Online technology for teaching and learning - gains and losses

This commentary describes recent developments in the use of online technologies for teaching and learning and considers what has been gained and lost.

Although Marc Prensky's 2001 description of "digital natives" (Prensky, 2001) - those who were "born digital" - is now largely disowned (including by Prensky himself), it has inevitably come to shape thinking about educational technology. It is undeniable that the Internet has changed most aspects of our lives in some way, yet there is scant evidence that the online world has fundamentally altered how we think or learn. Teenagers now hang out with friends on Facebook rather than in parks or on street corners, but the interactions are much the same as they ever were. In an introduction to a new F1000Research channel, Graham Scott writes:

"We assume that digital literacy and access are common to all who teach and communicate their science and to their audiences. We also assume that our digital communication is effective and that by using digital technologies learning experiences are enhanced. But are these reasonable assumptions to make?" (Scott, 2015)

The flipped teaching approach requires content delivery, whether text- or multimedia-based, to occur outside of the classroom and to replace traditional live lectures. Academic–student contact time is then used for interactive activities aimed at facilitating deeper conceptual understanding of the subject material (O’Flaherty & Phillips, 2015). Ideally, a successful flipped class approach improves student engagement, both within and outside the class. In reality, flipping is frequently a challenging task for students and academic staff alike. The potential for educational gains (and possible cost saving) are there, but support and persistence is likely to be needed to achieve success. Massive open online course (MOOC) style of flipped learning has received the most media attention over the past two years (Haggard et al, 2013). Thankfully, the initial hysteria around MOOCs revolutionizing education and sweeping universities away has now subsided. In its place have emerged more realistic thoughts about the impact of free online education. However, MOOCs have refocused attention onto open educational resources (OER), a potentially valuable area where content provision has ridden ahead of an underlying pedagogy (Knox, 2013). Valuable OER resources are out there - images on Flickr, videos on YouTube, explanations on Wikipedia. This article discusses social media and mobile technologies and considers their positive and negative aspects.
Social Media

Traditional media usually portray social media (computer systems that allow users to create and share information, ideas and content via online virtual communities and networks) as flat and monolithic in structure. In reality, nowhere has the complexity of the Internet and its influence on young people’s lives been portrayed as well as by danah boyd in her recent book *It’s Complicated: The Social Lives of Networked Teens* (boyd, 2014). Boyd reminds us that the hysteria surrounding the Internet is only the latest incarnation of the end of the world, and that Socrates warned of the dangers of the alphabet and writing, citing implications for memory and the ability to convey truth (sound familiar?). She is particularly eloquent on technological determinism and the idea that the Internet is unique and cannot be compared with anything that went before it:

"Utopian and dystopian views assume that technologies possess intrinsic powers that affect all people in all situations the same way. ... These extreme rhetorics are equally unhelpful in understanding what actually happens when new technologies are broadly adopted. Reality is nuanced and messy, full of pros and cons. Living in a networked world is complicated."

Social media is, generally speaking, “free” to education providers because successful projects tend to hook into existing sites where student attention may already be focussed rather than trying to create artificial, closed, small scale networks (Bik & Goldstein, 2013; Maleko et al, 2013). This means that there are no infrastructure limitations (beyond the provision of adequate wifi connectivity) as social media access tends towards “bring your own device” (byod) models where students provide their own phones or tablets. On the other hand this means a variety of user experiences which must be taken into account when designing any activity. This apparent loss of control over students goes hand in hand with perceived institutional risk (reputation) in the public sphere. Although such risks are usually overstated, there is certainly a need to pay attention to professional development of students to minimize risk of career damage.

And yet real changes are occurring on the Internet as it becomes a mature medium which has discovered what is effective online, particularly in terms of monetization. Doors are closing around the Internet. Net neutrality is a serious concern - will we have one internet or many? The big players - Google, Facebook and Buzzfeed - have discovered that monetization requires building a lobster pot for online attention - if you send your students to Facebook will you ever get them back? However, if
If you’re willing to take the risk, there is a lot of high quality microbiology information available via Facebook (Table 1).

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<tr>
<th>Organization</th>
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<tr>
<td>American Society for Microbiology</td>
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Table 1. Microbiology pages on Facebook.

The growing neoliberalization of the online world is about control, generating tension compared to the early blue sky days. This narrative runs parallel to other changes in education (Kahn, 2015). We now have the Internet as infrastructure, commoditized and packaged. How would your working week go if the Internet were not there on Monday morning? The economies of scale are attractive to the online giants and education providers alike - more users, more students. The online world works because of scale rather than depth. Billions of people use Facebook daily, but what do they use it for? Popular sites such as Buzzfeed (just Google that if it’s not familiar to you) are notorious for dumbing down and the invention of the listicle, short-form writing that uses a list as its structure, fleshed out with enough copy to be published as an article: "10 things you should know about E. coli". But as boyd (2014) has warned us, any over simplistic view of the Internet is flawed. At the same time as becoming notorious for items such as "29 Cats That Forgot How To Cat", Buzzfeed has also invested heavily (US$50m) in longform journalism, including science journalism. Does it matter where people read about microbiology? (Ghorayshi, A. (2015) Mail-Order Viruses Are The New Antibiotics http://www.buzzfeed.com/azeenghorayshi/mail-order-viruses-are-the-new-antibiotics; Dan Vergano, D. (2015) Africa At Risk Of Ebola Flare-Up, WHO Leaders Say http://www.buzzfeed.com/danvergano/africa-at-risk-of-ebola-flare-up-who-leaders-say)
Mobile technologies

For all the buzz around social media the really big impact of recent years has been from mobile technologies and information interfaces. The byod movement stresses reduced infrastructure costs, convenience and the potential for engagement with new forms of delivery. Set against this are the challenges presented by mobile technologies – an expectation of reduced response times or immediate responses, and the always on nature leading to reduced separation of work and private life, causing stress and anxiety for staff and students alike (Lepp et al, 2014).

Academic staff frequently feel that they lag far behind students in understanding and familiarity with mobile technologies, although the true picture is complex (Cochrane, 2014). Commercial organizations have adapted to the 24/7 mobile world much faster than academics. While it is unthinkable to someone of my generation that anyone would choose to read an academic paper on a mobile phone, that is a frequent occurrence in my experience. Although students push the boundaries of content delivery on mobile devices, the old formats do not work effectively on small screens. Longform text needs to be broken into small chunks and visual or audio content is frequently preferable to any text at all (Ekanayake & Wishart, 2014). However, mobile bandwidth is frequently limited (or expensive), and so video is not always a viable choice to replace text. Audio content shows much promise, for example for academic feedback, and there has been a resurgence of interest in podcasts, for example Vincent Racaniello's *This Week In Virology* (http://www.microbeworld.org/podcasts/this-week-in-virology). Adapting to mobile technology requires considerable thought and planning - it’s not simple to switch from text-dominated to multimedia content, which is one reason why academia has lagged behind in this area.

Summary

In an era where so much information is available from so many different sources, characterizing science education dichotomously as either “formal” or “informal” no longer makes sense (Falk et al, 2015). For all the rapid evolution of technology in recent years, academics have been slow to adapt and even slower to adopt the most effective formats and techniques (Shelton, 2014). However, the adoption of new technology has frequently had a negative effect in promoting over assessment! Even though constructive alignment of the interdependence of learning outcomes, teaching
methods and assessment is widely accepted (Biggs, 1996), the availability of shiny new electronic
gizmos sometimes overrides sense.

Yet the overall picture is not so bleak and there have been wins. YouTube is an example of this with
its accidental invention of the perfect OER - ideal unit size, hosted by a trusted brand, cross platform
availability (Grant, 2015). Millions of people are now receiving microbiology education via a plethora
of informal channels. Once academia catches up with the altered technology landscape, the future
looks bright for an educated public (Jandu, 2012).

References

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Maturing of the MOOC: literature review of massive open online courses and other forms of online


