Online learning resources: a creator's perspective

INTRODUCTION

For the last two decades, computers and the internet have been central to education. They are essential tools which allow educators to be creative and collaborative with their teaching, and to enable students an instant and 'always-on' access to content (Fig. 1). As a learning tool they are indispensable and at times frustrating, but increasingly they will provide the greater proportion of students' total quantum of learning. With changes in the way information is accessed and courses are delivered, as well as the omnipresent nature of the internet, education bodies need to be cognisant of newer ways to deliver information, and the ways in which contemporary technologies may be used to address some of the difficulties the modern surgical trainee faces in gaining knowledge and proficiency.

While the benefits of digital education are clear, there are a number of prominent potential issues:

1. Inconsistent content with a lack of peer review.
2. Excess volume of content, making it hard to distinguish which will provide the 'best' resources.
3. Content which is made inaccessible due to cost.
4. Content which is made inaccessible by institutional firewalls or by platform incompatibility.
5. Confusion and consternation over the risk of infringing copyright.

These issues are in varying stages of resolution, but each provides a potential bar to the delivery of consistent, quality education. However, the trend in each is very much towards improvement.

A POTTED HISTORY OF ONLINE EDUCATION

The modern internet is based on the early protocols devised by Tim Berners-Lee in 1989 to communicate between academic institutions. From the mid-1990s onwards, personal access to the internet has increased exponentially to become an almost universal tool for learning. Access to the internet for students has been essential for more than two decades, and its uses have increased in parallel with its popularity. The increasing portability of the internet and ubiquity of access have been dual drivers of its importance in education. This move towards portability began with the laptop in the late 1990s, followed closely by wireless internet access. It accelerated ten years ago with the development of personal digital assistant devices, followed by the release of smartphones such as the Apple iPhone (Apple Inc., Cupertino, California), an effect amplified by wider access to tablet computers such as the iPad. We have now reached the point where it is safe to assume that almost all students and doctors are carrying an internet-connected device with them at all times (Fig. 2).

For a long time the primary method of access to information on the internet was via Internet Explorer (Microsoft Corporation, Redmond, Washington), first released in 1995. Therefore, the primary method of distributing learning materials if you were an educator was through websites. Often this was done through host institutions that created the online framework through which written notes, Microsoft PowerPoint slides, and other materials such as audio files, could be distributed. This had the advantage for educators of removing the need to learn how to create a website. It had the knock-on effect, however, of restricting access to these teaching materials to students studying within their institution. Open access websites such as Wikipedia, which launched in 2001, offered a very popular alternative with freely available content, updateable by the user in a distributed contribution model.

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Fig. 1 Access to online resources has changed dramatically over the last 20 years.

Fig. 2 The range of content which can be integrated is large.

Over the next two decades, websites remained the most popular method of access to information for students. However, the landscape is now changing. Smartphones and tablets run a wide variety of applications. These applications bypass web browsers to become the primary portal for access to information.

Access to online resources has changed dramatically over the last 20 years. We are therefore presented with the same dilemma as we were 20 years ago. Very few of us will learn how to programme an application, and so in order to follow the demand for delivery of portable learning materials accessible on a range of devices, we need to rely on others to provide a framework to allow us to distribute learning materials. Thankfully, the mentality of protectionism towards content is changing. There is a marked shift in the delivery of research towards an 'open access' approach. This approach is being mirrored in education content, a shift for which the podcast format (which has always been freely available) has probably been at least partly responsible.
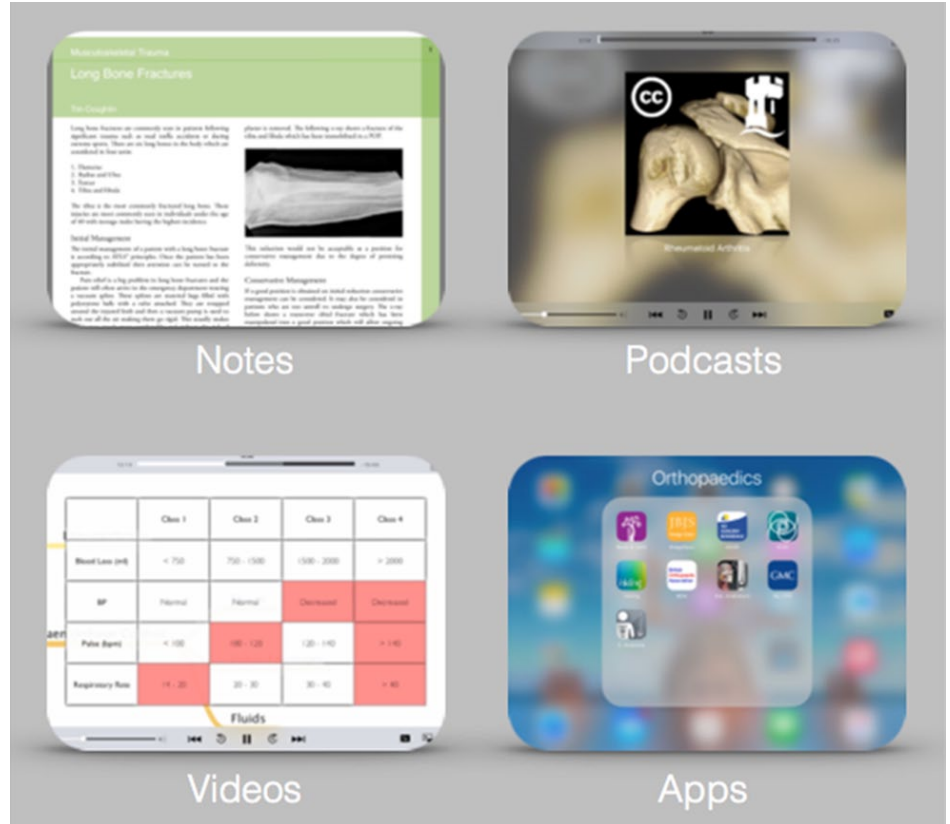
iTUNES U

iTunes U was created as a platform through which educational institutions can create open access online courses for their students. It is part of a wider move in online education to wards the 'massive open online course' (MOOC). These courses are not intended to result in a qualification, but are often (though not exclusively) used to augment traditionally taught courses. When used as an adjunct to in-person teaching, there is good evidence that reading overall is improved and examination performance increases.[1]

A variety of content can be assembled using the iTunes U format including documents, videos, audio podcasts and eBooks (Fig. 2). Links to websites can also be integrated into the 4000 or so medical applications currently available.[2]

This content can then be structured into topics which in turn are subdivided into lessons.

Each lesson has a text introduction to the assignments attached. The assignments are typically to read a document and review an audio or video lecture with follow-up to access a book chapter or a certain website. Students can check off assignments as they complete them to finish a lesson. Lessons can be completed in any order for focused learning, though the format of the course also provides an overall syllabus.

One concern which is often voiced is that, by making online resources available, physical attendance at actual lectures may be damaged, with a resultant fall in attainment – precisely the opposite of the desired effect. There is some evidence that when given the choice of accessing a course online or in person, 80% maintain attendance at in-person teaching. Interestingly (or worryingly, depending on your perspective), those students who replaced in-person teaching

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with an iTunes U course ultimately showed no fall in attainment.[3]

By providing a common platform, iTunes U allows educators to simply upload their content, avoiding the need to understand programming while giving the end user an application-like feel. The quality of the content on the platform is maintained by requiring those who upload material to do so as part of an established academic institution. A key benefit of using iTunes U is that by allowing a student to download a course for offline viewing, it removes the need for a live internet connection. While courses can be made private to the institution, many are made freely available internationally, likely due to the potential for positively reinforcing the brand image.

CREATIVE COMMONS LICENSING

One of the difficulties with creating and distributing educational content is the risk of breaching copyright. The safest way to avoid this is to meticulously ensure that all content is your own, including photos, videos and diagrams. When the desire is to create fantastic-looking, high-quality content, this can be prohibitively time-consuming. The result of this being, of course, that in the past, each educator interested in creating online resources either had to compromise on quality or reinvent the wheel by recreating each picture, video and diagram for themselves, thereby avoiding copyright breaches.

The solution to this problem has been presented by the Creative Commons licence. Creative Commons is a non-profit organisation which has made available a series of free copyright licences.[4] These licences are themselves based on the copyright principle of allowing some rights to be reserved, but they remove the need for others to specifically seek approval before reusing material. There are a number of degrees of 'protection' available, depending on which licence you choose to 'stamp' your content. Figure 3 depicts a standard licence. The

Fig. 4 Word cloud of student feedback taken over the last 12 months. The relative importance by frequency of the use of each word is denoted by its size.

Fig. 3 Standard Creative Commons Licence and logo for Learn Orthopaedics. 'CC' denotes the presence of a Creative Commons licence, BY requires attribution, 'NC' restricts commercial re-use and 'SA' requires the user to share alike.

'CC' logo refers to the presence of a Creative Commons licence on the work. 'BY' requires others to attribute the work to the authors when they re-use it. 'NC' restricts repurposing for commercial gain and 'SA' requires that any derivative work also be shared under the same licence.

These licences have proved popular regarding the generation of a range of digital content (not just educational resources), and allow for a more collaborative approach to content creation without the concern that work may be used without attribution to the author(s) or for other than the intended initial purpose.

HISTORY OF *LEARN ORTHOPAEDICS*

My own experience of releasing educational content began with a 2016 podcast called the MedSchool Finals Podcast. This was one of the first medical education podcasts and was very successful in its time. The response was instantly positive, with a typical review reading,

> "It's great to be able to get some lectures for revision when there are so few out there."[5]

The podcast was simply recordings of lectures which I delivered live to medical students with colleague Dr Wadhwa. They were made available online and via a website, with the PowerPoint lecture slides available for download. We showed that in 2011 the uptake of audio podcasts by medical students was 98%, with well over 90% owning a portable media player. Support for their use as a supplement to teaching was very high, although the concept
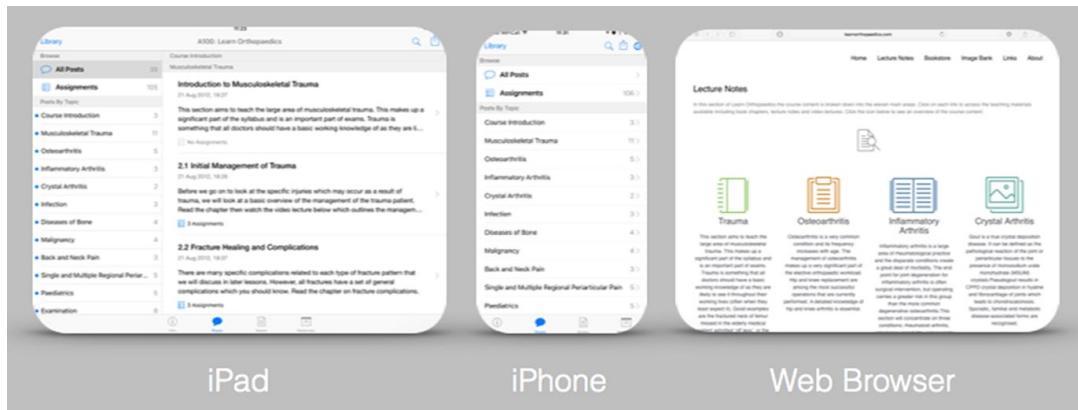
Fig. 5 Cross-platform compatibility. By making identical content available on a web browser as well as through iTunes U it ensures cross-platform compatibility.

of a podcast replacing lectures was poorly received.[6] Podcasts or audio recordings have been widely adopted within the orthopaedic fraternity, with resources as diverse as the Miller Review course and additional content from *The Bone & Joint Journal* being made available.

In 2010, the first version of my educational resource, *Learn Orthopaedics*, was made available online.[7] The content available was initially video lectures and audio podcasts, with written lecture notes following shortly after. I revised the website in 2012 and asked for the support of the University of Nottingham to publish the content in a more structured way through the increasingly popular iTunes U platform.

Learn Orthopaedics is now on its third major revision and has proven incredibly popular, with over 20 000 students enrolled on the course through the iTunes U platform and 5000 new students being added consistently each year at a rate of one every two hours. In the UK it has a rating of 4.5/5 stars and is regularly in the top ten most downloaded health and medicine courses (of more than 200 available). It has also reached the top ten in 23 of the 31 countries where it is available, with locations as diverse as India, Canada, Cambodia and Venezuela. The wide variety of countries is exciting, with success reported in using online courses to provide much-needed training in locations where access to teaching is lacking.[8]

STUDENT FEEDBACK
One of the elements that has always shaped *Learn Orthopaedics* is student feedback. When developing online resources where the content creator is often not face-to-face with the learner,

it is essential to seek out feedback and take it on board. Figure 4 shows recent feedback formulated into a word cloud.

This draws out quite clearly the aspects students currently feel are important. The success of *Learn Orthopaedics* is not due to a 'flashy' app or company sponsorship; it can be summarised in five themes from the feedback:

1. **'Great' and 'Resource'** At its most basic, a resource is a source of help or information. By creating a well-defined collection of learning materials which are relevant to students, this will ensure that the resource is used and that learning potential is maximised.

2. **'Important' and 'Topics'** The syllabus of the University of Nottingham was used to structure *Learn Orthopaedics* so that the students can clearly see the relevance of each section and how it integrates with their learning objectives.

3. **'Concise' and 'Revision'** When considering the level of detail for online learning materials, the trend is for students to want more concise and revision-focused materials. Online resources are not likely to supplant traditional print media in the near future and so their focus should be in providing clear study points to direct further learning.

4. **'Layout' and 'Clear'** Online content must present a high-quality design if students are to engage with the material. It is easy to be lulled into a false sense of security since students we teach directly are likely to accept any materials we create, partly because they know (and hopefully respect) us as educators and also because they have a clear sense of

how what we create relates to their learning needs. However, a student using a different system on another continent will perform a superficial quality assessment based on how content is presented. They will judge the book very much by its cover.

5. **'Free'** The fact that a resource is free, and free from advertising or sponsorship, is one of the most important factors, both in the financial sense as well as in terms of access. A very small number of internet resources may be able to make a significant income, but, by and large the barriers to setting up a paid-for website mean that the relatively modest benefits are outweighed by the narrowed scope for learning.

PERSONAL INSIGHTS
At the beginning of this article I outlined some of the problems facing modern online resources. Using a platform as the basis for content such as iTunes U, Coursera or Xerte allows students to identify content which is likely to be of a higher quality as it is endorsed by an organisation. However, in order to maintain a platform-agnostic approach it is important to have content mirrored on a website so that all students are able to access it (Fig. 5).

By making all material available under a Creative Commons licence, while borrowing images which are licensed under the same licence, it is possible to create content where there is no chance of falling foul of a breach in copyright, and at the same time contributing to the community which had made it possible.

The running costs for a website are relatively modest. Over the last five years the cost of registering a 'dot com' domain name, paying for

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website hosting and a one-off payment for website design software has totalled less than £100 per annum. It is therefore relatively easy to make the content available for free to students, maximising its impact. Looking to the future, given the volume of material available online, it is likely that peer review of resources will become more and more essential, and *Learn Orthopaedics* will have all content peer-reviewed.

Peer review is what has largely differentiated online content from traditional print. Retaining peer review will provide peace of mind for students, knowing that a level of quality has been required of the content before publication, and that the content from which they are learning has been judged to be accurate and at an appropriate level. Once this becomes the norm, online learning resources will take their place as the primary source of learning to complement quality, in-person teaching.

CONFLICT OF INTEREST
None declared

REFERENCES

1. **Gonzalez NR, Dusick JR, Martin NA.** Effects of mobile and digital support for a structured, competency-based curriculum in neurosurgery residency education. *Neurosurgery* 2012;71:164-172.

2. **Seabrook HJ, Stromer JN, Shevkenek C, et al.** Medical applications: a database and characterization of apps in Apple iOS and Android platforms. *BMC Res Notes* 2014;7:573.

3. **Paul S, Pusic M, Gillespie C.** Medical student lecture attendance versus iTunes U. *Med Educ* 2015;49:530-531.

4. **No authors cited.** Creative Commons. About the licenses. https://creativecommons.org/licenses/ (date last accessed 24 October 2016).

5. **No authors cited.** MedSchool finals podcast. http://www.podfeed.net/podcast/MedSchoolFinalsPodcast/8899 (date last accessed 24 October 2016).

6. **No authors cited.** Learn orthopaedics. www.learnorthopaedics.com (date last accessed 24 October 2016).

7. **Coughlin TA, Jones KI, Lund JN, et al.** The uptake of podcasting and portable media players amongst UK medical students. *Med Teach* 2011;33:85.

8. **Abraham R, Vyas D, Narayan M, Vyas A.** Strategically leapfrogging education in prehospital trauma management: four-tiered training protocols. *Am J Robot Surg* 2015;2:9-15.