Education and host to the largest network of teachers in the world. He has previously worked as TSL's Information and Research director and Head of Research and Development, having started as a researcher on the TES newsdesk in 2004.
- Dr William Painter created Europe's first online MBA programme in 1999, and has since supported NCC Education, Laureate, Bellevue University and others in establishing and administering leading online education offerings. He now focuses on helping UK and US post-secondary programmes to find opportunities in international markets.
- Ed Tranham is editor and publisher of The Assignment Report, the leading market intelligence report for the UK education industry. Since 1989 he has been actively involved in the setting up and development of a number of publishing and service companies within the sector, including Optimus Education (now part of Electric Word plc) and Cambridge Education Associates (now Cambridge Education).
- Christiaan Walstock is a seasoned investment banker who has been involved in investments in the education sector since 2004. Recently, he was Managing Director of Bahamdan, a family-owned investment group focused on the GCC and Europe, and was an advisor to K12, Inc. He is now a senior advisor at Cairneagle Associates.

Contributors

We are extremely grateful to a number of contributors who shared their time and expertise. The list below includes many of these, although there are others who preferred that we do not identify them.

- Patrick Craven, City & Guilds
- Julia Stiglitz, Coursera
- Professor Anant Agarwal, edX
- Rebecca Petersen, edX
- Eileen Field, Edison Learning
- Patricia Wastiau, European Schoolnet
- Simon Nelson, FutureLearn

- Kathryn Skelton, FutureLearn
- Jay Heap, Georgia Virtual School
- Jim Vanides, Hewlett-Packard
- Nick Breakwell, Hibernia College
- Laura McBain, High Tech High
- Ronda Eshleman, Indiana Online Academy
- Paul Howarth, Infinitas Learning
- Professor Diana Laurillard, The Institute of Education
- Denise Perot, The International Baccalaureate
- Peter Stewart, K12, Inc.
- Bror Saxberg, Kaplan
- Emma Wallace, LearnDirect
- Stuart Bowness, MediaCore
- Jamey Fitzpatrick, Michigan Virtual University
- Richard Moore, Moore Answers
- Gene Eidemann, Mosaica
- Dr Ros Morpeth, The National Extension College
- Steve Kossakoski, New Hampshire Virtual Learning Academy
- Dhruv Patel, Nisai Academy
- Liam Sammon, OCR
- Andrew Law, The Open University
- Kate Worlock, Outsell
- Saad Rivzi, Pearson
- Bryan Polivka, PolivkaVox
- Jim Wynn, Promethean
- Geoff Stead, Qualcomm
- Professor Dan McFarland, Stanford University
- Jason Geall, The Student Room
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- Chris Parr, TSL Education
- Michael Shaw, TSL Education
- Russell Beale, University of Birmingham
- Professor Barbara Kurshan, University of Pennsylvania
- Rebecca LeDocq, University of Wisconsin-LaCrosse
- Bob Gomersall, Virtual College
- Rod Knox, Virtual College

Methodology

The Department for Education asked us to carry out research and develop this report during February and March 2014.

Interviews

We looked to carry out detailed interviews (evenly distributed in the range of 20 minutes to 2 hours in length) with c.50 experts who typically fell into one of the following categories:

- experts in MOOCs
- experts in secondary-level e-learning
- experts in secondary-level school challenges and needs.

Many of these (those who gave permission) we have acknowledged in the list above. We are truly grateful for their generous contribution of time, effort and expertise.

These interviews focused on:

- attitudes to and benefits from MOOCs
- business and operational dynamics of MOOCs
- MOOCs and non-MOOC e-learning in the secondary space
- challenges in schools, and ways in which e-learning can help with these.

Some interviewees contributed operational data on MOOC and e-learning platform costs, volumes and learner performance. We have only used this data in an aggregated form, unless specifically allowed by the contributor.

Desk research

We identified and reviewed many of the more rigorous analyses of MOOCs and e-learning – some of which were introduced to us through the interview programme.

We have in particular looked for:

- data on costs, volumes, growth, learner outcomes
- plans for the development of any particular MOOC
- analysis of school needs; and in particular how schools differ from higher education or lifelong learners in their e-learning needs

Needs identification and mapping out potential supports

From the interviews and desk research, and with the advice of our advisory board, we developed a list of thirteen specific needs within the 11-19 education space – and scoped out MOOC / e-learning solutions that might help with each of these challenges.

Teacher Survey

In order to validate and prioritise these assessed needs, and to test the proposed solutions, we undertook a large-scale teacher survey over the last weeks of the research.

We looked to test:

- appetite for MOOCs in general, including some questions identical to those we asked of experts (to allow us to compare the teacher and expert points of view)
- prioritisation of the list of identified needs / challenges
- assessment of the impact, value add and suitability of the proposed supports.

We used SurveyMonkey as a platform, and with the help of TES Online and TSR to identify and approach teachers, were able to complete 817 survey questionnaires.

The excitement about the opportunity from MOOCs

Much of the hype and hysteria surrounding MOOCs is caused by different perceptions of what MOOCs are and the motivations people have for making them, and different expectations about their impact across a range of learners and learning environments.

MOOCs are held by many to be the vanguard of a revolution in online learning, and this revolution is expected to disrupt current business models for education, or at least for higher education. The causes of this revolution in online learning are:

- that there is a growing need for higher education, particularly in developing countries, that cannot be satisfied fast enough by building more institutions;
- that traditional education is increasingly expensive, particularly if you factor in the cost of living in a university city;
- that there is a demand for greater flexibility in education (any time, any place);
- that there is an increasing demand for on-the-job continuous professional development as employment patterns change.

The origins and development of the MOOC

Distance learning has been developing since the 19th century, since Sir Isaac Pitman's Stenographic Shorthand courses were mailed out in the 1840s and the University of London offered the first distance learning degrees in 1858.

The National Extension College offered distance learning to a generation of returners after the Second World War, and still supports about 20,000 learners a year now – but was largely superseded in the higher education space by the Open University in 1969. The OU invested in modern, high quality material – broadcast by the BBC from 1971 until 2006 – that comprised elements of both lecture and demonstration.

In 2008 George Siemens from Athabasca University and Stephen Downes of the National Research Council led a course called Connectivism and Connective Knowledge ('CCK08') for 25 tuition-paying students from the University of Manitoba and 2,200 non-paying online students. The term MOOC was coined in relation to this by Dave Cormier and Bryan Alexander.

Much of the early work on MOOCs comes from Stanford University, to the point where the university has been described as the MOOC-manufacturing factory. In 2011 Stanford launched three MOOCs on a much larger scale, including the Introduction to Artificial Intelligence ('CS221') course by Sebastian Thrun and Peter Norvig – which saw c.160,000 sign-ups.

In the beginning of 2012, a wave of MOOC businesses launched. The Stanford group yielded Coursera (Professor Daphne Koller and Andrew Ng) and Udacity (Sebastian

Thrun). The MIT open courseware movement launched MITx, which then became edX in partnership with Harvard. Throughout all of this, many mainstream American universities signed up enthusiastically to launch courses on the major platforms. The New York Times branded 2012 as ‘The Year of the MOOC’.

“MOOCs are moving pretty fast. People always ask me what it looks like five years from now. But really, it’s hard to see the next 12 to 18 months out.” Rebecca Petersen, Director of Research and Educational Initiatives, edX¹

2013 was a tougher year for the new sector. Several providers published data showcasing high drop-out rates, the unsuitability of MOOCs for “challenging” students, the risks of cheating, and continued difficulties in making the commercial model work. Sebastian Thrun notoriously pivoted Udacity towards the corporate training sector towards the end of 2013 after disappointing results from the highly publicised partnership with San Jose State University. There are many who agree with him that vocational learning is the easiest nut for MOOCs to crack.

George Siemens, the American education thought leader and champion of connectivism, labelled 2013 as “The Year of the Anti-MOOC”² in parody of the level of criticism.

MOOC supporters, and there are still many, point out that this is a normal part of the technology adoption cycle; as Gartner describes it: “the trough of disillusionment”³. In fact, the second wave of adoption is usually far more productive, as the technology matures and catches up to efforts to rush it out.

“We can see all the services in education moving online, across the board. It’s not just MOOCs; that’s just one aspect of the trend which will result, like mechanisation in manufacturing, in fewer suppliers serving more customers. This is happening more slowly than in manufacturing – there are powerful vested interests holding back the rate of change.” Bob Gomersall, Chairman, Virtual College

Where MOOCs deliver the greatest benefits

There are, broadly, three ways in which MOOCs can deliver large benefits.

Firstly, there is the concept that you can get more for less – that with the right alignment of assets to needs you can achieve a better learning result than could be achieved in

¹ As reported at <http://www.redefinedonline.org/2013/12/high-school-students-try-out-moocs/>

² <http://www.elearnspace.org/blog/2013/07/08/neoliberalism-and-moocs-amplifying-nonsense/>

³ <http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp>

physical lectures, at a low price – at least for a small segment of learners, probably for a large segment, and possibly under some circumstances for everyone.

Secondly, there is the idea that the flexibility made possible through self-paced learning can help people to make time for learning (with the caveat that making time to sign up to a course clearly does not always equate to actually having time to attend it).

Thirdly, there is the power of ‘democratisation of content’ (sometimes the democratisation of knowledge). There is the acknowledgement across academia that education, and especially higher education, has been for the privileged and that we must also serve the rest. When a young learner in an African village can access a Harvard course, and when he or she might be offered a scholarship for further study as a result, the world will be a far fairer place.

Each of the three areas has seen some success.

Major misconceptions about MOOCs

Our research calls returned again and again to four major themes where the gap between expectations and the rate of progress was becoming particularly acute.

That “vanilla” video and text MOOCs can be used to teach anything

Most MOOC courses are unadventurous in respect of content. They blend some set text with a video of the teacher speaking – sometimes in a lecture theatre, sometimes directly to camera. Occasionally the teacher will do things on camera: move around, play with some physical objects to illustrate an example or even write on a board of some sort.

There are stringent limits to the level of engagement and the intensity of learning that can be attained from passive methods like this.

“It’s incredibly important to use software tools to enable students to develop problem-solving skills, to get them trying things out, manipulating, doing things themselves. To do this in online learning demands very well designed interactive content and activities.” Professor Diana Laurillard, The Institute of Education

There are examples of supporting material that is experiential / experimental – which learners can use to “learn through doing”, even online. We look at some examples of this content later, but the key issue is that it is expensive to build good content.

“To teach effectively you have to plan learning objective by learning objective, and understand the appropriate learning modalities (which resonate with particular learning activities) and resource needs (which drive the possible delivery and assessment models). Some things can easily be done online, some are difficult, and some should not be done so. On the plus side, this is not the sort of work that

needs to be done again and again – this is a hard piece of analysis which is needed once per curriculum.” Jim Wynn, Chief Education Advisor, Promethean World plc

That MOOCs suit everyone (or even most people)

MOOCs are not a panacea for all educational ills. In particular, the early successes have been overwhelmingly concentrated on professional, educated, intellectually curious people in the 25-50-year-old age bracket. There have been many attempts to provide e-learning to students for whom study is challenging. K12, Inc. invested heavily in this area and although they did well in the context of previously underachieving learners it was always a struggle; Udacity implied that learner quality was a problem in its large (and ultimately unsuccessful) partnership with San Jose State University.

There are many trade-offs in optimising a course for different needs, and most authorities (even in Stanford, where arguably they have more experience than anywhere else) acknowledge that there is not yet the body of knowledge to do this really well.

If we look at whether MOOCs can suit schoolchildren or not, there are two major issues to consider. Firstly there is a question of whether younger learners can self-learn – for a variety of reasons including scaffolding, self-motivation, calibration. Secondly, the consequences of failure are much higher when teaching a young person literacy or numeracy – and a 90% drop-out rate will always be unacceptable.

There may be opportunities in areas such as MOOCs for niche subjects, MOOCs for particular segments of learners, MOOCs as supplementary supports, or MOOCs closely linked to other forms of student support – and we explore these in much greater depth later. At present, most authorities do not consider an unsupported, standalone MOOC fit to comprise the main learning resource for secondary school students.

“Can all high school kids learn through a MOOC? I don’t think so, more like a small minority of the more motivated students. Most will need a lot of scaffolding, personal attention and encouragement from a teacher, and a face-to-face discussion environment.” Professor Barbara Kurshan

K12, Inc. have incredible experience in running blended schools (a mix of online and face-to-face classes), and one of their executives’ rule of thumb was that 20% of students will learn no matter what (and might well be suitable for MOOCs), that about 60% will need some help and will manage in a blended or mixed online/offline environment, and that the remaining 20% will struggle and need a lot of targeted support.

That MOOCs are entirely new

Many in the e-learning and distance learning communities express frustration with the hyperbole surrounding MOOCs. “This isn’t new”, they claim. “We’ve been doing the same things for years / decades, and we’ve learned a lot about where these techniques work and don’t work”. After all, William Rainey Harper claimed that “the day is coming when the work done [via distance learning] will be greater in amount than that done in the class-rooms of our colleges” in 1885⁴.

The differences that we see MOOCs bringing are threefold. Firstly, they have attracted substantial investment, both from venture capitalists and social foundations. Secondly, they have taken advantage of technology to reduce the operating cost to the point where the incremental cost per student can be vanishingly small. Thirdly, they have cracked the student acquisition model, building volume through PR and viral referral.

That MOOCs are free of cost

Although “purist” MOOCs are designed to be scalable and free at the point of use, they do cost something. One of the major uncertainties is what the business model is going to look like.

Every element has at least a fixed cost, and sometimes a variable one. The platform has a cost (not just the development but also the configuration for each MOOC); the content acquisition has a cost (even when existing content is used it needs to be collated / curated). Assessment and student support can be delegated to peer learners, in which case it is they who pay the non-monetary cost.

So somebody is paying for each MOOC – if not the students, then somebody else.

“You’ve got to ask yourself what the eventual model is. I think it’s been really important for me to run MOOCs, and it was a good thing to do – but I can’t keep doing this forever, there isn’t the financial support for it.” Professor Dan McFarland, Stanford University

⁴ <https://teachingcommons.stanford.edu/teaching-talk/case-close-learning>

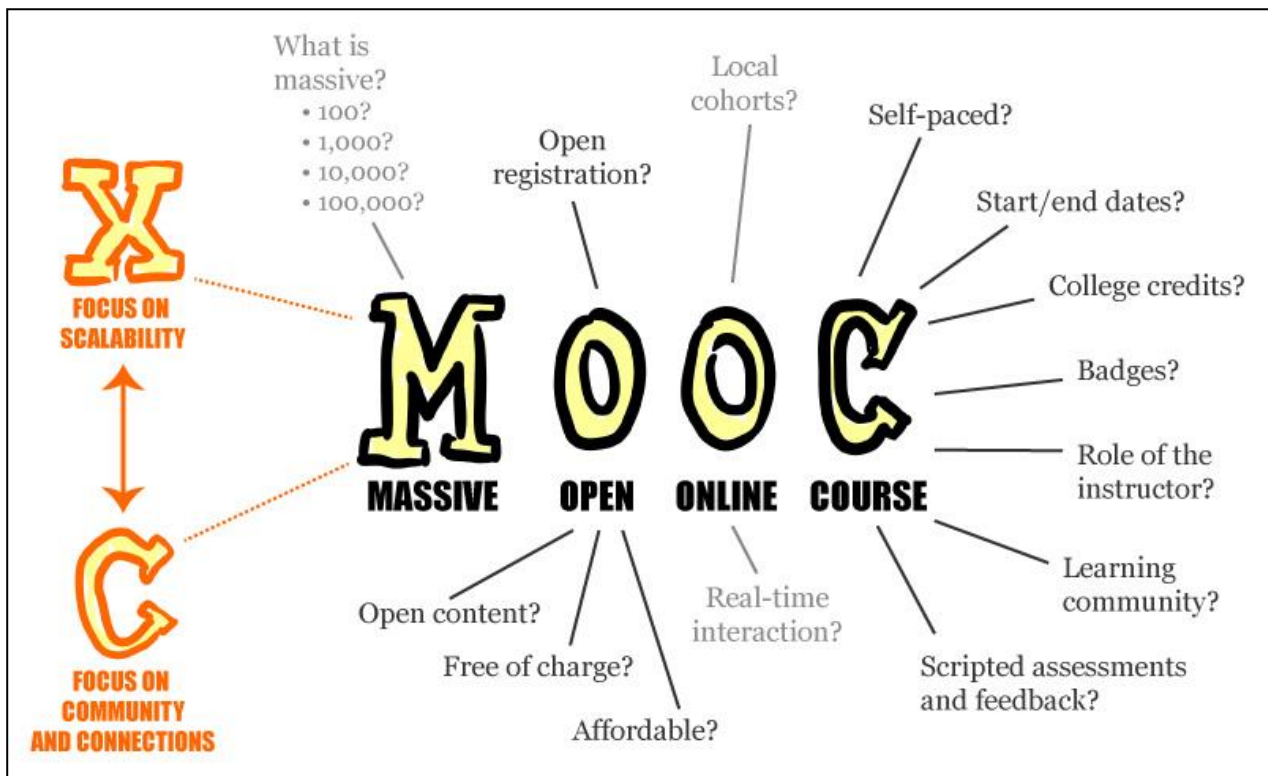
The landscape, terminology, and make-up of MOOCs

There are various approaches to classifying MOOCs. We consider three.

- Firstly, what is it trying to achieve and how is it trying to achieve it?
- Secondly, what are the assets and capabilities required?
- Thirdly, what is the commercial model (costs, benefits)?

What is a MOOC?

Figure 1: Elements of MOOC fragmentation



Source: Matthew Plourde (licensed CC-BY-ND)

Matthew Plourde's diagram (originally published with the subtitle "Every Letter is Negotiable") illustrates some of the issues around the definition of a MOOC. The most common definition is:

- Massive – at least with the potential to be very large, i.e. very low variable cost. This tends to preclude any non-automated / crowdsourced student support or assessment
- Open – generally free of charge and open to all
- Online – 100% internet, no blended
- Course – this is harder to pin down, but generally this implies at least the organisation of content into a defined course of study (as distinct from a collection of Open Educational Resources), and many consider that a cohort/synchronous approach is also implied (i.e. a course that runs between certain dates, with a

certain rate of implied progression, and a fixed group of learners who progress together

There isn't a single model for MOOCs, and there isn't even convergence towards a core set of models – rather the MOOC universe is fragmenting. New models, and associated acronyms, include:

- xMOOCs – structured courses
- cMOOCs – connectivist courses; interaction is more important than content
- pMOOCs⁵ – project-based MOOCs,
- iMOOCs⁶ – focused on driving innovation
- BOOCs⁷ (big online open course) – smaller than massive, to facilitate group-work
- SPOCs⁸ (small private online courses) – even smaller, less open, generally for existing students
- SMOCs⁹ (synchronous massive online course) – lectures broadcast at fixed time, charged
- DOCCs¹⁰ (distributed open collaborative courses) – a cMOOC+, less anchored to content
- VOOCs – vocational MOOCs
- Flex-MOOCs¹¹ – courses that are more customisable to the learner's preference

In addition, there are a number of adjacencies to the various MOOC models, and the gaps between are shrinking and blurring.

- Open Educational Resources (OERs) are collections of similar free educational material (often including videos and assessments); increasingly these are being thematically organised. The key difference in comparison to MOOCs is that they typically lack the technology platform to drive sequential delivery and to track student progress.
- Online practice resources comprise strong formative assessment with remedial content. The Khan Academy is the best known of these, linking basic learning content (short videos) with a dashboard that shows either the learner or a teacher (where relevant) progress and areas of strength and weakness. Typically these resources differ from MOOCs in that they do not involve cohorts progressing together through a defined course.

⁵ <http://www.olds.ac.uk/blog/pmoocpedagogicalpattern>

⁶ http://imooc.uab.pt/model_en

⁷ <http://newsinfo.iu.edu/news/page/normal/24014.html>

⁸ http://en.wikipedia.org/wiki/Small_private_online_course

⁹ <http://www.utexas.edu/news/2013/08/26/university-offers-first-ever-synchronous-massive-online-course/>

¹⁰ <http://www.insidehighered.com/news/2013/08/19/feminist-professors-create-alternative-moocs>

¹¹ <http://coil.psu.edu/blog/2013/07/12/flex-moocs/>

- Supported e-learning includes student support, usually from a teacher who is monitoring and managing the course.
- Blended learning provision involves a mixture of online and physically collocated (face-to-face) teaching. In fact, a multi-site blended learning course looks very like a MOOC in that it is a course, includes content, generally involves group-work, and the student support is provided by the face-to-face teacher i.e. is separate from the core resource.

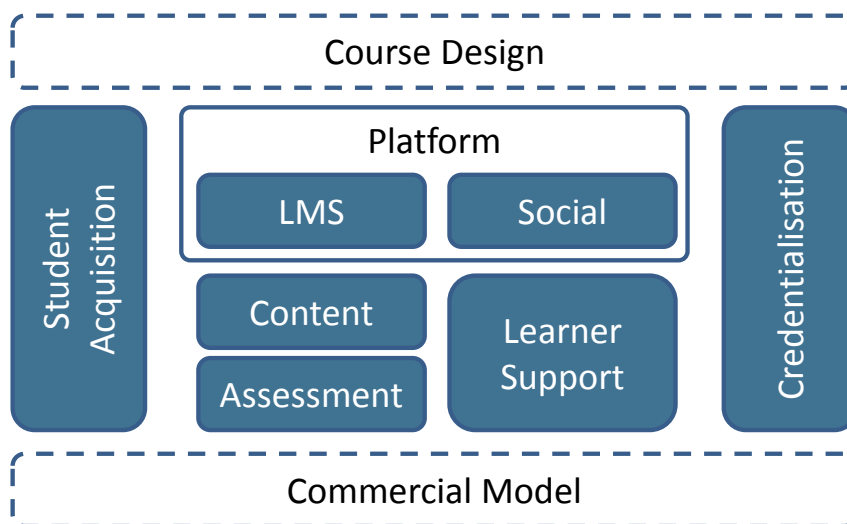
For the purposes of the scope of this research, we have taken an inclusive view of the MOOC constellation; there is enough uncertainty over business models and applicability that we see no advantage, and plenty of risk, in ruling out options.

In particular, we have not excluded models that have variable cost – we consider it possible (and likely) that some solutions will require student support in order to answer the needs of the 11-19 educational segment.

What is in a MOOC, and how it works

When we look at a business, we try to distil the key assets and capabilities that define operational performance, and in the e-learning space we look at nine things, as illustrated below.

Figure 2: Components of MOOCs and other e-learning provisions



We treat Course Design and the Commercial Model differently from the other aspects of a MOOC; these comprise the major model decisions that drive the need for the other seven components.

Some problems only need to be solved once. Others are specific to a particular course type, others are specific to circumstance.

Course Design

What is any particular MOOC course trying to achieve? There will always be some learning, but is that learning focused on knowledge acquisition, skill development, problem-solving experience, group engagement? And, perhaps most importantly, for whom is the learning intended? An approach that suits a lifelong “hobby” learner will probably not meet the needs of a university undergraduate, much less a secondary school pupil.

We think of this in two respects. Firstly, what decisions are being made about the course (both explicitly and implicitly)? Secondly, are these decisions aligned both mutually and with the resources available to the course?

One set of key decisions relate to the definition of the course (“what it is”):

- target learner audience

- what the course structure will align to (a curriculum, a qualification, a specific set of skills / outcome)
- length of course
- level of course
- whether there will be defined start and end dates, and the pace of the course
- mix of content and interaction required.

Another set relates to the approach of the course (“how it does it”):

- how the course will attract the target audience
- where the content will come from
- whether there will be assessment included in the course, and how
- how students will be engaged / supported
- what will come from the course, in terms of “credentialising” students (recognising and rewarding participation).

“There’s an idea that kids always need synchronous courses to be engaged – this is completely flying against the cultural norms of this generation, where resources are self-paced, on-demand.” Mike Feerick, CEO, ALISON

It is vital for a good course to ensure that the model embraced is aligned with both the needs of the learners and the available assets; this is a matter of capable execution. Course design is a difficult task, and it requires a competent designer with experience in online learning. Although these skills are becoming more common, at present there are few designers with experience of more than a narrow segment of course structures.

“One thing that is clear is that online teaching is different from face-to-face teaching. You need different skills, and a great classroom teacher will not necessarily make a great online course designer or facilitator. There are more and more courses aiming to help add those skills for traditional teachers, mostly online.” Professor Barbara Kurshan, Head of Academic Innovation at the University of Pennsylvania.

Depending on a number of factors, course development costs between £15k to £100k for a “normal” 6-8 week, 20-30 hour MOOC. This cost is administered by the course designer, and some of it is incurred by him or her. The largest component of the cost of building a course is content creation or acquisition, about which more later.

Student Acquisition

For most services delivered over the internet, customer acquisition is a substantial and often the single largest cost, usually variable (through some sort of pay-per-click model). Not so for MOOCs. Provision of a service that is free at the point of use doesn’t fit well with paid student acquisition.

Most MOOCs have relied on a mixture of public relations / viral buzz and an existing 'captive' audience. In the main, the PR impetus has been created by the MOOC platform (e.g. Coursera, Futurelearn) while captive audience has been provided by the course provider and partners (e.g. OCR, Cambridge University Press and Raspberry Pi in the case of the Cambridge GCSE Computing MOOC).

We split viral student acquisition into two forms – one “direct” model reflects learners recommending their specific course to others, while the other “indirect” approach represents the recommendation of the concept or overall platform. Often the direct recommendation will fail because a course with defined start- and end-points has completed, and may not be re-run (at least for some time).

“Increasingly teachers are now promoting [the course] to their students and we are seeing a shift in enrolment numbers from teachers to students. It’s very important for many teachers that they see the course themselves, and get comfortable with how it can fit alongside in-school teaching, as we see this as both a MOOR (Massive Open Online Resource) for teachers and a MOOC for independent students.” Liam Sammon, Director of Commercial & Education Services, OCR

Technology Platform

The technology platform is the enabler for other key assets and capabilities. A weak learning management system (LMS; that part of the platform that serves content and manages the learner’s progression through the course) imposes limits on what types of content can be used, the sophistication of paths through that content (and therefore also limits on the extent of personalisation), and the user-friendliness of the core learner interface.

“My lab at Tribal Innovation had a lot of success with adaptive platforms in the mid-2000s – but it was always focussed on very specific subject areas (Adult Numeracy, Literacy). We couldn’t find an intuitive enough algorithm for subject-independent scaffolding, and adaption that would work for unrelated subjects too.” Geoff Stead, Qualcomm

The social platform is critical to learner engagement, and a weak social platform limits the interactive activities that can be carried out – in terms of peer review / grading, group activities and problem-solving, and collaborative learning (especially in terms of helping learners to take forward a discussion in conclusive steps rather than just state their opinions and react to others’). Without the social platform, there is little point in having the course online – it may as well be on a DVD.

Nobody has really found a great solution for the social platform yet; the existing options are just not ready for the new, still-emerging memes in social learning.

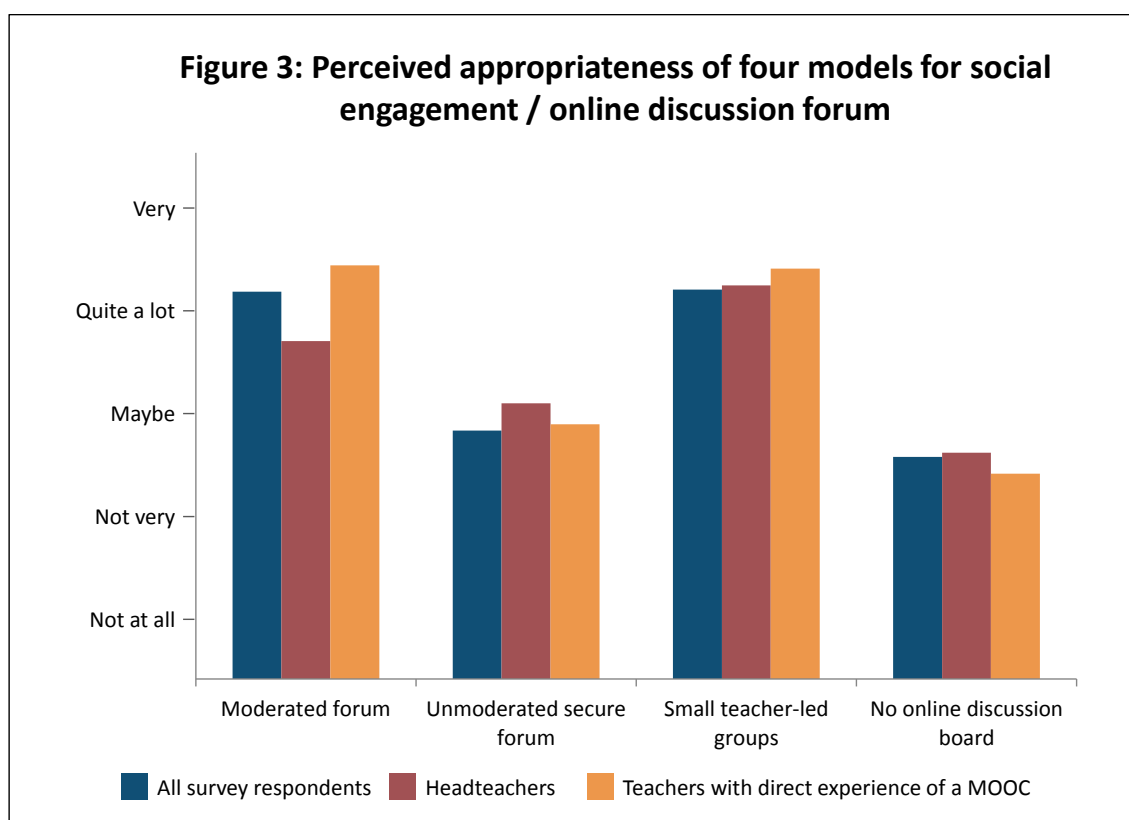
“Real advancement of understanding comes from embedded learning – when the student is fully engaged with the issue. This can’t just come from video broadcasts

alone; it comes from deeper interaction – with either play-based activities, or other learners. As students discuss what they are learning they challenge and build their comprehension.” Jason Geall, Chief Executive Officer, The Student Room Group

There is a somewhat open question as to what sort of social engagement is appropriate for younger learners. We have heard concerns over conversation security – particularly in respect of under-16s, in respect of keeping young learners safe both from outsiders and from each other. Facebook requires a minimum age of 13 to set up a profile, although struggles to police this age limit.

“There are lots of questions about the social interaction platform for a MOOC, especially for younger learners and in respect of concerns about safeguarding. We certainly don’t have all the answers yet and we’re still working on a solution for our full launch in September; but we’re increasingly confident that we will be able to provide a forum solution that allows peer-to-peer learning.” Liam Sammon, Director of Commercial & Education Services, OCR

The Student Room (the UK’s leading student community with 2.3m registered members) is used to addressing this issue – c.25% of their members aged 14-16, and about 4% are under 13 years old. They have about 100 moderators, who are a mixture of volunteer and full-time staff.



Source: Cairneagle teacher survey

We included a question in our teacher survey on this; proposing four options –

- a moderated forum – which incurs costs that can be significant, and which can stifle discussion / debate if there is lag in the moderation.
- an unmoderated but secure forum, where only validated students can sign up using a code issued to their teacher (similar to Edmodo's model)
- a small group tool, where teachers can set up their own mini-forums (similar to a Facebook page for a course)
- no online discussion board – i.e. carry out discussion in class.

The results of this are shown in Figure 3 above, and it is clear that it was recognised, especially by teachers who have personal experience of a MOOC, that the online discussion board is important for student engagement. Preference was focused on a moderated forum and on teacher-led groups (particularly popular with headteachers).

So how should a MOOC select a technology platform – what are some of the issues?

1. Age and technological capability

Firstly, there is an issue around underlying technological capability. The development of MOOCs and learning from them has been very rapid – and some of the old e-learning platforms (c.5 years old) are looking very dated. They were built before anyone really understood what tools were going to work, and they were built quickly. “Some of these are now embedded in high schools”, says one prominent education technologist, “and can't run the right functionality and content to deliver good outcomes.” They drive students to disengagement because they are boring and hard to use; most of them treat content in a very flat, very linear way – similar to reading a book – despite the accepted understanding that one approach does not fit all.

Technology is still developing. One of the expert interviewees talked about a new platform called declara.com; still being tested and not yet ready for roll-out, but it has a lot of potential. “It's come through the social engagement and analytical door”, said the interviewee, “not the pedagogical development route. It's completely optimised for measurement of interaction, and can track engagement and reactions to content”.

2. Simplicity of operation

There are hundreds of virtual classroom and LMS platforms available¹², and some of the most capable are the hardest to use. Coursera's platform has a reputation for being simple (and well-supported); the focus on rapidly growing the partner list

¹² See www.trimeritus.com for an excellent comprehensive list; and <http://www.trimeritus.com/lowcostLMS> for a list of free and lower cost LMS platforms

has led to a design choices that lay out a standard approach to grading, peer review etc. Set against that, edX has a reputation for more flexibility, and Google Course-Builder, being open source, is even more customisable (but at a cost – one course we know of spent c.£30-40k configuring the platform).

“We selected the Telefonica platform in part because it was stable but flexible – it could be customised according to our needs. Many of the other options either didn’t yet exist (effectively providers were offering to build us a platform that they did not yet have) or were more rigid. We are still very pleased with the choice”. Patricia Wastiau, Principal Adviser for Research and Studies, European Schoolnet

3. Scale of deployment

Given that there are hundreds of platforms available, why choose a big one? For two reasons:

- firstly, it is more likely to survive, be supported, and attract ongoing development. Dozens of these platforms stop support or even cease operations each year; generally smaller ones. This is obviously highly disruptive to any courses or content that sits on the platform; and
- secondly, there are real advantages in teacher familiarity with a platform, and in their ability to collaborate within one.

“Now we are seeing approaches from national ministries of education, looking to adopt the ALISON platform on a whole-country basis. There are clearly economies of scale – not just in deployment, but in teachers building a shared understanding of how to use a network, and being able to work together effectively.” Mike Feerick, CEO, ALISON

Content Development / Acquisition

Content development and acquisition is the largest “per course” expense, and there are many options for a MOOC in respect of the quantity, quality and mix of content in which they invest.

“Publishers think of content as being linear or hard-wired, and that doesn’t work without major teacher support. What we need is enough content to personalise the learning experience, and a recommendations engine to match the right content to student needs.” Mickey Revenaugh, Co-Founder, Pearson Connections Education

We have carried out detailed interviews with, or analysis of the accounts of, approximately 20 MOOC providers. Of course the cost of MOOC content depends most of all on the intended duration of the course. After this, our observation is that the factor with the greatest impact on the course is the experience of the content producer – it seems reasonable to use a rule of thumb that the cost of production falls by

approximately three times as the content developer moves from being a beginner to having some expertise.

For core video content, it is common to see costs for “produced” video starting at £1,000 to £2,000 per minute (including the time of the presenter and ‘crew’, the equipment and editing) when the creators lack experience. Similarly, it is common to see this falling to £250-750 per minute with practice and some investment.

“For content production we’ve been able to drive the cost down and the quality up. Our main advantage has been using our relationships to identify high quality teachers to get involved. They have been a real asset and have given far more than expected, and being a free resource they are more willing to engage for the betterment of their subject. Our growing skills and confidence in MOOC production and some minimal capital investment in a new studio have also helped us achieve this higher quality to cost ratio.” Liam Sammon, Director of Commercial & Education Services, OCR

Of course simple video footage can be produced much more cheaply by one person with a webcam; the lower limit to this is entirely driven by the desire of the creator to allocate his or her own time as cost.

Although production competence is an important factor in this cost erosion, another factor is the growing appreciation that high production values are not necessarily required – and that simple videos are often good enough.

Lecture capture technology can reduce the cost of content production, especially if the MOOC is based on an existing course. There may be a trade-off in quality (several MOOC creators report that the most significant driver of content cost is the number of re-shoots, especially with teachers that are not used to performing for camera).

“Production of video content is harder than people realise – and if academics are doing it themselves it will never look that great. I’m not a newsreader; although I believe in the content of my material and in its value, my delivery is not polished.”
Professor Dan McFarland, Stanford University

The best use of lecture capture software is to combine the video of the teacher with footage of the screen, board, or experiment being worked on. This requires less editing (the learner can effectively “self-edit” by allocating their own attention), and relies less on performance.

What is running on the board, or screen? More content; sometimes just written notes from the lecturer, but often higher value, higher impact material. Animation can be used alongside video or interspersed with it, and can be a powerful support to making content engaging (which, especially for younger learners, requires more than text and talking heads).

We looked at functional skills e-learning (arguably the hardest group of young learners to engage) last year and found that even at scale, with experienced producers, it costs c.£1,000-2,000 to create a 5 minute clip which blends some video with explanatory animation.

Beyond animation there are activities, often game-based ones, that let learners “play with” the concepts that they are studying.

“High-quality baseline curriculum content is becoming easier to source – there is a good base layer of high-value digital textbook material. We now spend more development resources on what goes on top of it, on material that supports lesson structures – video or interactive media and support material for the educator—and assessments.” Mickey Revenaugh, Co-Founder, Pearson Connections Education

“Our content model is a 'spine and rib-cage' one. We believe that teachers will want a core set of high quality videos and accompanying assessment exercises (the 'spine') that is tightly aligned to the curriculum and in which they can have confidence. We then augment these core videos with additional resources - games, additional exercises, worksheets etc. and this is the 'rib-cage'. We're very keen to utilise the rapid expansion of open education resources (OERs) as part of the rib-cage and are already building this into this MOOC and our plans for MOOCs in other subjects. Making this resource free when combined with us being a not-for-profit organisation allows us to really engage with this growth in OERs.” Liam Sammon, Director of Commercial & Education Services, OCR

The OpenScience Laboratory, built by the Open University and supported by a £1m grant from the Wolfson Foundation, has about 50 high end experiments, some of which remotely hook into real tools and laboratories around the world while others are for the most part interactions with real data via authentic interfaces such as the virtual microscope and other virtual instruments. It is incredibly exciting for students keen on physics (although some of it is definitely A-level+ material) and two thirds of it is open access to schools and the general public, making up about 70 hours of experimental time. But these come at a steep cost – about £15,000 per hour of activity.

The Concord Consortium produces comparable simulations of key scientific experiments, and receives extensive funding from the National Science Foundation (for the key RITES project they received an NSF grant of US\$12.5m, or £7.5m).

Online content producers see a four-way trade-off, between quality of content, volume of learners, price per learner, and longevity of content. For niche courses, it is very hard to invest in high quality content without a very high price point or significant visibility of demand (and, in particular, of curriculum change). Even for high volume courses, such as functional skills (literacy, numeracy), fragmentation of provision and the corresponding erosion of volume can be a very significant barrier to investment.

“As a distance learning provider, one of our greatest investments is in developing carefully structured and well-designed course materials. For courses that lead to qualifications like GCSE or A level, the course materials need to be written precisely for a specific syllabus. It’s very hard for us to invest given the frequency of curriculum change – and indeed for others: whenever you see the curriculum begin to change you see the publishers slowing investment until it has settled down again.” Dr Ros Morpeth, Chief Executive, National Extension College

Effective MOOC content tends to be expensive; if it is aligned to specific curricula then a lack of visibility into the stability of those standards will hold back investment. As one functional skills provider that we spoke to put it, “every time we invest in a new series we bet the future of the firm on our being able to use that for three years. If the content doesn’t stay current for at least that long then it will be hard to afford to replace it.”

Assessment

Automated assessment has come a long way, and has further to go. Multiple choice tests now select from a bank of questions; short answers can be automatically marked based on key words; automatic scoring of essay questions is beginning to be feasible (for example by training a heuristic engine on a sample of 500 graded results).

As ever, formative assessment (where the objective is to reinforce learning) carries different challenges than summative assessment (where the objective is to award a grade), and many courses conflate the two.

Some courses offer a second try at the weekly tests; encouraging learners to go back and re-study their weak areas before submitting a score that will feed into the overall course assessment.

Peer grading of assignments may be no better than an automated assessment (sometimes worse), but buttresses engagement and participation, and the peer feedback supports ongoing learning much more effectively than a simple grade would.

For the moment, simple assessment is easily done online. Once detailed, accurate, reliable assessment is needed then this becomes a challenge.

“Pearson has a partnership with Coursera; so now course providers and MOOC participants can use a Pearson exam centre to take Coursera tests.” Saad Rivzi, SVP Efficacy, Pearson

One revenue opportunity for MOOCs may be to offer teacher-grading as a premium offer, although there are scale issues here also – in a course of 100,000 learners there may not be the available tutor bandwidth for grading even 1% of the participants.

Student Support

The high drop-out and failure rate in a MOOC most often reflects a lack of motivation or time; but there is also a high correlation between “engagement” and completion. How can a low-cost / no-cost model replicate the help and encouragement that students get from a traditional teacher?

Many of the best e-learning models that we have reviewed explicitly split support resource into two aspects – help with understanding content, and encouragement. The former is often reactive (e.g. the student clicks some sort of “ask the teacher” button) while the latter is proactive (e.g. when the student hasn’t logged in for three days he or she gets a call from a tutor to ask how it’s going). Neither of these fit into the cost base of a typical MOOC, so what are the alternatives?

Communities are an important support in both respects. Building relationships of any sort makes an activity very “sticky”; once learners begin to see themselves as part of a group then the completion rate climbs rapidly.

“Teacher-facilitated ‘knowledge communities’ – where learners learn together and teach each other – are enormously more powerful than teacher-led knowledge transfer – where the teacher stands at the front of the classroom and talks at students. Active engagement is much higher for a learner that is part of a group, on a journey of discovery together.” Jim Wynn, Chief Education Advisor, Promethean World plc

On a virtual platform this group engagement can develop in several ways. Simply asking and answering questions and beginning to discuss the course on a forum is a very strong start. Social activities can be very powerful, whether group assignments or peer review.

“Study after study has shown that mentorship is incredibly important in its impact on outcomes in Higher Education. Drop-out rates are cut up to half when a mentoring relationship is in place and working. Whatever happens in student support should reflect that, somehow.” Saad Rivzi, SVP Efficacy, Pearson

For scalable support, many courses and communities recruit a tier of volunteer advisors or monitors that can be grown with the membership.

“We’ve been doing a lot of research on MOOCs. We’re looking at different ways of crowdsourcing student support as it’s hard for instructors to keep up with and manage such a large population. For example we’ve found that crowdsourcing community TAs works much better when you draw them from the previous cohort than from the same one. You’ve got to be careful who you get though – and once you start screening for the right knowledge, skills and attitude of teaching assistants it becomes more complex and taxing to do well.” Professor Dan McFarland, Stanford University

For MOOCs in the school environment, there is the interesting option of co-opting the class teacher. Not only would this offer an expert authority who is close to the learner, but one who is positioned to deliver a broader spectrum of support and encouragement, and who can see the learner's online learning progression in the context of their overall needs and abilities.

Credentialisation

Recognising and rewarding participation in a MOOC is fraught with uncertainty, whether with a qualification equivalent to that gained from traditional offline study (or credit towards such a qualification) or with a certificate of participation. There was no agreement amongst those we interviewed. Some took the view that students will do anything for credit / qualifications, others that earning traditional rewards is uninteresting to school-age learners. Some considered that traditional qualifications are the only ones that hold value and that MOOCs must offer these to be successful, others that offering traditional qualifications through a MOOC experience would undermine the institution of higher education, and still more that new and informal qualifications would meet many learners' needs.

"The issues around certification and credit are complex. On the one hand this can be a huge support to MOOCs – dabblers who wouldn't otherwise finish might stick with a course if there is a return that they value. On the other hand it asks the question about what we pay for in education – the teaching, or the certificate? Will certified MOOC's replace teaching in community colleges and large lecture courses? What happens to the lecturers? There are a lot of ethical issues in this."

Professor Dan McFarland, Stanford University

The Khan Academy gamifies participation with badges that range from the trivial ("answer five questions correctly in a row") to the near-impossible (earning a 'black hole' badge can take months or years of sustained effort). The Mozilla Foundation's Open Badges project provides very useful infrastructure for communicating informal qualifications, and organisations like degreed.com are beginning to try to synthesise formal and informal qualifications into a canvas that holds overall credibility.

"Some students will do anything for credit – they can chunk through an awful experience to get credit. But this isn't learning, it's compliance.... We should make sure that we give credit for activities that are informal; we want a self-actualised student who can really do things." Jim Vanides, Global Education Program Manager, Hewlett Packard

Coursera among others offers the "signature track" as a premium option on free courses; allowing students to receive a validated certificate of participation (and, if the final score is high enough, of distinguished achievement).

There is an open question about the value of certificates of participation to employers. RTI International and Duke University published in March 2014 a study¹³ which reports that employers, when questioned, are generally in favour of recognising MOOC participation in recruitment, and using MOOCs for professional development. We are eagerly awaiting the output of another study (which we anticipate being published in 2014) that looks to test employer reaction to informal qualifications on job applications and associated curriculum vitae.

“For the 21st Century workforce, 16-18 year olds will be increasingly competitive proving they have skills, not necessarily qualifications. Employers in the future won’t wait for the right qualifications to come out of the education space – they will create their own certifications, tag them to content, and roll them out at scale.”
Mike Feerick, CEO, ALISON

There is the sense from some students that offering an award cheaply “online” devalues it. We hear from many educators that students on a (high cost) traditional program feel quite differently about the value for money of their course if there is a low-cost alternative. This is leading several institutions to charge a steep premium for the qualification rather than the learning.

Commercial Model

There is no such thing as a free lunch. Although MOOCs may be free at the point of use, someone is paying for everything, and the service offered (and cost of the capabilities required to offer this) must be aligned to revenue or funding.

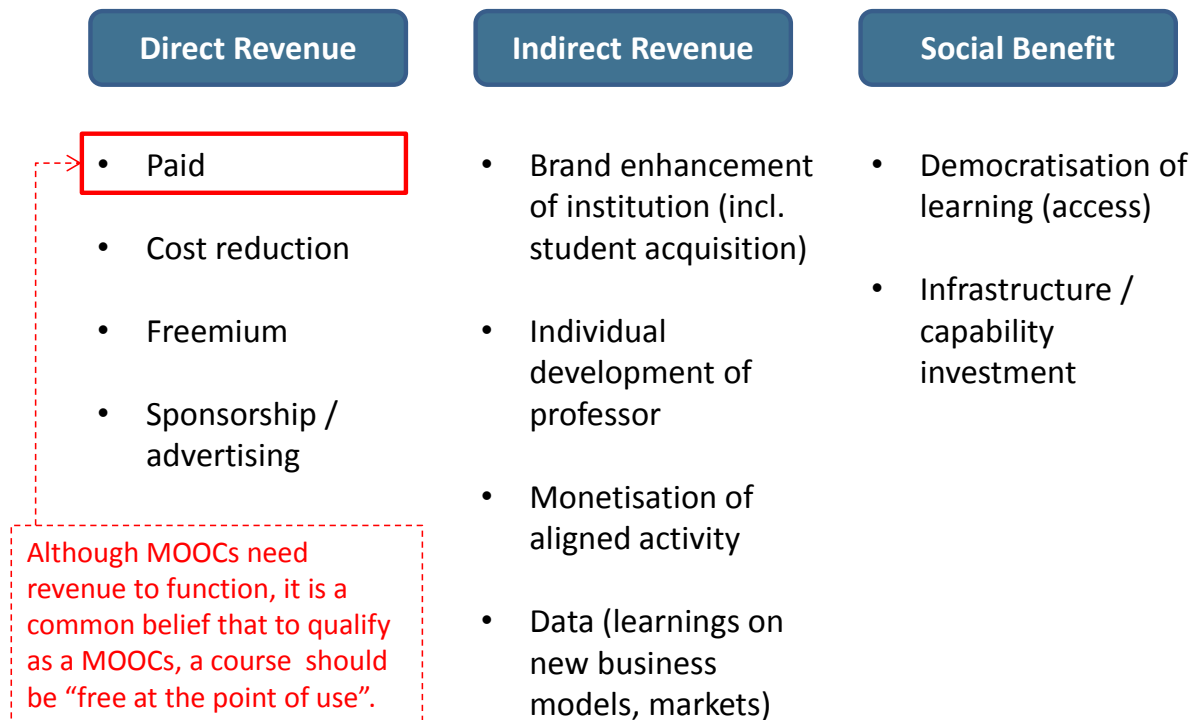
We consider three broad approaches to funding a MOOC, as illustrated in Figure 4 below.

Sometimes MOOC providers receive direct benefit from their service. Although charging for the service may not strictly be “open”, a low cost of learning through a MOOC – whether paid for by the student or by the student’s institution – may offer greater access or ‘bang for buck’ than the higher cost of more traditional learning. More usually, MOOC revenue is through a freemium model – some enjoy a free basic service, others pay for a premium offer.

It is not impossible for MOOCs or MOOC-like courses to be supported by sponsorship or even advertising. In other cases, institutions have offered a course via MOOC to reduce the cost of core provision.

¹³ http://www.rti.org/pubs/duke_handbook-final-03252014.pdf

Figure 4: Elements of MOOC monetisation / benefit



There are several opportunities to realize indirect revenue or benefit; for example many universities providing courses through Futurelearn do so in the hope that this will support their traditional student acquisition efforts, and more than one Pro-Vice Chancellor for Teaching & Learning has told us that “we can’t afford not to be in Futurelearn, for the sake of our brand”. Alternatively, reaching a wider audience may be part of an academic professor’s development plan.

There are also ancillary activities that align well with free online courses and which are, by extension, supported. This is especially the case for assessment and qualification – for example it is likely that some independent students will take OCR’s Computing GCSE examination after studying through their MOOC.

Some providers expect to use the MOOC – an environment where student activity can be measured in a much more granular way – to collect data to improve their delivery of both online and offline teaching.

Finally, some MOOCs are funded externally, either to support democratisation of learning (providing access to people who wouldn’t ordinarily be able to) or as an investment in improving education outcomes across a broad market – for example the Khan Academy was initially funded by Google and the Gates Foundation.

Key learnings from the experience to date with MOOCs

There are many more studies on MOOCs that focus on higher education and lifelong learning than do on school-age learning, but it is not our intention to do more than lightly summarise the state of this provision.

Lifelong learning:

- Very large numbers of learners (well over 10m at this point) have tried a MOOC.
- Drop-out rates are very high. It is typical to see 30-60% of registrants never participate, and of the learners who participate in the first week, normally only 5-15% complete the course in its entirety.
- Student satisfaction (of those who do complete) is very high. It is typical that 80-95% of completing students express that they are happy or very happy, and indicate that they would recommend the course.
- Most MOOC learners in the US and UK are educated, white, middle-class.
- The highest completion rates are seen in courses relating to work or personal circumstances (UPenn – Cardiac Arrest; Edinburgh – Equine Nutrition)

Higher Education learning:

- In the US, one third of higher education students take at least one course online; and 90% of academic leaders believe that this will exceed 50% within the next five years
- However only 23% of US academic leaders believe that MOOCs represent a sustainable method for offering online courses
- Approximately 5% of US higher education institutions offer a MOOC, and c.10% are in various stages of planning for one
- American Council on Education has recommended a small selection of MOOC courses from Coursera and Udacity for college credit
- “Pure” online MOOCs have not been particularly well-received. San Jose State University’s (SJSU) MOOC partnership with Udacity was put on hold following disappointing pass rates
- Blended programs and SPOCs using MOOC platforms and courses have seen greater success. SJSU’s blended engineering course with edX is being rolled out to other campuses following high pass rates; the University System of Maryland has seen some success in a trial funded by the Bill and Melinda Gates Foundation
- In the UK, as of February 2014, there were 58 MOOCs offered by universities (29 on the Futurelearn platform, 21 on Coursera, and 8 built independently). Two of these (at Edge Hill and Oxford Brookes) are offered for credit.

The Rapid Establishment of FutureLearn

FutureLearn was announced in December 2012, and developed incredibly quickly. Prototyping started in March 2013, with restricted test courses running on the minimum viable product by July 2013, and the first public courses launched in September 2013.

“We are a for-profit business, wholly owned by the Open University, and as such I have a business plan and financial targets. There are obviously brand and reputational benefits for the OU, and it’s an important innovation play for them. But there are also many benefits for our partner universities – and common to all of them is a desire to establish their own brand and reputation foothold in this space. Most of them also recognise the potential to recruit students in the UK through FutureLearn tasters.” Simon Nelson, CEO, FutureLearn

The first development focus was on the platform technology – over time this has begun to migrate from “build, build, build” to managing the platform for student engagement. The second area was to build the content team to support partners in developing the courses – and this is an area that has continued to grow. The third big push was to establish a marketing team to attract students, and to help the FutureLearn partners to do this. Partner support and management has represented a steady demand on the business.

“Student engagement is a balance, which at FutureLearn is enabled by the robust partnerships we’re building with universities. Without great courses, learner engagement isn’t going to happen. For our part, we are focused on creating a platform which realises our product vision - telling stories, provoking conversation and celebrating progress. By building these things into the platform, we can help our partners to deliver engaging learning experiences.” Kathryn Skelton, Head of Strategy & Insight, FutureLearn

In the initial courses, 27% of learners (16% of total sign-ups) made it to the last week, and 15% of learners (9% of sign-ups) completed the majority of steps in the course, including all the assessments. This is ahead of the results from other major MOOC platforms. Those who did make it to the end-of-course survey gave overwhelmingly positive feedback; of these, c.90% rated the course as good or excellent, and 94% stated that they were likely or very likely to recommend FutureLearn to a friend.

Like most mainstream MOOCs, the demographics are evenly spread – c.16% of learners are under 25 and c.4% under 19, although the youth demographic is growing.

Deployment and analysis of MOOCs in school-age learning (“K-12”):

Professor Rick Ferdig wrote a paper for the Michigan Virtual Learning Research Institute called “What massive open online courses have to offer K–12 teachers and students”¹⁴. The paper asks more questions than it answers, but Professor Ferdig’s tentative conclusions include:

- MOOCs can be used as supplemental learning opportunities
- MOOCs can be used to provide diverse cultural, international, and interdisciplinary perspectives for both teachers and students
- MOOCs can be used as professional development by teachers or professional development leaders
- MOOCs can be used to improve and increase teacher community.

“In sum, there is very little research in the post-secondary [Higher Education] MOOC arena; it is almost non-existent in K-12.” Professor Rick Ferdig, Kent State University

An example of a successful MOOC with high completion rates (80% - not surprising in the context that the participants are teachers) is MOOC-Ed’s (“MOOCs for Educators”) Digital Learning Transition course. MOOC-Ed has run many courses, and reported¹⁵ in September 2013 on the success of the DLT course, which saw 2,600 participants from all 50 US states and represents an example of a scalable approach to professional development.

There is an acceptance in the US that students at community colleges (roughly equivalent to the UK’s further education colleges) could benefit from e-learning. To date the best approach appears to be the flipped classroom model – where the course is used to deliver content outside of the class, and classroom time is used to discuss and engage in group activities. Failure rates have dropped especially for remedial classes.

One area that is seeing widespread enthusiasm for MOOCs is the US Advanced Placement programme, overseen by College Board. This offers college-level curriculum and examinations to high school students; these can yield college credit in advance of enrolment. Examples include:

- edX is working with College Board on a pilot with Davidson College in North Carolina to offer high school students online lessons in AP calculus, physics and macroeconomics. The pilot allows teachers to use the material as a MOOC (unsupported) or as a blended course (mixed online content and physical classes).

¹⁴ http://media.mivu.org/institute/pdf/mooc_report.pdf

¹⁵ <http://www.mooc-ed.org/wp-content/uploads/2013/09/MOOC-Ed-1.pdf>

- University of Houston System offers two MOOCs on the Coursera platform – “Preparing for the AP Calculus AB Exam” and “Preparing for the AP Statistics Exam”
- Amplify (a subsidiary of News Corp) offers a MOOC to prepare students for the AP Computer Science Exam, which is offered either to independent students or as a blended program through schools

College Readiness MathMOOC¹⁶

The University of Wisconsin-La Crosse was funded by the Bill and Melinda Gates Foundation to create an open version of their summer foundation course / remedial maths course.

Following a successful pilot of 38 students (37 passed) the university used the Desire2Learn platform to scale up to a larger cohort of 1,000 students, but kept a degree of student support. The course uses more senior students and provides some tutor availability.

UWLAX is now looking at options for making the course self-funding (while remaining free at the point of use).

There are also many examples of universities running transition MOOCs for secondary school students, broadly equivalent to foundation courses:

- Brown University – “Exploring Engineering”, a recommended prerequisite for specific engineering fields, hosted on the Canvas platform
- University of Miami Global Academy – “Advanced Placement Calculus” and “SAT Biology Test Prep”
- Wake County Community College – “Introductory Algebra Review”, to support maths placement tests, hosted on the Udacity platform
- University of Wisconsin – La Crosse – “MathMOOC”, delivering remedial maths for college courses, hosted on the Desire2Learn platform
- University of Prince Edward Island (Canada) – “Experience U”, a five week foundation course to provide understanding of HE

¹⁶ <http://www.uwlax.edu/MathMOOC/about.html>

The Open University's overlap between OER and MOOCs

The OU has been the UK's dominant provider of distance learning since its formation, and it is both the parent of FutureLearn and a provider of MOOC courses for the FutureLearn platform. It is also rich in Open Educational Resources.

"We release about 5% of our content through a wide range of channels", says Andrew Law, Head of Free Education at the OU. "There are currently about 10,000 contact hours of content on the OpenLearn platform, available without having to log in or identify yourself. At the moment this is quite 'pick and mix', but we are beginning to organise the content more, and thinking about how to give learners feedback and keep them engaged in the absence of formal course enrolments. We also have material on iTunes University."

The majority of the Open University's material is at higher level, and the core demographic is 25-35 years old. "We're unlikely to ever completely focus on school-age learners, although there are plenty of 16-19 year olds who do use our content", says Andrew. This is mostly at access level; pupils are increasingly embracing additional learning to differentiate themselves in university applications via their personal statement.

If the material is organised thematically, feedback is given, and some sort of student engagement tools are deployed, then the OER model begins to be adjacent to the MOOC space – principally lacking arranged synchronous cohorts to be a core xMOOC.

The virtual school movement in the US operates at substantial scale – over 300 virtual schools operate, with over 200,000 children enrolled. The largest operator of such schools, K12 Inc., teaches 77,000 students. Although outcomes have not been steady, there is a body of experience in respect of online tuition which is at a different scale to that in any other country. These schools are regulated on a state-by-state basis, and it is worth reviewing a couple of these.

New Hampshire's Virtual Learning Academy was founded in 2008 and is funded by the state on a performance basis – i.e. it is paid per student, depending on whether they pass their courses. There is a funding cap from the state, which has limited growth. Teachers are also paid on a performance basis, and perhaps because of this the completion rates are high (87%). Full time teachers manage 125 students. Two thirds of the 20,000 students attend another public school and are 'topping up' with one or two additional courses, while about a quarter are home-schooled. Technology is relatively simple – Moodle, Adobe Connect, Genius (a student information system).

The Indiana Online Academy (founded 2005) is not funded by the state, but instead has to sell services to schools at US\$200-300 (or £120-180) per 16 week course. This means that student numbers are much lower (c.1,400 during term time), with schools generally

only funding students at IOA rather than put on a low demand course on-site, or to allow students to re-take a course they failed in high school. Technology is again simple – Desire2Learn, Adobe Connect, Genius.

Florida has been a pacesetter in online education, having seen the launch of many state-funded virtual schools. Now Florida is going further, and Governor Rick Scott signed a law in 2013 which allows MOOCs for high school students in several subject areas (including algebra, geometry and biology). The MOOCs have end-of-course examinations, must use Florida-certified teachers, and win approval from the state Department of Education. A number of pilots are proceeding, including:

- In Miami-Dade, G. Holmes Braddock Senior High School is piloting a MOOC in computer science. The University of Miami's Global Academy, an online middle and high school, is offering MOOCs to help students prepare for the Advanced Placement calculus exam and the SAT subject test in biology.
- High-school students in Pinellas County are enrolled in a remedial math MOOC offered by St. Petersburg College.
- Broward College is offering a new MOOC focusing on college-level reading, writing, and math – but half of initial enrollees were high school students from the local county.

In Ireland, ALISON (reportedly the second-largest MOOC provider in the world) and Macmillan Maths Doctor have together developed an online free-to-use course that is fully aligned to the Maths Leaving Certificate (equivalent to A levels). Although the course is free, tutors are available on a pay-per-use basis for one-to-one support.

Synthesis of K12 MOOC learnings:

We have observed the following successful deployments in the 11-19 year age group:

- To deliver advanced studies courses, at a level beyond those taken by most students
- To deliver additional courses (that can't fit into school timetabling), taken by advanced students
- To teach low take-up subjects
- As a supplementary resource or as the content anchor for blended learning
- As foundation courses, to prepare students for higher education
- To teach independent learning skills
- As remedial courses, to give students a chance to catch up
- To broaden exposure / experience (multicultural, interdisciplinary)

In addition, there are many examples of MOOCs that provide teacher professional development to educators of the 11-19 age range.

The Khan Academy and its impact in schools

Khan Academy, the digital learning organisation, had 10 million unique users in the month of February this year, 65% in the US.

The Bill & Melinda Gates Foundation has funded Khan since 2010, and has funded SRI to assess the impact of the tool in a range of California schools over a two year period from 2011-2013.

Generally teachers made little use of the content on the Khan Academy website, preferring to deliver teaching themselves. Rather, they used the website as a source of problem sets and practice opportunities for the students, and the teacher reports as an aid to identify gaps in learning.

When the pilot teachers began to use the Khan Academy, few had computers available on an anytime, one-to-one basis. As they grew familiar with the tool, the teachers acquired this technology for their classes.

Some of the key benefits identified by teachers were: positive student perception and high engagement levels and a positive response from teachers especially to the ability to monitor and support students better. Student outcomes were positive too, as there was a correlation between use and (1) test scores and (2) some non-achievement outcomes (e.g. math anxiety). The modular structure of the resources, the differentiated instruction, the independent learning and the rapid feedback were valued too.

In respect of applicability of the use of online learning as a component of overall instruction (i.e. blended learning) the conclusion was positive as teachers like the access to extensive curated and aligned digital content. Most students (ages 10 to 14) are not yet used to acting as independent learners and need support from teachers to orient them.

Looking forward into the evolution of the MOOC model

Through the literature review and from our interviews, we have observed a number of changes underway in the capabilities and model for MOOCs:

- Content is becoming cheaper to make, at the margin. This stems from cheaper and better hardware, easier-to-use editing software, and platforms that can present content more effectively.
- Expectations of content quality are fragmenting – some believe that it is becoming more acceptable to offer very simple videos, while others believe that the “talking head” video style is increasingly unacceptable, and that appropriate animation or visualisation is required.
- Platforms are advancing; better social tools (for example peer grading is increasingly automated) and some progress in building functionality to allow personalisation.
- Course designers are becoming more experienced – not only is there a growing body of experienced MOOC administrators, but those who are coming to their first MOOC are better prepared (more learning material available, including e-learning courses).
- Assessment getting more powerful; multiple choice is becoming a minority grading tool, alongside automated free text grading, peer grading, and – in future – automated long answer grading.
- The proliferation of MOOC provision and availability is fragmenting student volumes, making it harder to reach massive scale.

School-age MOOCs in the UK

As yet, there are few UK MOOCs focused on the 11-19 age range. Those we have identified are listed below.

Table 1: List of current UK MOOCs for the 11-19 age range

Provider	MOOC	Level	Focus	Launched
Calderdale College, OCR, Google, IoE (funded by Ufi Charitable Trust)	Citizen Maths	KS4	Aligned to OCR qualifications	2014-2015
OCR (with CUP, Raspberry Pi)	Cambridge GCSE Computing	KS4	Aligned to GCSE Computing course	2013 (beta)
Cambridge University (funded by the Underwood Trust)	i-want-to-study-engineering.org	KS5	Entrance interview preparation	2013
Cambridge University (funded by the DfE)	Cambridge Mathematics Education Project	KS5	A level Maths	2014
Cambridge University (funded by the DfE)	Rutherford Physics Partnership	KS5	Physics problem solving	2014

We have become aware of several initiatives underway, although these are still commercially confidential. It seems likely that at least a further 5-10 MOOCs aimed at this age range will emerge in the UK during 2014, and at least a similar volume in 2015.

MOOCs are being developed by:

- Universities, which have large numbers of content-developing professors looking at new technologies and processes, and which increasingly need to actively acquire young students.

- Qualifications / assessment businesses, that have access to a potential revenue stream (in exam fees) that is sufficient to prop up low-cost teaching and learning; increasing the accessibility of a qualification is an effective cross-subsidy.
- Technology firms (both platform businesses and integrators), which see an opportunity to gain access to learners directly, and capture a larger share of the value from education delivery.
- Social enterprises and the government, which wish to provide case studies and to “seed” the commercial development of the marketplace.

“Both Desire2Learn and Blackboard are addressing the MOOC and scalable e-learning spaces. They are both very embedded with a large range of educational institutions, and should be well positioned to lead the push for MOOCs into the secondary space. There are surprisingly few school-age publishers making the same push.” Professor Barbara Kurshan.

Cambridge GCSE Computing

OCR, in partnership with Cambridge University Press and Raspberry Pi developed the Cambridge GCSE Computing MOOC as a not-for-profit to support the new computing curriculum and the emphasis being placed on technology through the “year of code” and similar.

The platform is in development at the moment (the full launch is scheduled for later in 2014), but is heavily populated with content and has seen excellent feedback from pilot schools and has some MOOC functionality.

The course is based on a full GCSE curriculum with c.80 learning episodes and core videos – incredibly long by MOOC standards. This has precluded a particular start date or rate of progression – and also means that it will be meaningless to compare “completion rates” or similar metrics against shorter courses.

Initially most participants were teachers, looking for support on the Computing curriculum transition and for ideas to use in the classroom. A growing proportion of the learner body are students (a body that has now grown to two thirds of total registrants), overwhelmingly in the 14-16 year age range. Over 40% of these indicate that they are studying GCSE Computing.

Liam Sammon, who led the development of the MOOC, says that “Our ambition was to support teachers, and to fill a gap for non-specialist teachers. Our philosophy is not to try to replace classroom learning, but to augment it and make it easier with great content produced by excellent teachers.”

Areas of remaining development focus include the forum and social engagement tools, the facility to offer adaptive learning, and to extend the content community.

How can MOOCs contribute to school-age learning?

Teaching for the 11-19 age range is, of course, entirely different from teaching either university students or lifelong learners. The pupils have different needs, and these must be reflected in the provision in order to see success (or even to avoid undermining progress). We must recognise that schools and teachers also have different needs, and that these must also be reflected.

One challenge in deploying MOOCs into schools is that – for most applications – the consequences of failure are significant. The idea that stand-alone MOOCs are suitable for all learners has proven false in higher education, and will be doubly so in secondary education. A drop-out rate of over 90%, as seen in higher education and lifelong learning MOOCs, won't wash. Indeed, there is a risk that unwise deployment of MOOCs could exacerbate gaps in attainment between historically advantaged and disadvantaged learners.

Accordingly, the idea that MOOCs can replace any significant number of classroom teachers in the short or medium term is fanciful.

The opportunity is difficult to define. There will be benefits in learning effectiveness; it is certainly true that some young learners can become highly engaged and increase their productivity when exposed to wider opportunities. There will be benefits in efficiency (a few look at the potential to adjust the teacher-student ratio, although more look to “free up” teachers from administration and lower-value tasks in order to focus more on critical interventions).

Our strong view, having reviewed the development landscape and impact of MOOCs and school-age e-learning, is that the overall opportunity emerges, slowly, through niches. There is no ‘magic answer’ that will make all teaching better overnight – rather, there are some areas which are less well-served where MOOCs and MOOC-like platforms can quickly play a useful supporting role. As more teachers experience this form of learning (both as students and as teachers), they will be best placed to identify further opportunities and to help craft solutions that help; eventually, these sort of learning tools will become an expected part of the toolkit.

Our approach has been to try to identify these niche needs, and develop high level propositions that might support them, and to test both with teachers.

Having said this, we do expect to see some of the following themes:

1. It is likely that using MOOC-type courses as a supplementary resource could support teachers with their out-of-classroom teaching preparation. The organisation of excellent resources into courses, with a mixture of core and extended resources, could somewhat streamline lesson planning. As and when a

high quality adaptive learning engine becomes available this would become even easier.

“One area where MOOCs can add to schools is by curating resources and aligning them with the way the school curriculum is taught. Content repositories don’t do this, and a packaged course like this would definitely be usable by a good teacher.” Professor Diana Laurillard, The Institute of Education

“A well-designed e-learning reporting tool – like the dashboards in Khan Academy – is a magic lens that can become a teacher’s best friend in prioritising interventions and improving their own personal impact in the classroom.” Sherry Coutu, Technology Entrepreneur and Investor

“Timetabling in schools has often resulted in unnatural patterns for learners that are simply not appropriate. Deploying MOOCs can resolve such issues enabling subjects to get the short sharp bursts of learning or longer periods of deeper study that are more suited to some subjects than others.” Jim Wynn, Chief Education Advisor, Promethean World plc

2. Arguably the greatest benefit from MOOCs, is the opportunity to teach more young people to teach themselves, to generate independent learners.

“It is learner effort that is the greatest contributor to learning. The opportunity to teach youngsters to teach themselves – to make independent learners of them – has enormous value and could be the greatest benefit to come from MOOCs.” Dick Moore, Director, Moore Answers

“Most students don’t discover until later in life that learning and school is actually for their benefit. The ‘new learner’ sees school as only one available component of their personal learning network. For students that are so inclined, MOOCs (and the access they give to new courses and new material) are fantastic – but most haven’t been so enabled.” Jim Vanides, Global Education Program Manager, Hewlett Packard

It is increasingly clear that some learning provision is going down the MOOC route. This may or may not replace an element of school delivery (over the next ten years) or an element of some universities’ delivery (over the next five years) – but it will replace elements of corporate training and lifelong learning, within the next five years.

Among the people we interviewed, there was a view often expressed that if we do not teach young students to become lifelong learners, and to use the tools that they will be offered, then we are doing them a great disservice.

It is not enough to measure the quality of MOOCs today, and compare that to available opportunities. We should also assess the likelihood that MOOCs will improve to the point where they do offer a compelling proposition within current students' working life and – if so – then beginning to familiarise learners with MOOCs early rather than late may yield substantial benefit.

3. There appears to be strong resonance between the provision of MOOC self-learning and the acquisition of skills, which highlights the opportunity in the vocational space.

“In some areas of learning – for example Computer Programming, Language Learning – the qualification is less important than the student’s ability to show what he or she can do. MOOCs can be a very good way to acquire the skills and knowledge to do this.” Dr Ros Morpeth, Chief Executive, National Extension College

High level view on MOOCs

We asked experts and teachers how appropriate four high level models of MOOC might be to 11-19 year old learners. These four models were:

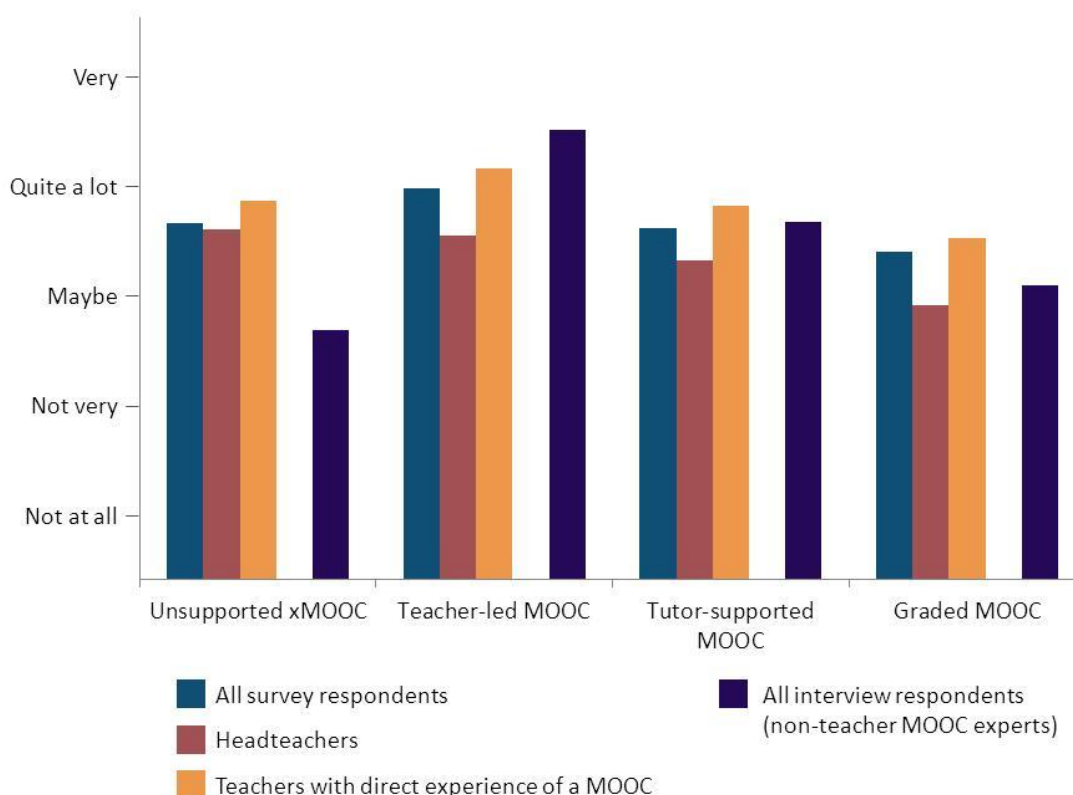
1. A “pure” xMOOC – comprising mixed static and video content, and a moderated discussion board.
2. A MOOC that offered the facility to report on participation and progression to the class teacher
3. A MOOC supported by remote coaches who could answer questions and work to maintain student engagement
4. A MOOC that graded participation and progression, and fed this into qualification awarding

The results of the scoring are shown in Figure 5 below. There are several points worth noting:

- Overall, there was more expectation of benefit than of risk, although we are acutely conscious of the potential for sample bias (we asked a large number of teachers to complete a survey about the opportunity for MOOCs in schools).
- Teachers did see benefit in a MOOC that reported to them, over platforms that didn't; there was no pronounced objection to the involvement of external tutors.
- There wasn't very much difference between teachers who did and didn't have direct experience of MOOCs (although those who did were slightly more enthusiastic overall).
- Headteachers were much more negative about graded MOOCs than classroom teachers.

- Non-teacher MOOC and e-learning experts were much more negative about an unsupported MOOC, and much more enthusiastic about a MOOC that can be linked to the classroom teacher.

Figure 5: Perceived appropriateness of four different MOOC models, for 11-19 year old learners



Source: Cairneagle interviews and teacher survey

Specific identified needs / challenges

The following list of challenges for schools is drawn from our experience with UK schools as well as informed by this research exercise.

1. Offering low take-up subjects at GCSE and A-Level is difficult, because there are often not enough students to justify the class (and the specialist teacher)
2. It is hard to find fully qualified teachers for some subjects, because there is not a sufficient pool of trained teachers from which to recruit
3. It is very difficult to support students who for whatever reason cannot or do not attend school

The number of people learning – or in some cases not learning – outside school is unclear. Depending on definition (including long-term sick, home-schooled,

members of traveller families, excluded, or with behavioural issues), estimates of the number of students in this position range from 50,000 to 130,000.

4. It can be difficult to fit in learning around the work elements of an apprenticeship program
5. It can be hard to satisfactorily stretch gifted & talented students
6. It can be hard to provide remedial support for lagging students (especially important in the case of English & Maths functional skills)

Any gap in basic capability places a serious constraint on further learning. Individual support is expensive in terms of budget and/or class teacher time. Moreover, peer pressure may impair learning of more basic material in a mixed ability group.

7. It can be difficult for teachers to properly support the research process in relation to the Extended Project Qualification (EPQ)
8. Schools find it hard to offer a full range of vocational qualifications, including trade-specific ones, given the greater number of awarding organisations and courses
9. Some teachers find it challenging to deliver sensitive classes (such as Religious Studies / Sex Education), especially in areas of mixed cultural background
10. It is difficult to deliver pre-examination revision courses ('test prep') that are focused on individual needs
11. It can be difficult for widening participation programmes to reach students and convey understanding of higher education student life, requirements, opportunities etc.
12. Students (especially those from disadvantaged backgrounds) often need preparation for higher education courses, but Foundation courses are expensive both financially and in terms of time
13. There may be better ways to deliver professional development courses for teachers

The case for teacher professional development as a key long-term lever of outcomes has grown steadily over recent years, both promoted through coaching within schools and within sectors (for example the National Centre for Excellence in Teaching Mathematics trains evangelistic super-teachers to act as local hubs for Maths CPD, and provides tools to support this). INSET days have limited utility – although they do build working groups and collaborative relationships in schools.

“We see our platform, and the wider world of MOOCs, being used in a number of unexpected but exciting ways. We have seen high school teachers using MOOCs in an after-school model; we have seen MOOC-like tools for first year teachers to help them get hold of their classroom; we have seen lots of requests to use MOOC content in a blended learning mode, and research is underway to understand the impact of MOOCs in these settings.” Julia Stiglitz, Director of Strategic Partnerships, Coursera

European Schoolnet Academy

European Schoolnet is the network of 30 European Ministries of Education (including the UK DfE), based in Brussels. It's a not-for-profit founded in 1997, and it carries out about 40 projects a year.

A year ago Schoolnet started working on the European Schoolnet Academy, a MOOC platform specifically focused on teacher development. Two pilot courses have been launched – one on Innovative Practices for Engaging STEM Teaching on the 17th March, and another on Future Classroom Scenarios on the 24th March. These have attracted initial classes of 2,500 teachers between them. Another three courses are being developed for launch in 2015.

Patricia Wastiau, the leader of this development effort, explained that “Teachers really don't get much opportunity to cooperate about what they do in the classroom; in these circumstances, it's hard to introduce innovation and avoid pressure for conformity. We wanted to offer something complementary to traditional CPD, that builds on the learnings we have developed through our international cooperation projects within which time and opportunities for exchanges between teachers do take place”.

The approach is more connectivist than xMOOC, focusing on groupwork and sharing experiences, but a certain level of content is needed to put participants on the same reference framework – this is a mix of video, animations, quizzes, and peer-assessed assignments. Content production costs have been relatively high – we have estimated that the bill runs to about €100k per course, although undoubtedly this will fall for future courses as the team gains in experience, as is usual for MOOC developers.

Prioritisation of these specific needs

As part of our teacher survey, we asked respondents to assess each of these issues, and the results are shown in Figure 6 below.

Perhaps unsurprisingly, the areas that most concerned classroom teachers were classroom issues – the challenge of providing support to students that are ahead of or

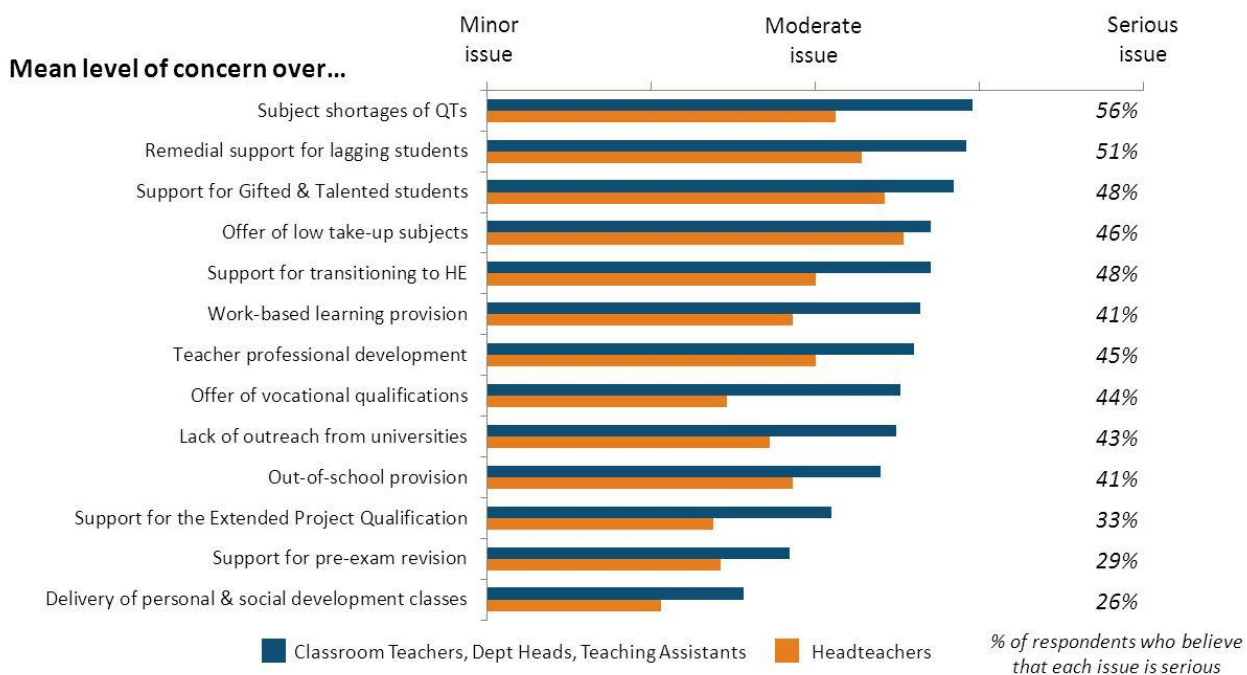
behind the class median, and the provision of properly qualified teachers to deliver subject teaching. Over half of the survey respondents felt that these three issues were “serious”.

Issues that are a part and parcel of the teaching job – helping with pre-exam revision, and delivering personal & social development classes (sometimes perceived to be “sensitive”) were de-prioritised.

Those issues in the middle, recognised as areas of concern but not given the same sense of urgency, had more to do with administration. These included provision of education outside school teachers bailiwick such as work-based learning, out-of-school support, vocational qualifications (all of which were emphasised as more serious by those who teach outside of mainstream schools).

Headteachers had a different set of priorities. Their area of greatest concern was how to offer subjects that have limited demand; a difficult challenge given the proliferating number of qualifications within the constraints of relatively stable budgets. After this they focus on a need to support Gifted & Talented learners and those progressing to Higher Education.

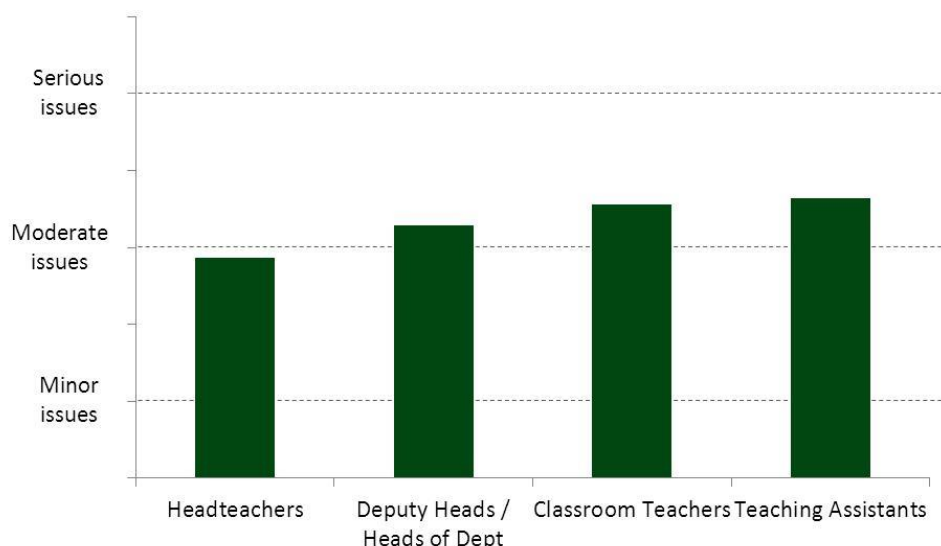
Figure 6: Teacher prioritisation of specific identified needs in 11-19 education



Source: Cairneagle Associates teacher survey

Overall, head-teachers thought that these needs were lesser problems than did deputy headteachers or heads of department, and likewise for classroom teachers, and likewise for teaching assistants. The average scores, across all the identified needs, are shown in Figure 7 below.

Figure 7: Average seriousness of specific identified needs, segmented by respondent type



Source: Cairneagle Associates teacher survey

Beyond the obvious link between lack of control and greater anxiety there is an implication of this for any new initiative in school-level education; if you rely on senior-staff champions for change, then there is likely to be less sense of urgency than if you can start to make progress bottom-up.

Potential solutions / supports for these specific needs

We then proposed 14 high level propositions that might help address these needs, and asked teachers to assess each. The following pages include mini-profiles of each potential solution, together with the assessment of the value that might be realised, the degree to which it is appropriate to students of each age group, and a selection of comments from the responding teachers.

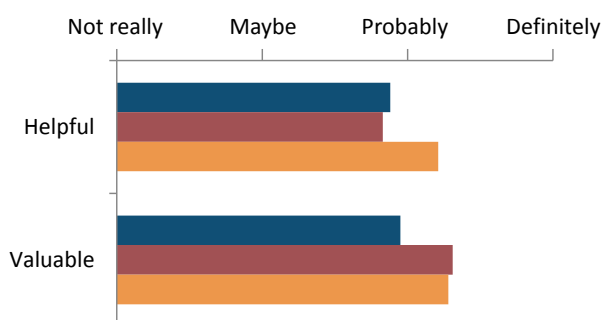
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Need: Offering low take-up subjects at GCSE and A-Level is difficult, because there are often not enough students to justify the class (and the specialist teacher)

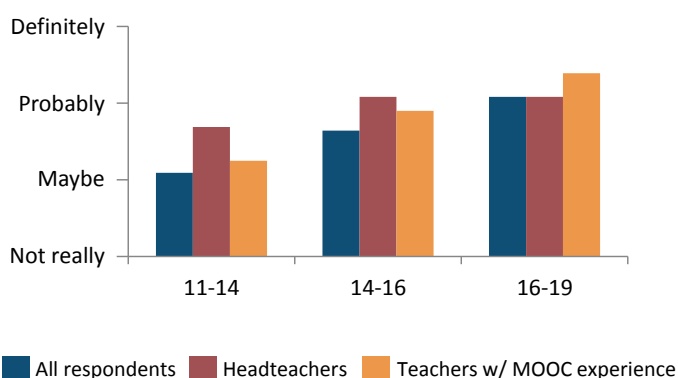
Proposition:

- An online course, built to be aligned to the curriculum and qualification
- Containing c.50-75% self-study material (text, videos, problem-solving exercises / games, quizzes)
- Containing c.25-50% material that would be delivered by a teacher (either in person for a cluster of schools, or by webinar / over the internet where schools are)
- The course would be managed by a teacher, who would monitor learner needs and progression, set and mark work, and support learners individually where needed

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- The fact that a teacher is monitoring would I'm sure make this a more successful option.
- Teachers should not be made redundant through the backdoor. Digital learning should take place in a teacher-led environment.
- Our school is struggling with this at KS4 and 5. This would be a most welcome solution!
- My Further Maths class are not given a full timetable This would offer the extra support they so badly deserve/need.
- Some well motivated students could do this. However, it would need significant management by which ever teacher managed the class.
- You still need a teacher to teach the subject - no getting away from that.
- I have already used this successfully at my school with psychology before a full time psychology teacher was appointed.
- Might be better for local schools and colleges to work together and combine resources rather than working in competition to get learners.
- Depends on subject. Most subjects with low take-up are specialist areas which require properly qualified specialist teachers that can offer a full experience. Performing Arts subjects could not be delivered like this. Paper-based subjects might be suitable (e.g. Philosophy).
- I am not sure that this would really help someone who needed a particular subject for their career.

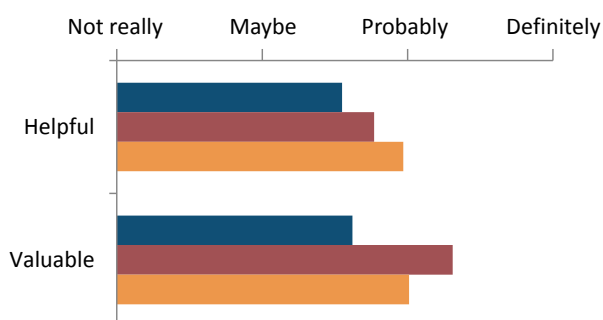
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Need: It is hard to find fully qualified teachers for some subjects, because there is not a sufficient pool of trained teachers from which to recruit

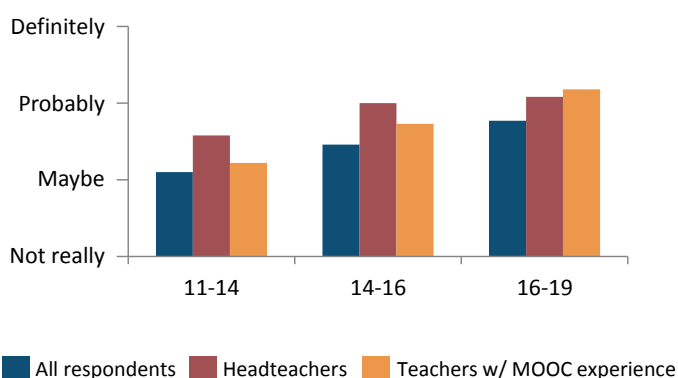
Proposition:

- An online course, built to be aligned to the curriculum and qualification
- Containing material for self-study and supplementary use (text, videos, problem-solving exercises / games, quizzes)
- Intended to "spread" a subject specialist across a larger group of learners

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- I believe a real classroom, with a competent teacher is the best solution for engaging learners and supporting their development. If this is not available, then an online course is a good second alternative.
- I teach chemistry and as a shortage subject students would gain some confidence – but the practical elements of the course would not be met on-line.
- Such courses would be useful to supplement and complement in-class learning and teaching but it would be a mistake to downsize the teaching profession to facilitators and use technology to 'try and deliver education' - it will help some people but not all.
- Open to abuse and coasting by more able students.
- This might help provide some useful resources for the teacher's preparation. But it wrongly represents what learning is all about. Learning involves a change in the mind set of the individual doing the learning - light bulb moments - this requires interaction with a teacher who is alert to opportunities of adapting material and challenging the student to facilitate such changes.
- The attendance and participation will have to be monitored by the school.
- this would be useful as a supplement I don't think it would be able to replace a teacher for the groups. i.e. at GCSE we often have Physics taught by a non-Physics specialist, would be good to have this support for those classes, so lessons still delivered by the non-specialist but this run in conjunction.

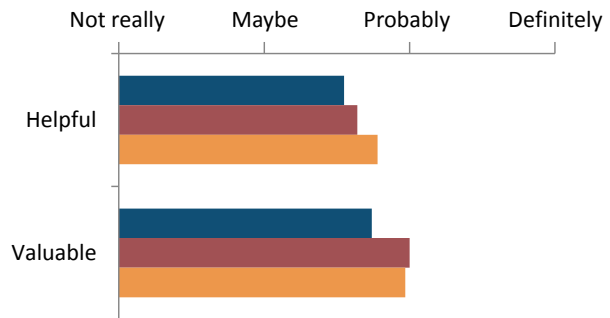
2b

Need: It is hard to find fully qualified teachers for some subjects, because there is not a sufficient pool of trained teachers from which to recruit

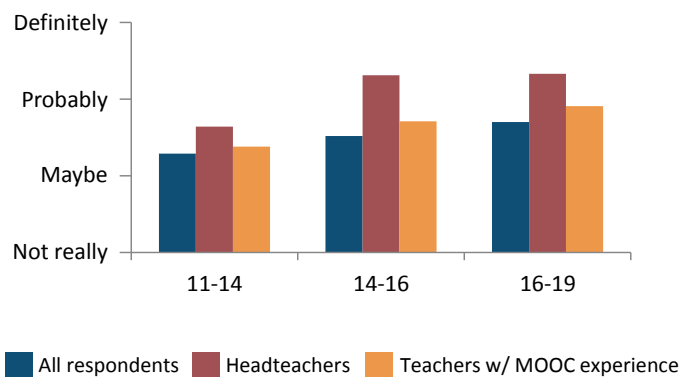
Proposition:

- An blended course, built to be aligned to the curriculum and qualification
- Containing some material for self-study (text, videos, problem-solving exercises / games, quizzes)
- Predominantly containing material for use by a teacher in a classroom
- Intended to support teachers who are less familiar with the subject

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- There is no substitute for a well qualified specialist teacher in their subject
- I feel this would be harder the older the students were as they expect more and deeper subject knowledge from their teachers.
- A non-specialist teacher using this resource would still essentially be a 'child minder'. Learners would not be able to progress beyond a certain point unless subject specialist available to support them with their difficulty. The approach would only work as a short term measure.
- I don't want a PE specialist to be teaching my (gifted) son physics.
- This is a growing problem in the schools I visit - help is definitely needed.
- This would very much depend on how confident the non-specialist teacher would feel supporting learners on these courses.
- Train the non-specialist teacher to make them effective!
- The online course and self-study I think are good ideas, but if a teacher doesn't know the material the students will eat the teacher alive. Especially the older the students are. The person in front of the students needs to know the material inside and out.
- Schools should not offer subjects that they cannot properly staff with fully qualified teachers.
- Ideally, a teacher should be familiar with the subject, but this could be a good temporary solution until a qualified teacher is found.

3

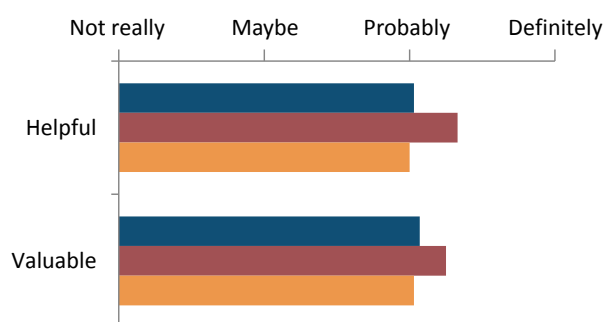
Need: It is very difficult to support students who for whatever reason cannot or do not attend school

Proposition:

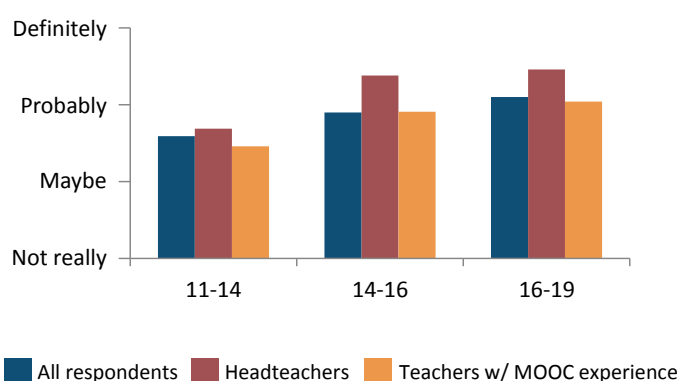
- Online courses, built to be aligned to the curriculum and qualification
- Focusing on core skills (especially literacy, numeracy)
- Containing material for self-study (text, videos, problem-solving exercises / games, quizzes)
- Including a "safe" environment discussion board to engage in group work with other learners
- No built-in tutor support

(note: in retrospect we should have specified a facility for pay-as-you-go tutor support, similar to the ALISON / Macmillan Project Maths)

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

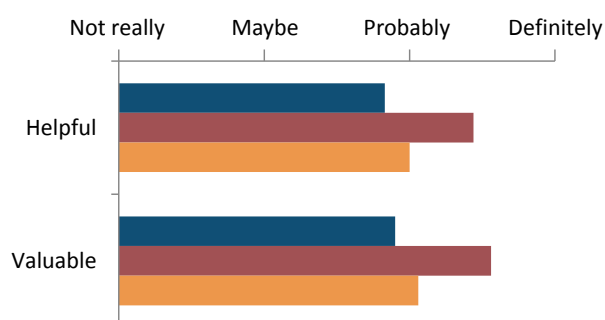
- These children need to interact with other children or they begin to feel isolated. There is a risk of marginalisation.
- As long as the discussion environment is really safe. Some form of tutor supports would be better.
- We have a teacher dedicated to going to student's homes to deliver their education.
- This is an excellent idea, but really needs some sort of tutor support as well.
- It's important to be able to track activity though.
- A brilliant use of the resources, particularly for children whose learning has been delayed if compromised by circumstance.
- This would definitely not be appropriate method for a child with behavioural issues. It is vital that learners who can't attend lessons should have access to education.
- This solution really should be broken up, learners out of school for behavioural and illness based reasons are massively different!
- Behavioural issues won't be fixed by studying at home.
- This has been needed for a long time and would be of great support to these children.
- There is extremely limited access to appropriate tutoring way for my 14 year old daughter (Chronic fatigue Syndrome/ME) so on line resources or core, extended and vocational qualifications would be amazing and would make an enormous difference to her life and future.
- I think for physical reasons like distance or injury or sickness, this would be great, but for social and behavioural reasons it'd be a plaster on a sprained ankle: covers up the problem without actually doing anything.

Need: It can be difficult to fit in learning around the work elements of an apprenticeship program

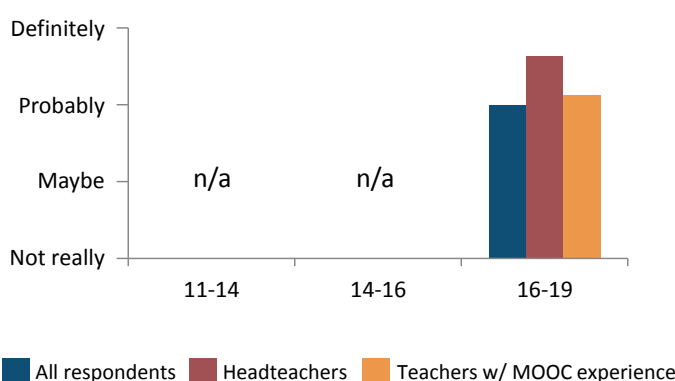
Proposition:

- Online courses, focused on core skills (especially literacy, numeracy) and support for appropriate vocational qualifications
- Containing material for self-study (text, videos, problem-solving exercises / games, quizzes)
- Including an unmoderated discussion board to engage in group work with other learners

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

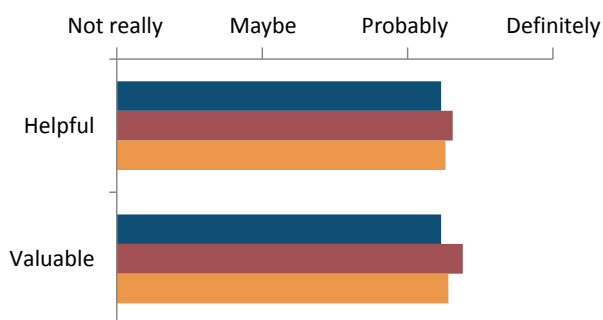
- I am not convinced that this group would be able to deal with the home study, they probably need regular meetings with tutors or teachers for guidance, and with their peers to exchange ideas and provide mutual support.
- Students opting for apprenticeships are often in areas of unfamiliar learning and will need some real-life guidance.
- Discussions should still be moderated.
- In my opinion, MOOCs should be supplemented by some meeting or social gathering to build rapport before the group embarks on the group-work. This would be achievable if MOOC works in small geographical clusters. Thus it can be opened to all in the beginning and once the registration is over the groups be formed based on geographical proximity.
- I think the actual fact they have to attend study centres means they have time devoted to it, if it were online only I think that it might be down to students to find the time out with their working schedule.
- Probably more cost effective for the employer.
- In my experience young apprentices would not benefit from self-study courses - they generally need the discipline of coming into college and have direct tutor input. It might work for older apprentices.
- It would allow learners to progress at their own pace without fear of failure amongst their peers.
- Totally different environment from the class room so yes this should work with those keen to progress in a working environment.

Need: It can be hard to satisfactorily stretch gifted & talented students

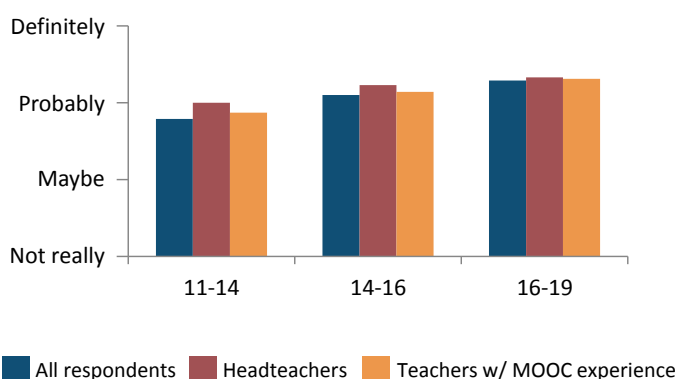
Proposition:

- A collection of open education resources, aligned to the curriculum but designed to be more challenging
- Containing material for self-study (text, videos, problem-solving exercises / games, quizzes)
- Including a "safe" environment discussion board to engage in group work with other learners
- No built-in tutor support, but intended that the classroom teacher would support the effort

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- Any extra and different resources and approaches to stimulate their research and independent learning skills would be appreciated.
- Gifted and talented learners are often highly motivated and this may work for them.
- I have worked with gifted and talented students and different schools have very different ideas about what constitutes gifted and talented!
- Good teachers should already be able to think of ways to extend their most gifted students.
- This would be a brilliant resource, taking the pressure off the teacher and supporting the student, parents usually drive gifted and talented students so would naturally support leaving teachers to drive softer skills in the classroom alongside the curriculum.
- I've seen arrangements in the past between schools and Open University where the modules are assessed and credit given. I've seen it work very effectively for gifted learners still at school. Needs school – OU liaison ideally.
- I am happy to tick definitely on this one because G&T pupils are less likely to abuse system, more likely to want to learn.
- Unfortunately G&T children have suffered through cuts to extra-curricular resources over the last 5 years, and there is a large gap which could be filled.
- Alternatives could involve bringing experts into schools to work with gifted and talented students, sharing knowledge and skills. Or mentors, possibly older students.
- Always good to stretch learning if wanted.

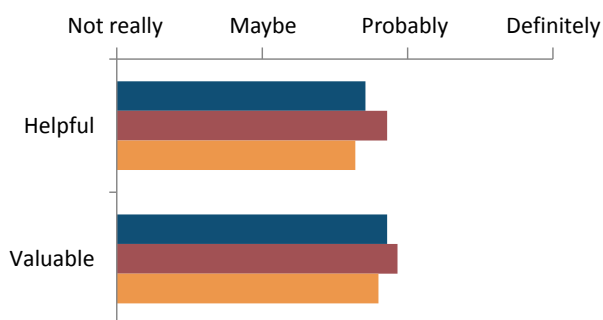
6

Need: It can be hard to provide remedial support for lagging students (especially important in the case of English & Maths functional skills)

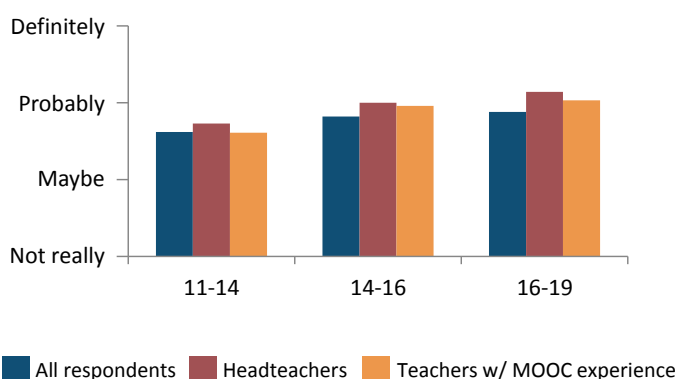
Proposition:

- Short self-study courses focused on core and functional skills (especially literacy, numeracy)
- Highly games-based, focused on tutorials and practice tools
- Including a degree of competitive tension with (anonymised) other learners, e.g. high scores, head to head matches etc.

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- Those that fall behind would ideally have the support and guidance of learning support teachers to help guide them. However, any other support is welcome.
- When work materials are translated to play tools, it makes learning easier.
- Self-study is probably inappropriate for learners who are struggling.
- Young students love games.
- Students who fall behind usually do so for complex reasons, the same reasons often keep them from catching up.
- I see the potential for more support in the classroom for students who are falling behind who are not SEN - they tend to get forgotten in a busy classroom.
- Difficult to engage weaker students, so I like the idea of a competitive element - perhaps with prizes.
- Many struggling learners are unable to study independently but games and puzzles often appeal.
- There is a whole spectrum of Special Educational Needs and some respond better to one-to-one tuition.
- My experience of Lit and Num packages in the past suggest that there is a short term impact, then the novelty wears off.
- I wouldn't underestimate the importance of beginning this support in Years 5&6.
- Students often become discouraged by the competitive tension, especially if they have learning difficulties. The competition could therefore have a negative effect.
- Yes to replace expensive outside tuition.
- Will learners not get fed up if everything is games based?

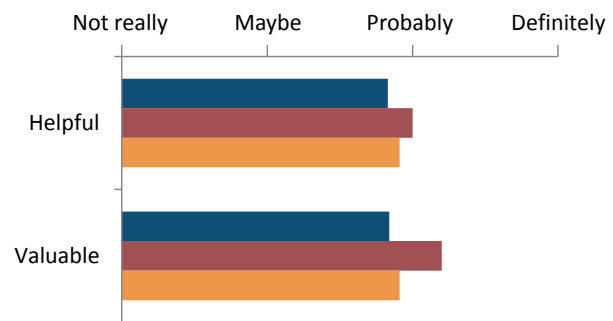
7

Need: It can be difficult for teachers to properly support the research process in relation to the Extended Project Qualification (EPQ)

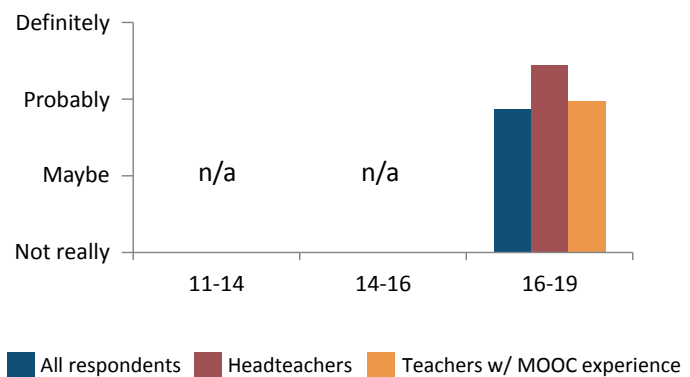
Proposition:

- Short online course for teachers on the EPQ, how to support students
- Short online course for learners, focusing on the skills needed to complete the EPQ, the timeline, guidance from former EPQ students
- No social engagement, just a number of video resources

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

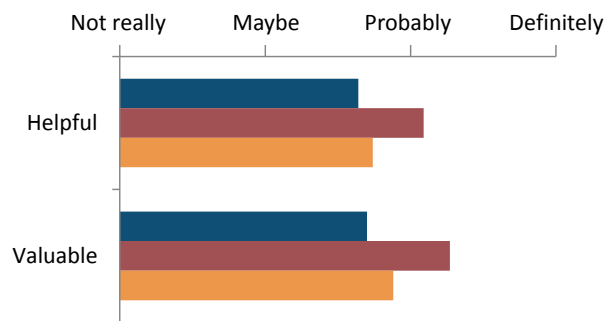
- This would save teachers time.
- It is always better to have a "real" teacher but since much EPQ work happens during the holiday, an on-line resource might be helpful.
- The range of possible EPQs is vast so it would be difficult to cover sufficient topics.
- Often EPQ is taught as an add-on by non-specialist staff, so this would be extremely beneficial.
- This should include talks and presentations from students who have achieved EPQ.
- My daughter is currently completing an EPQ and feels that tutor support is vital.

Need: Schools find it hard to offer a full range of vocational qualifications, including trade-specific ones, given the greater number of awarding organisations and courses

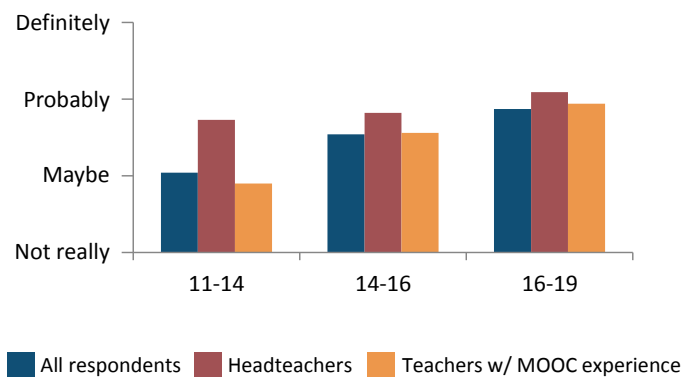
Proposition:

- An online course built to align to the vocational qualification
- Containing material for self-study (text, videos, problem-solving exercises / games, quizzes)
- No in-built tutor support
- A "safe" environment discussion board to learners to engage in group work

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

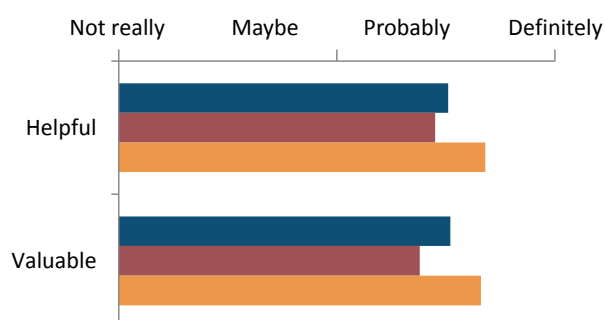
- Vocational learning also needs hands on practical experience e.g. to learn to be a chef, a builder.
- Having worked with a vocational group, they are not self-motivated at all and almost need one-to-one teacher support.
- Of particular benefit to self-motivated students with an interest in e.g. computing which is not being taught adequately at any level in our area - from primary to A-level. The demand is there - they really, really want to do it - but there is an enormous lack of staff with real world experience and ability to teach.
- School – FE college links need to be further developed.
- The use of FE colleges to deliver vocational qualifications is well-established. There is no need for schools to replicate this: rather they should work in partnership with FE.
- It would be better for schools to work in liaison with local colleges/trainers/businesses to provide training. Most vocational courses require a lot of practical work.
- This could support vocational teaching but the greatest thing about taking a vocational course that is led by industry experts is that students have access to a realistic work ethos.

Need: Some teachers find it challenging to deliver sensitive classes (such as Religious Studies / Sex Education), especially in areas of mixed cultural background

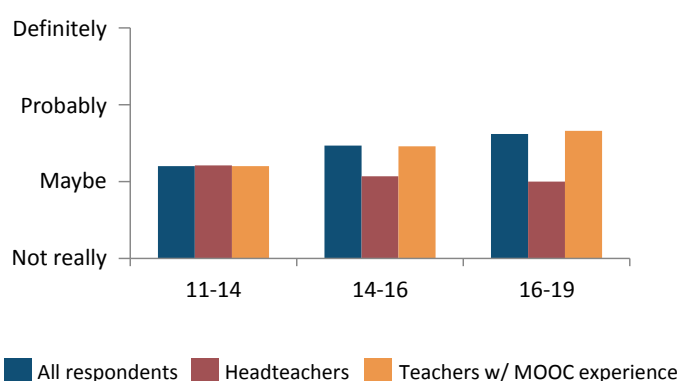
Proposition:

- A short online course focused on a single set of issues, optimised for use on a tablet / smartphone
- Containing material for self-study (text, videos, problem-solving exercises / games, quizzes)
- Lots of contextual material to explore different aspects and points of view
- An anonymised and moderated discussion board, anonymised "ask a teacher" functionality
- The course would report participation levels to the class teacher / school, but no details relating to content

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

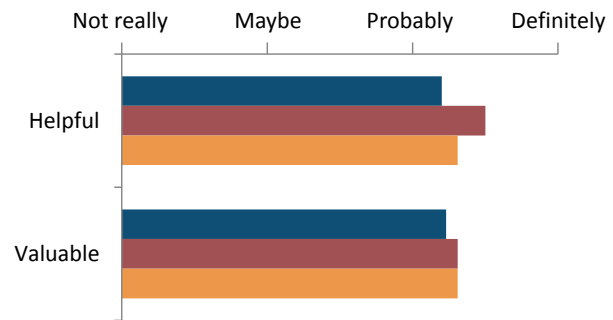
- It would need to be checked carefully, we have over 70 nationalities and materials are not necessarily suited to all students.
- I don't think the course would be able to manage the variables of subjective opinion.
- Sensitivity is not something that computer programs are created to react to and know when to step in and help a learner.
- I think the discussion board would be a good idea, but would be concerned about uptake of students from certain backgrounds.
- An online course takes away the embarrassment factor.
- Sensitive issues need an adult available immediately for concerns that may arise. Sensitive subjects can lead to CP issues arising, which need addressing and may not be noticed or may not lead to a child disclosing if online.
- Given that sex education when delivered well is about relationships rather than just reproduction, I cannot believe it is better to provide that on-line than by a sensitive and skilled teacher.
- There are dangers here of who sets the agenda for the online course. If it's a private venture, they may have particular motivations which gear discussions in a particular way. We have seen this problem in the move to free schools where there are some very strange ideas circulating. In a situation where schools are under pressure to accept funding, this is highly contentious and threatens rational and objective learning.
- A balance between preserving privacy and ensuring that the students are accessing and applying the right information should be found.

Need: Some teachers find it challenging to deliver sensitive classes (such as Religious Studies / Sex Education), especially in areas of mixed cultural background

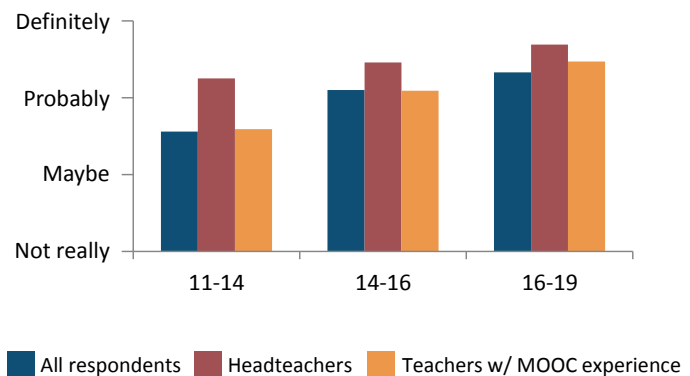
Proposition:

- A short online course covering a single qualification
- Containing summary material for self-study (text, videos) with lots of formative assessment (quizzes, problem-solving exercises)
- Additional remedial material which the learner can dig into where relevant
- A facility to print out performance by topic (including specific issues) in a form suitable to help a teacher provide individual support

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- In my experience students need a mixture of well organized tasks and deadlines to help them get organized. This coupled with specific and detailed feedback from a teacher. Not many have the skills to plan and work through tasks independently without the regular face to face contact.
- Depends on the quality and relevance to the exam board. Many teachers in independent sector prefer their own tailored materials as revision guides can be too superficial and not aim to stretch for the top grades.
- As many students love working with computers, online could be a good option.
- Love the idea of a print out of performance by topic - would be a good way to monitor students.
- This can be very specifically tailored to the exam course.
- There's already too much 'preparation' for exams when they are high-stakes linked to funding or rankings. Education should be and must be about more than testing, stats and data, however, if short course was about skills for qualification followed up and part of actual classroom participation it could be valuable and relevant.
- One to one tuition is often the best but this could be a very good second.
- Being able to pick and choose the additional help and content you need is valuable.
- The MOOC would be very helpful in addition to all the support teachers give to students already.
- Similar to Enhanced Results Analysis offered by AQA to feed back on underperformance.
- We have experimented with something similar at school and it has worked really well.

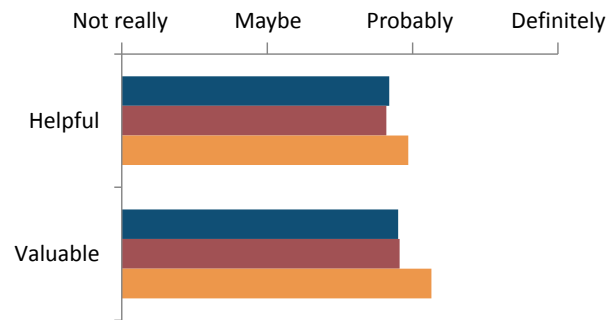
11

Need: It can be difficult for widening participation programmes to reach students and convey understanding of higher education student life, requirements, opportunities etc.

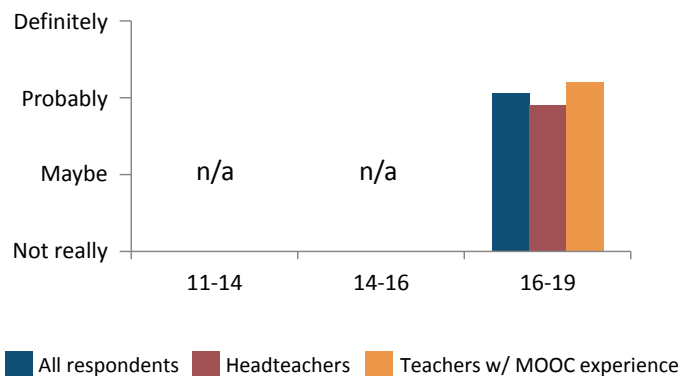
Proposition:

- A set of short units that cover academic life, extracurricular life, financial commitments, life away from home, employment opportunities
- Video material entirely developed and presented by current and recent university students
- Anonymised discussion board to facilitate a volunteer group of current university students to answer prospective students' questions

Perceived value:



Age appropriateness:



Comments from teacher survey respondents:

- As their parents are least likely to have had the relevant experiences then both the students and parents are likely to be interested in this type of initiative.
- Students need to experience the real academic environment, not a virtual one.
- A better solution would be to bring students from disadvantaged backgrounds to visit the universities and see the campus themselves.
- Need access to the technology needed, which could be difficult for less privileged.
- Most universities/tertiary institutions have open days and websites with similar information, as well as visits from personnel to secondary schools/colleges to speak with students. These are probably more valid and targeted to specific groups.
- Students would benefit from these prior to university visits.
- It really needs mentoring schemes where students who already attend university and have come from a poorer background go back to schools and talk to learners. It needs dealing with right from primary school. It requires teachers and parents to be able to see students from less privileged backgrounds as potential university students. Ultimately it needs the abolition of privately funded schools and the destruction of the class system in the UK. Until then people in all classes will continue to think 'that's not for the likes of me'. With these thoughts the introduction of a course to counteract this is too little, too late.
- Should be even for 14-16 year olds so they don't discount university too soon and for example not do A levels

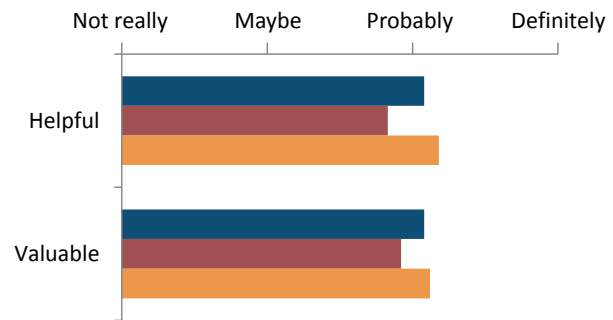
12

Need: Students (especially those from disadvantaged backgrounds) often need preparation for higher education courses, but Foundation courses are expensive

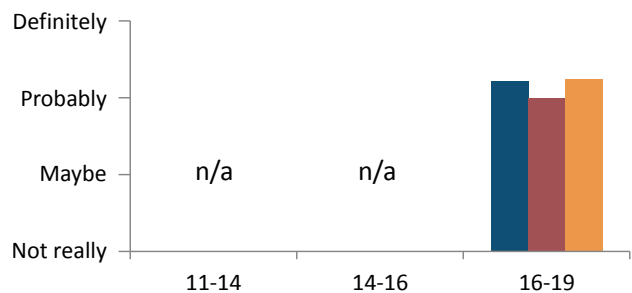
Proposition:

- A set of short courses, aiming to prepare students for university life
- Focusing on key academic subjects, study skills, life around learning
- Academic material would be text and video based with problem-solving challenges (mainly literacy, maths)
- Study skills material would comprise a number of project-based challenges
- Life around learning material would comprise videos developed and presented by current and recent university students
- Universities would be able to recommend to candidates that they complete key modules
- Learners would be able to email a transcript of their progress / completion to a university

Perceived value:



Age appropriateness:



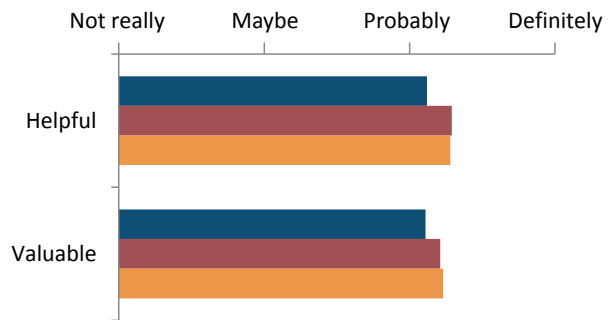
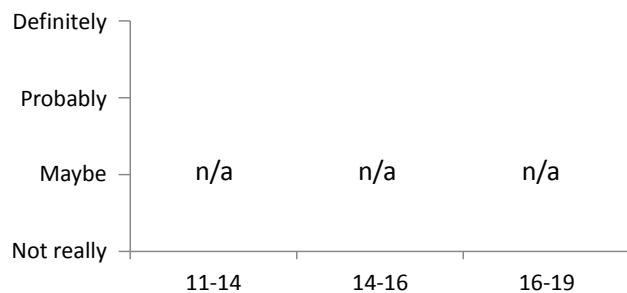
■ All respondents ■ Headteachers ■ Teachers w/ MOOC experience

Comments from teacher survey respondents:

- Surely schools already prepare pupils for the transition to Higher Education.
- The only alternative I know of is a face-to-face course, which I have taught. This, however, means that students take an extra year or number of months to do this course.
- Timing of this would have to be very carefully managed as young people have a lot of pressure with exams and UCAS application as it is, without feeling more pressure to complete even more work.
- I would imagine all this stuff is easy to access on internet. I'm not sure "a course" is required for the majority of Uni applicants.
- We have one to one strategies to address this in Year 13.
- Much needed. Many students find university life challenging and drop out.
- With students already accepted they are most likely to have an interest/level of engagement already making these great ways to 'reach' students.
- You could go a step further by suggesting possible career paths after university depending on the chosen course.
- There should be no transcript of progress.
- Uni prep should I believe be taught in year 13 as a compulsory study-skills course for students applying for uni. I'm not convinced that students would actually do an online course in their own time. Maybe if it was timetabled into their school hours.
- Many A level students need more experience of independent study, which will be required at university.
- Life skills are gained by living life. Not through online courses.

Proposition:

- CPD courses based on a cMOOC (emphasising groupwork over content)
- General courses that cover common issues in education
- Specific courses that are focused on teaching particular levels, subject, topics
- Highly course-driven; start point and end point – although after the course teachers could choose to remain connected to their coursemates
- Typically assuming 1-4 hours of participation per week
- Shared collaborative space to encourage teachers to work together, experiment in their in-school work and discuss the results
- Courses that would match up teachers from different schools (c.10-40 per course)
- Schools could sign up for a group course, where teachers within the school would be the only participants

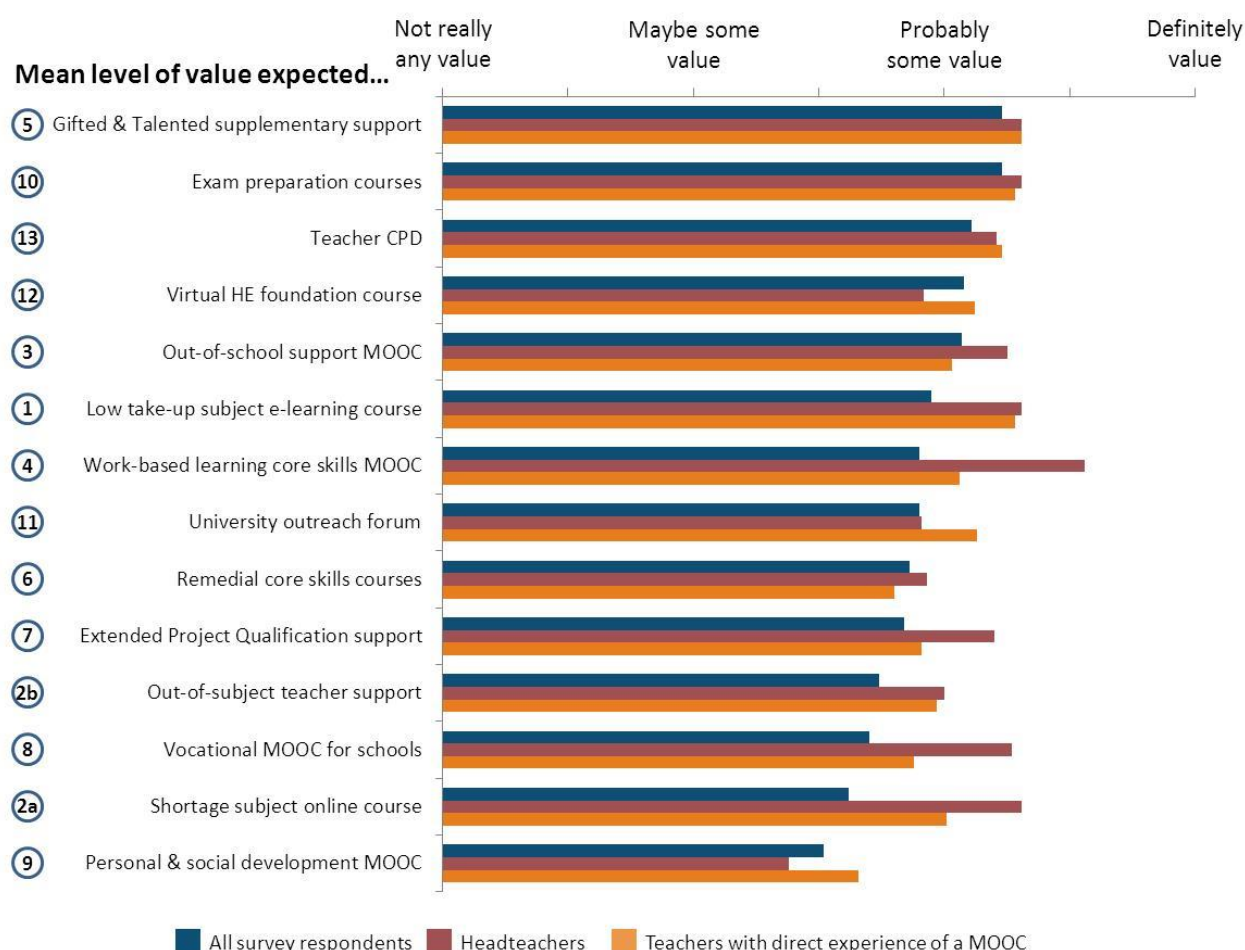
Perceived value:**Age appropriateness:**

■ All respondents ■ Headteachers ■ Teachers w/ MOOC experience

Comments from teacher survey respondents:

- It might work well as long as you can log in and work at any time you want. I find it great and like this sort of thing but many teachers don't.
- I like TeachMeets, where teachers share ideas. This would help us access teachers and their knowledge/ training.
- Teachers are hard pressed to complete their work in schools and this could help but where would you find the time!
- Face to face is always preferable for CPD. Apart from the training, the networking is invaluable.
- Virtual learning communities have a lot to offer teachers.
- Whether used would depend on costs. Schools are cutting back on CPD.
- The school would have to make participation compulsory.
- Having used this methodology in training staff we have found that a blended approach is more effective and that staff do not engage well with the online materials without also real life inputs which include 'stories' and practical examples. They also don't like the difficulties that are always encountered in using the technology.
- Sounds valuable. I'm just not sure that at the moment you could convince teachers that they could find the time or motivation to do this.
- Don't just add to workload. This has to be shown to be better, simpler, quicker. Something has to be taken away so the net effect is a win-win. Sell this to teachers - we've freed up time so you can choose how to spend that freed up time and heads share experiences of their star performers

Figure 8: Teacher perception of opportunity value



Source: Cairneagle Associates teacher survey

The expectations of value depend on the background and position of the constituency.

For the overall teaching industry, the top three opportunities (in terms of value) are:

- Supplementary support for gifted & talented students
- Exam preparation courses
- Teacher CPD

For teachers who have direct experience of a MOOC, the top 3 opportunities are:

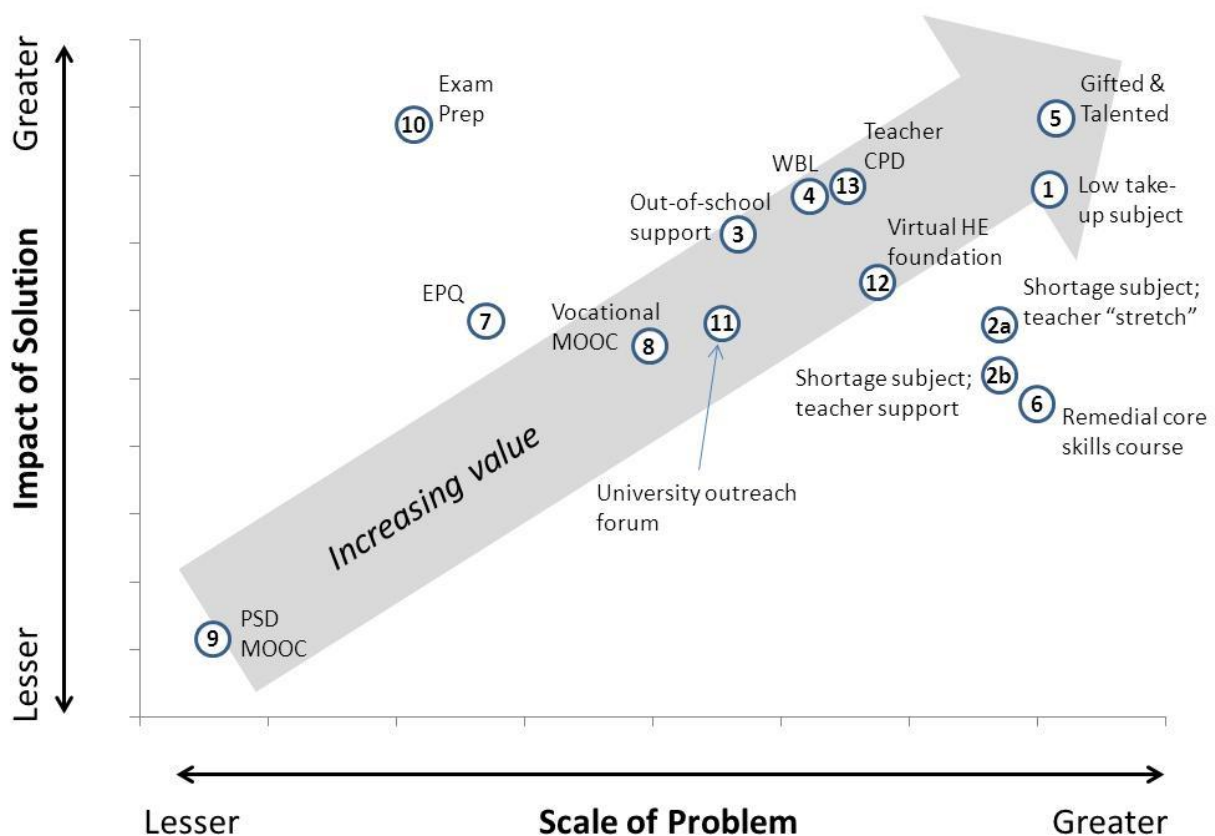
- Exam preparation courses
- Low take-up subject e-learning course
- Supplementary support for gifted & talented students

For headteachers, the top 3 opportunities are:

- Work-based learning core skills MOOC
- Supplementary support for gifted & talented students
- Shortage subject online course

Asking for a value assessment gives a one-dimensional snapshot of a complex set of inter-relating issues. If we map the expectation of how helpful each solution might be against the perception of how serious a problem it is addressing, then this shows us (in Figure 9 below) the trade-off between less effective solutions to a more serious problem (e.g. remedial support for lagging students) and more effective solutions to a less serious problem (e.g. exam prep).

Figure 9: Scoring of MOOC and MOOC-like opportunities; need and impact



Source: Cairneagle Associates teacher survey

Barriers and obstacles that hold back the deployment of MOOCs

Adoption at the point of use can be driven by learners and parents (tangentially) or by teachers (in the mainstream). To see substantial change in the next decade, teachers would need to embrace the concept and integrate it into classroom teaching.

Promoting change in the teaching profession can be extremely difficult. Teachers are heavily worked, as each year's teacher workload diary shows (50+ hrs per week in 2013);

they mostly operate in isolation; the high-stakes inspection regime increases the risk of change (and even more so the perceived risk of change); and morale is poor.

The most common comments in response to our survey were variation on “recruit more teachers, pay them more, reduce non-teaching calls on their time and they’ll fix all of these problems”.

“Many younger teachers are incredibly enthusiastic about new tools; to try them out and learn what works and doesn’t work, and take advantage of the best parts – and often they are held back by systems which aren’t used to innovation. There is however evidence from EUN that older teachers with well-honed pedagogies are now experimenting with technology more successfully than ever before.”

Jim Wynn, Chief Education Advisor, Promethean World plc

“To really embrace online learning requires the teacher to shift their view of themselves – from a deliverer of content to a facilitator and mentor. This is a huge mental leap, and most teachers are anchored by their training and by a whole career of experience. Before this changes on an institutional scale, consumers will force change by looking outside of traditional institutions and mainstream schools for their education.” Mickey Revenaugh, Co-Founder, Pearson Connections Education

“It’s very difficult for secondary schools to develop innovative technology-based teaching; you’ve help teachers discover what works for their students, but the pace of the curriculum is very demanding and doesn’t leave time for experimentation. In every school it should be possible to invest in this: for keen teachers to BID FOR TIME to innovate and test new ideas.” Professor Diana Laurillard, The Institute of Education

Provision of MOOCs is held back by uncertainty over demand, and by a lack of clarity in respect of the commercial model.

The 21st Century Learning Alliance grants fellowships each year to support teachers in investing time and effort to develop innovative working methods. We highlight two case studies from the 2013-14 fellowship group that exemplify teacher development of new techniques.

21st Century Learning Alliance Fellowships – Samantha Broom

Samantha Broom is Head of Modern Foreign Languages at St Mary's Catholic College in Blackpool. She was awarded a 21st Century Learning Alliance fellowship to assess the use of new technologies in the classroom with a link to the SOLO (structure of observed learning outcomes) Taxonomy, to effectively develop ways of using technology to transform teaching and learning rather than just to do the same things as before but on an electronic device.

She has set up a research and design group with five colleagues, with the aim of making key technology tools more accessible to teachers. "Kids are digitally comfortable – they are ready and willing to exploit technology. There's a generational divide which means that many teachers need support in getting up to speed and using new technology to teach in different, creative, engaging ways. But it's important and very exciting – my mind boggles when I think of where technology will be in ten years' time."

"MOOCs as such might not have much of a role in schools – they're not going to do my job for me. There is interesting supplementary material around – not much, but some is good. Pearson's Active Learn tool is a great asset to enhance GCSE work, although expensive when considered for lower down the school. Kerboodle by OUP (formerly Nelson Thornes) has been around for five years, and is a phenomenal resource at A Level to support students."

Samantha and her team have been exploring how different web 2.0 tools can be used in order for them to fall into the relational and extended abstract categories of the SOLO taxonomy, allowing pupils to harness technology in order to create a way to display their knowledge, but with a pedagogical purpose. Research has led Samantha to consider the current trends in technology in school, both with staff and pupils, and also to look at the theoretical research into using technology that is currently going on around the world.

21st Century Learning Alliance Fellowships – Nicola Scott

Nicola Scott is a Mathematics Teacher and KS3 Maths Co-ordinator at Hinchley Wood Secondary School in Esher. She was awarded a 21st Century Learning Alliance fellowship to research the impact of a 'flipped classroom' on progress and attainment in mathematics. Pupils watch instructional videos at home thus releasing teacher time in class, which is used to work with pupils in smaller groups or one-to-one to give additional support, explain more challenging mathematic concepts and support pupils to work on investigations.

21st Century Learning Alliance Fellowships – Nicola Scott (cont.)

“There is so much potential in the flipped classroom model, to let students learn in a way that suits them. The kids are really enjoying it.”

The first group (a top set year 9 class) are generally positive about the change with all saying they like this method for learning. Some felt that they would like a “normal” homework occasionally to help them consolidate their learning and get feedback on areas for improvement. All students felt that they were appropriately challenged most or all of the time. The second group (a mixed-ability year 7 class) were slightly more ambivalent. They liked that the homework and tasks in class were differentiated, but some didn’t know how to take notes and struggled with IT issues.

Students are more confident and parents have commented that they like being able to support their child by being able to watch the videos at home together. Students are more engaged and thus more to learn more effectively not just in Maths, being equipped with the right study skills. They are more confident in writing notes which will help them with revision and as they progress to A-Levels and on to university.

“We are producing some of our own content, partly using screen-capture technology. Also there are a growing number of teachers who produce video material for sharing – we’re working with two others in particular who run their own websites. In terms of commercially-produced material, we buy CGP and MathsWatch resources. Increasingly things are developing from collections of open educational resources into courses – Colin Heggarty is currently combining videos together to suit particular learner needs over a larger part of the curriculum.”

“I can see MOOCs serving some needs in schools. There are students in the educational system who are long-term sick. At the moment we set them work, but we can’t support them very well – so a MOOC may well be the answer to this. Similarly we are offering a second Maths GCSE to the top set; but if there were a handful of students in the next set down who were very keen to try it, a MOOC could give them access to the basic learning – and of course we would support them outside class time.”

“There’s no substitute to the time and attention of a teacher – however the flipped classroom is about thinking of alternative ways to support student learning and progress, particularly where the needs of the learner are varied.”

Different needs for different levels

We consider three critical issues to be substantially age-dependent.

- Firstly, the degree to which students require scaffolding in their learning.
- Secondly, the degree to which study can be self-directed and self-driven.
- Thirdly, the degree to which students can be allowed access to the internet and social interaction outside of a “walled garden”

Both approach and content must be driven by learner needs, and these vary by age group and according to the environment. We split the scope into four major groups:

11-14 year old students

This age group needs much more scaffolding than older cohorts, and it is very difficult to deploy a remote solution that does not involve face-to-face management.

“The younger the age of the learners, the more intuitive teachers are, and have to be, about what they need. Much of this comes from body language and other non-verbal communication – and you can’t pick this up in a purely online classroom.” Bryan Polivka, PolivkaVox

“Learners in the 11-14 range do not have the maturity to be responsible for their own learning.” Respondent to the Cairneagle teacher survey

14-16 year old students

The 14-16 age range starts to see more ability and appetite for self-directed learning, including e-learning. There remain issues around social engagement that make some providers uneasy about the prospect of being responsible for a discussion board.

“Younger minds need more scaffolding, typically imposed by a good teacher and a well-structured platform. But scaffolding on its own is not enough – you also need adaptivity – which is what you get when a good teacher delivers cool content (i.e. the right content for the learner’s need). We started building adaptive platforms at Tribal Innovation, and it was very hard to dynamically apply them.” Geoff Stead, Qualcomm

16-19 year old students in school

Once learners are over 16 years old then notionally MOOCs should be much more applicable. Education is increasingly elective at this point, and there should be a greater degree of subject interest, allowing more self-directed / self-managed learning.

Fragmentation begins to be a challenge. There are more potential courses at A level, and fewer learners taking them – so early-adopting MOOC and content developers do not see the same return on investment.

16-19 year old students in further education

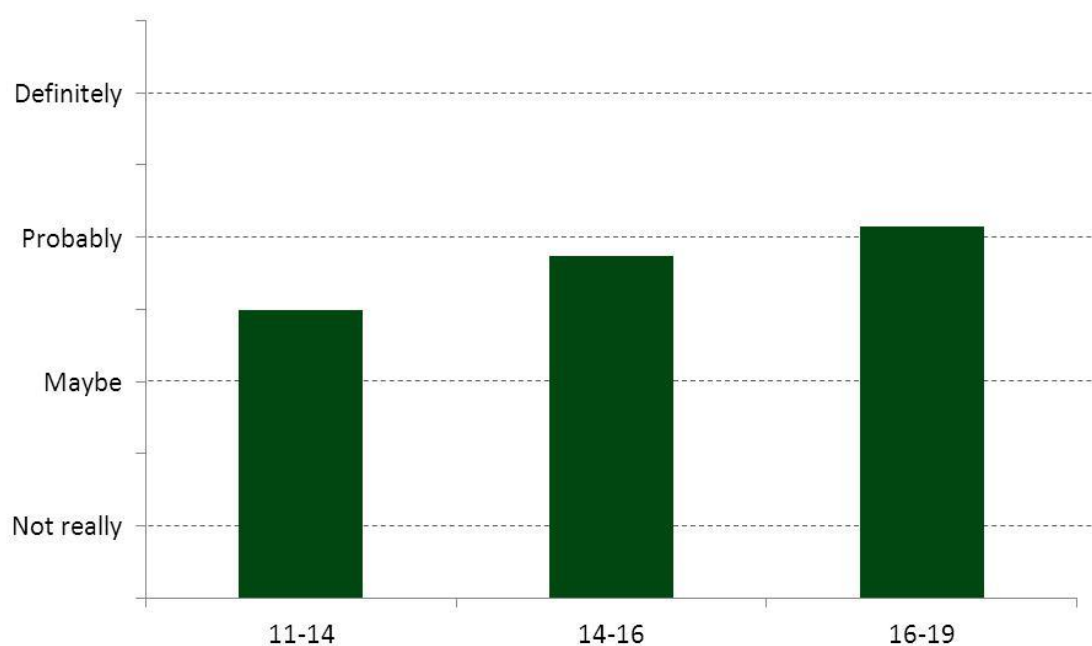
Further Education colleges should be obvious early adopters. They already lead the field in deploying e-learning, demand more self-motivation from their students, and offer courses with a lot more flexibility than schools.

Many vocational courses, notwithstanding the even greater degree of fragmentation than in A levels, are extremely well-suited to MOOCs and e-learning, since the mix of skill acquisition and “real-world” context allows for a compelling mix of content types.

“Further Education colleges should adopt MOOCs or similar platforms much more easily. They don’t have the same discipline problems, don’t have the same pressure to produce success. They don’t have the same restrictions – there’s much more freedom to differentiate.” Bob Gomersall, Chairman, Virtual College

Learners combining further education with work, including under apprenticeship schemes, clearly have much to gain from an additional flexible learning resource, particularly in the context of challenging trade-offs in the delivery model (at centres, on employer site). There are many concerns over shifting resources away from this group.

Figure 10: Average appropriateness of a MOOC or MOOC-like solution for each age group



Source: Cairneagle Associates teacher survey

“At the age of 11-14 children need parental support and teacher's support directly and guided instructions; at 14-16 they need the support of subject experts but can begin to self-study; at 16-19 they are equipped to self-study with little support from a professional expert in any form (including online) for any field.” Respondent to the Cairneagle teacher survey

Conclusion: opportunities to realise the potential for MOOCs for 11-19 year old learners

The research clearly indicates that MOOCs and MOOC-like platforms can yield significant benefits for significant segments of learners. In this final section we review some of the issues holding back experimentation and deployment, and identify some avenues that may unlock these benefits.

- **Most teachers do not have enough familiarity with or understanding of MOOCs to be comfortable using them.** Those teachers that have tried MOOCs themselves (as learners) are significantly more enthusiastic about the potential to use them in their teaching.
 - MOOCs, as an emerging component of the teaching toolkit, should be a component of teacher training. All teacher-trainees should experience a MOOC. This would not require very much in terms of development; there are many subject-specific MOOCs to choose from, including many that are short.
 - Teachers should be encouraged to experience a MOOC as part of CPD. There are many MOOCs in the US and Europe that are focused on teacher development and the acquisition or sharpening of classroom skills, planning skills, content development skills etc. The vast majority of these are free at the point of use. The European Schoolnet Academy MOOCs¹⁷ are specifically designed for teachers, and the UK DfE is a stakeholder in the organisation.
 - Best practice and successes should be upheld and celebrated. The overwhelming majority of MOOC deployments are not looking to replace or undermine teachers, but to increase their effectiveness.

“In education, change comes from the bottom up – you need to find ways to uphold best practice, and show both teachers and school leaders the impact that new approaches can have.” Sherry Coutu, Technology Entrepreneur and Investor

- **There are relatively few MOOC courses available that are focused on and suitable for school-age learners.** So far most are being funded by government / social enterprise on a project basis, and so far these have focused on niches in Key Stage 5. There is beginning to be some commercial activity, but uncertainty persists over the mainstream appetite from schools / teachers, and over the commercial model.

¹⁷ <http://www.eun.org/academy>

- If funding is needed to unlock investment, then the next “tranche” of funding might be allocated to mainstream deployment in Key Stages 3 or 4. This is the area that will yield the greatest (although not necessarily most concentrated) benefits, and where there is most learning to be done.
- There will be benefit in funding commercial or part-commercial initiatives, on a modest scale. The uncertainty over feasible business models is holding back investment from a number of groups that should be involved in MOOCs. Showing the potential to realise commercial value will do much to stimulate involvement.
- **It is hard for teachers to set up their own MOOCs.** Many teachers like to control their class time, and invest very significant amounts of time in developing and sharing material; however video content is much harder to create than text or graphical material. There are already open-source platforms that can hold and serve a MOOC (e.g. Moodle, Google Coursebuilder). Most VLEs can be set up to deliver courses into the classrooms, and even on the school premises. Some can serve students outside of school.
 - This could be made easier through improvements in sharing facilities, and by “priming” an archive with public domain video content.
 - There are teacher networks that could facilitate this (TES Online is the principal one), but current video content is relatively limited and often not in a form where it can be adopted into a course (for example, the video may be embedded). Relatively small changes could emphasise the opportunity for self-made / shared MOOCs, and stimulate content creation from teachers.
 - Alternatively, it is possible that a public teachers-for-teachers sharing platform (comparable to the grids for learning) might help with this, but the long-term sustainability of such a site must be questioned.
 - Video content availability could be primed with public domain material (for example both BBC Bitesize and OpenLearn have large archives – and collaboration between them would have especially good coverage).
- **There appear to be specific opportunities to create significant value for UK schools, teachers and learners.** These opportunities include provision for gifted & talented students, for supporting low take-up subjects, and for exam preparation.
 - There may be benefit in further research into one or more of these areas, to develop and test the pedagogical grounding of the proposition, to establish commercial feasibility, and to assess the real benefits by piloting with schools.

- We strongly urge that some of this research be focused on the commercial requirements and opportunity, to help stimulate development and investment from the private sector.
- **There is no measure of participation in those school-age MOOCs that are not linked to qualifications.**
 - A consistent framework of “badges” for participation in extracurricular or additional study could, at the margin, support learner take-up of courses not linked to qualifications.
 - In addition, this would make it easier for HEIs or employers to understand (and credit) the level of commitment and interest that a particular course of MOOC-supported study implies.
 - Such a framework would in no way have to be exclusive, but for it to be credible it would best be established independently of any individual MOOC provider.

“The key point with this new technology is that if [the UK] doesn’t take a leading position and sell it to the world, then the rest of the world will build their expertise and sell it to us. We can’t avoid the influence – only catch (or miss) the bus.” Bob Gomersall, Chairman, Virtual College

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