Moving beyond the hype:
A contextualised view of learning with technology in higher education

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Preface

Wendy Kilfoil

Universities South Africa (USA) is a grouping of the Vice-Chancellors of public universities (http://www.hesa.org.za/)[1]. Since 2005, the organisation has provided leadership and an authoritative voice to the newly transformed public university sector after the mergers. In addition to the HESA Board, comprising Vice-Chancellors, the organisation has set up structures to anticipate debate, and influence and respond to policies, trends and complex challenges that affect higher education nationally and internationally. The Teaching and Learning Strategy Group (TLSG), led by a Vice-Chancellor, is one of those structures. The TLSG harnesses sectoral expertise to carry out its work. It also, from time to time, appoints task teams to work on particular themes.

One of the focus areas for the TLSG for 2014 was learning with technology. A great deal of hype surrounds technology that, combined with the speed of change, complicates a complex phenomenon to the extent that it can become difficult to make decisions about the best technology choices for South Africa in general and each institution in particular, given the historical legacy of material conditions at each university. When finances and other resources are constrained, universities need to decide on the best investment in technology to promote student learning in their mainstream qualifications and for their strategic goals. As universities, the guiding principle must be student learning and not technology as such. Theories of learning become a map for how the student engages with technology. The objective of the study is to enable Vice-Chancellors to take the document to the executive leadership at their universities and discuss a change management strategy on the integration of education technologies into their universities, given their educational mission and their individual contexts, enablers and constraints.

The TLSG therefore decided to bring together experts to write position pieces on a number of issues to serve as input for Vice-Chancellors to guide decision-making at their institutions. These experts had to:

- be working in the field of educational technology in South Africa as academic, academic development or support staff;
- have a national reputation for the area of expertise; and
- be knowledgeable about international trends, but able to contextualise them for South Africa.

It is understood that the publication would need frequent updating given the dynamic nature of technological development.

It is intended that each piece will adopt a critical, theoretical stance that engages with the matter of learning, while being clear and simple; give a clear explanation of the technology and its affordances; discuss the current trends internationally and their applications in different South African contexts; broadly outline costs of licensing, infrastructure and personnel; and provide resources for further reading. However, some pieces are of a more theoretical nature to provide pedagogical insights into the use of technology in education and map discourses around technology-enabled approaches to learning.

The TLSG approved the publication of the document under a Creative Commons licence as an open educational resource for use by other institutions. It also agreed to the writers being allowed to expand the publication into a research publication.

Educational technology is a broad focus at all levels of education in South Africa. For the university sector, the Department of Higher Education and Training (DHET) and the Council on Higher Education (CHE) provide strategy and policy.

The DHET's publication, *White Paper for Post-School Education and Training – building an expanded, effective and integrated post-school system* (DHET 2013), starts with an emphasis on social justice. Section 7 deals with 'Opening learning through diverse modes of provision' and section 7.4 deals with 'Equitable access to appropriate technology'. The publication is cited in various contributions to this volume. The DHET has promised to 'elaborate a concrete development plan for the period up to 2030' (DHET 2013:7).

The CHE has focused on the quality imperatives around burgeoning online technologies used for distance provision and, in 2014, launched its publication *Distance higher education programmes in a digital era: Good practice guide* (CHE 2014). A focus on the quality of teaching with technology and on its impact on students' experience and success is an approach supported by the TLSG.

This publication deals with clusters of issues:

Contexts

Vivienne Bozalek and Dick Ng'ambi deliberate on learning with technology in the South African context and the reasons why it is so important to enhance the access and skills of students from disadvantaged backgrounds possibly entering universities where, for historical reasons, infrastructure is not optimal.

[1] This URL will change to accommodate the change of name of the organisation from Higher Education South Africa to Universities South Africa.

Teaching approach/ model

A number of articles deal with this theme from different perspectives:

Alan Amory discusses some models to support learning and teaching with technology. A team comprising Antoinette van der Merwe, Vivienne Bozalek, Eunice Ivala, Lynette Nagel, Marí Peté and Cassim Vanker explore the concept of blended learning.

Distance education has played a significant role in higher education in South Africa and Maria Madiope and Devan Govender go into supporting technologies for open distance learning (ODL), focusing mainly on the University of South Africa (Unisa), but also acknowledging that many other South African universities offer forms of distance education as well. Underpinning the ability to teach or learn with technology are digital literacies, which Cheryl Brown and Tabisa Mayisela discuss.

Just as learning to teach is important, so is professional development for teaching with technology. Detken Scheepers gives pointers on this topic.

Openness

The concept of open education is an altruistic one: creating and sharing objects or courses with people and higher education institutions that might not have the capacity to produce such resources on their own. Open educational resources (OERs) are considered by Cheryl Hodgkinson-Williams and Glenda Cox. As an extension of the OER concept, the notion of massive open online courses (MOOCs) has arisen, and Laura Czerniewicz, Andrew Deacon, Mary-Anne Fife, Janet Small and Sukaina Walji discuss the rise and implications of MOOCs for education.

Devices as 'windows on the network'

We did not start our review with technology. Planning a curriculum involves focusing first on outcomes, content and assessment and then on the technologies that will help achieve the outcomes, that will best support student learning and the creation of more self-directed learners. However, Cheryl Brown and Nicola Pallitt discuss personal mobile devices (PMDs) and laptops as learning tools.

Trends

A number of articles survey trends in learning with technology. Daniela Gachago and Eunice Ivala explore Web 2.0 and social media: essential tools for contemporary teaching and learning; Nicola Pallitt, Sonja Strydom and Eunice Ivala write about e-portfolios; and Dennis Kriel writes on gamification. Working online allows for easy tracking of student activity within a module, and learning analytics (LA) is explored by Dolf Jordaan. However, we need to be aware of ethical considerations in using student data, as Paul Prinsloo and Michael Rowe warn.

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Council on Higher Education (CHE) (2014). *Distance higher education programmes in a digital era: good practice guide*. Pretoria: CHE.

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The context of learning with technology

Vivienne Bozalek and Dick Ng'ambi

This introductory article looks broadly at the importance of a pedagogical focus that is informed by context, learners' needs and appropriate pedagogical principles when considering technology and learning. A brief overview of current international trends is given. Universities are cautioned against the trap of adopting technologies for learning simply because they are in 'fashion' globally. The bulk of this article examines the current South African landscape and the pros and cons of various pedagogical approaches for learning with technologies.

Recommendations

- Pedagogical creativity that is cognisant of context, learning goals and prior knowledge of students to inform choice of technologies.
- More exploration of cloud-based information and communication technology (ICT) infrastructure for 'unlimited' educational possibilities to achieve the intended desired attributes of graduates.
- The importance of understanding available technologies and drawing pedagogical insights from user-driven initiatives.

Learning with technology

Learning with technology is often confused with learning about technology or learning technology. The understandings associated with these constructs differentially affect how educators approach teaching in relation to technology. Learning with technologies has a pedagogical focus, whereas learning technologies focuses more on the technology itself. Meaningful learning requires learning tasks to be aligned with both learning outcomes and teaching strategies, yet to take cognisance of a learner's prior knowledge and competencies, and the technologies available to the learner. It follows that learning with technology is about ways of appropriating technologies to achieve meaningful learning. The primary consideration for learning with technologies should therefore start from an outcome of accomplishing meaningful learning, and work backwards, asking pedagogical questions, interrogating strategies of teaching and evaluating the affordances of technologies to support this end (Ng'ambi et al. 2013). As can be seen from this approach, technology is invisible in well-designed learning activities because learners focus more on the task at hand and less on the tools needed to accomplish the task. For example, educators could design collaborative and participatory tasks using different tools; hence, the emphasis on teaching with technology (Johnson et al. 2014) and not teaching technology, although technological skills are acquired in the process.

Current trends internationally

The New Media Consortium (NMC) was established in the early 1990s with the aim of recognising and supporting innovative uses of 'new media' technologies, in particular contexts and periods/time frames. NMC is particularly useful for higher education leaders and policy makers as it provides an overview of what are considered to be innovative practices in higher education, given the affordances of the technologies of the time. Each year, NMC and Educause publish the *Horizon Report* for higher education, which gives an indication of the trends and technologies that will lead to changes in higher education. The *Horizon* reports predict the impact of a set of key trends on higher education institutions (HEIs) in terms of drivers for the adoption of learning with technology for the forthcoming five years, as well as imminent changes in the next one to two years. The reports also identify challenges that are predicted for universities in terms of learning with technologies. The *NMC Horizon Report: 2015 higher education edition*, for example, predicts two long-term trends: a focus on the importance of flexibility and innovation in learning environments, as well as increasing collaboration between HEIs (Johnson et al. 2015). A solvable challenge identified in the report regarding learning with technology in HEIs was the need to improve digital literacy, both among academics and students. Another important, but difficult (wicked) challenge, to which the *Horizon Report* alludes is transcending the binary between the elevation of research and devaluing of teaching. The report proposes that a possible solution to this would be to provide incentives to academics so that they are motivated to teach with technologies, as well as developing more sustained and in-depth professional development strategies. With regard to up-and-coming trends in learning with technology, the *Horizon Report* predicts that bring your own device (BYOD) and the flipped classroom would continue to be popular practices in HEIs, with greater use being made of mobile and online learning. Makerspaces, where technology is used by students to build and design things, and wearable

technology are predicted to become prevalent after two to three years. In five years' time, adaptive learning and the Internet of Things is predicted to come to higher education teaching and learning (Johnson et al. 2015).

The *Horizon* reports, while useful to read for HEIs, are directed at global trends, which seldom align with trends in resource-constrained contexts that grapple with technology infrastructure, such as unstable electricity, low broadband, limited access to smartphones and other related contexts. It can thus be argued that meaningful teaching with technologies is not about trying to use technologies that are trending, according to the *Horizon* reports, but requires sensitivity to the context. This sensitivity to context should inspire creative and innovative teaching with technology, and it is these technologies and their use that could be useful in these contexts. Higher education leaders and policy makers should therefore allow the context of the current South African higher education to inform their review of the teaching-with-technology landscape in terms of policies and practices. The following sections of the article will thus focus specifically on the South African context.

The South African landscape

The South African higher education landscape is sandwiched between systemic contextual problems inherited from past educational policies (Bozalek and Boughey 2012; Leibowitz 2012; Soudien 2012; Fraser 2009) and a generation of limitless possibilities enabled by 'emerging technologies'[2] (Broekman et al. 2002; Veletsianos 2010). These challenges are intertwined, such that both need to be attended to simultaneously because it would be counterproductive to address the inherent problems and neglect the preparation of the future generation. While these challenges are not unique to South Africa, they impact on education policies and consequently perceptions of learning with technologies. The conundrum of being sandwiched is exemplified in *The National Plan for Higher Education* (Department of Education 2001), which noted that ICTs have the potential to bring far-reaching changes in the higher education landscape in the 21st century. The *White Paper for Post-School Education and Training* (DHET 2013) of the Minister for Higher Education and Training recognised the potential for ICTs to provide a more inclusive educational environment, with the possibility of addressing issues of inequality through more flexible forms of delivery that could include rural communities and those who are currently unable to access higher education (Cross and Adam 2007). The *White Paper for Post-School Education and Training* (DHET 2013) also makes strong reference to the necessity of using ICTs in post-school education and for ensuring equitable access by providing infrastructural support. Thus, the South African landscape may have a population whose inadequate access to technologies and infrastructure might appear to justify the use of 'outdated and inadequate ontologies' (Coeckelbergh 2011:87). Matched against the affordances of ubiquitous technologies, there is reason to believe that the phenomenon of leapfrogging is highly probable. However, teaching with technologies in these contexts requires pedagogical creativity for transformative learning to happen and address participatory parity.

[2] Veletsianos (2010:17) defines emerging technologies as 'tools, technologies, innovations and advancements utilised in diverse educational settings to serve varied education-related purposes'.

Participatory parity

While large systemic shifts in the teaching and learning practices of institutions on the whole are not perceptible, multiple opportunities now exist for individual academics and students to shape their own learning and teaching contexts. These opportunities have the potential to provide ways of working towards participatory parity in terms of access and use of technology-enhanced learning practices, extending learning seamlessly across many boundaries and barriers currently thwarting participatory parity, hence the need for transformative pedagogies.

Transformative learning

Although there is increasing support and use of technologies to promote learning, the lack of pedagogical guidelines has resulted in most educators integrating technologies in their teaching without an explicit pedagogical rationale (Ng'ambi et al. 2013). The consequence has been that uses of technologies have not always yielded transformative learning outcomes, focusing on the technical aspects of these tools and remaining on a superficial level (Dabner et al. 2012; Dede et al. 2009). One of the strategies for addressing this challenge is to design learning that is wrapped around students' digital literacies.

Students and digital literacies

Although students' access to digital devices is becoming increasingly diverse, a small, but consistent group of first-year students arrives at university with insufficient access to ICTs and basic computer literacy skills (Nash 2009). In South Africa, the 'insufficient access to ICTs' is a general challenge that is rooted in the fact that only very few homes have computers and Internet access. Most students from such homes could encounter a computer for the first time when they reach high school or even university. On the other hand, most students entering higher education are competent users of mobile phones and have excellent social networking skills acquired through experiential learning. The irony is that the skills and capacities that students have are often not validated or in sync with institutional practices and policies, thus resulting in lost opportunities for engagement with students in learning with their own devices (Ng'ambi and Bozalek in press). Interesting questions and dilemmas are raised about transferring digital capabilities from one technology to another (Magunje and Brown 2013). Mobile application (app) development has given rise to new forms of ensuring the transfer of digital capabilities from one technology to another with an increase in apps for desktops and mobile phones. The point here is that users who are competent mobile phone users do not need to unlearn their skills to acquire new skills before they can engage. For example, in Boyinbode's study at the University of Cape Town (UCT), students used SMS 'lingo' to engage critically with a recorded lecture using mobile devices (Boyinbode et al. 2013). This exemplifies how the students' competency with SMS lingo was encouraged to achieve a pedagogical goal.

Situated knowledge practices

Higher education is now faced with a need to reconceptualise practices such as computer literacy and move beyond a view of students' technical competence to one of situated knowledge practices that students need to use digital tools for communication, expression and

social action in the academic world (Brown 2012). As more students start accessing smartphones, social media use increases and a continued rise in the use of student-owned tools, such as social media, instant messaging or mobile technologies, is seen (Kornberger 2009), widening the potential for emerging technologies to scaffold situated learning practices. Some of these examples of teaching with technology include Bosch's (2009) study at UCT that created a learning activity using Facebook for students to engage with one another and with the lecturer; and Makoe's study (2010) at the University of South Africa (Unisa) that explored the use of social interaction among distance learners using Mxit, a South African mobile chat service. In a book on activity theory, authentic learning and emerging technologies (Bozalek et al. 2015), various case studies representing instances of activity theory, authentic learning and emerging technologies are examined. At the Cape Peninsula University of Technology (CPUT), Morkel and co-workers used Facebook as a cognitive tool to mediate studio-based learning; at UCT, Campbell reported using mobile phones to mediate learning mathematics among students repeating a failed mathematics course; at the University of the Free State (UFS), Rambe and Bere show how WhatsApp was used to foster seamless learning (see case studies in Ng'ambi et al. 2015:216–233). The above examples show that situated knowledge practices can be achieved when technologies with which students are familiar are used for tasks that involve communication, expression and social action in the academic world. These may lead to user-driven initiatives.

User-driven initiatives

Facebook is one of the most widely used mobile applications on smartphones or basic Java-based phones (Barden 2014; Gachago et al. 2013). An emerging practice of using Facebook has been the formulation of micro-communities of people who share interests or participate in similar activities (Bosch 2009). It is these user-driven initiatives, enabled by the affordances of a social networking tool, that have led to an increase in pedagogical explorations of using social media for educational purposes. Although some academics remain apprehensive about embracing user-driven initiatives, there is a general trend towards cloud-based educational tools.

Cloud-based educational possibilities

Another related social practice is the phenomenon of connecting users to the latest stories, ideas, opinions and news using Twitter. Users of Twitter send tweets (short messages with a maximum of 140 characters), and this determines the tweet style. With about 1.1 million South Africans registered on Twitter (Dugan 2011), the tweets are defining a new age of knowledge generosity. Thus, it is evident that there is a clear shift in South Africa's higher education landscape from a relatively low/poor ICT infrastructure, where institutions were solely responsible for both infrastructure and education provision, to a more cloud-based ICT infrastructure with 'unlimited' educational possibilities, and a higher reliance on low-cost, mobile, flexible, ubiquitous technology solutions that are often initiated and provided by academics and students. Twitter has been used successfully in higher education to provide support and motivation for students, and maintain contact with each other (Bennett and Folley 2014). Thus, Twitter is an example of a technology that was not designed for education, but has multiple uses, and has increasingly been appropriated to achieve a learning outcome.

Learning with OERs

Learning can thus be extended through boundaries, and open educational resources (OERs) can democratise access to knowledge, which can open up opportunities for attaining social justice and inclusion in higher education. However, the enthusiasm with which these opportunities have been greeted must be tempered with a criticality, which has hitherto been largely absent in the fervour of enthusiasts who have written about the use of OERs and social media for higher education pedagogy. There are very few studies that are theoretically grounded and provide a critical, analytical lens to examine OERs and Web 2.0 social media, with the exception of Knox's (2013) five critiques of the OER movement, the first of which he identifies as an under-theorisation of openness. The second is the role of pedagogy being diminished, with an untheorised learner-centred model of education. The reality that social media can also be used to extend ignorance and that OERs rely a lot on what feminists have correctly identified as unpaid labour are subjects that have not been considered by these enthusiasts. What is needed are creative ways of theorising critical higher education pedagogies using these contemporary technologically mediated opportunities.

Discussion

Our argument in this article is that, while the *Horizon* reports are a useful dashboard on global technology trends, the mere fact that the massive adoption of a particular technology is predicted should not in itself influence adoption. There is clearly a difference between trends in resource-constrained as opposed to resource-rich HEIs. Understanding context – including technologies available, accessed and for which the majority of students either own, or are familiar with – is a useful point of departure when learning with technology. The contrast to this is dumping technologies on students and staff, simply because funding is available or the technology is reported to be in 'fashion' globally, and hoping for a positive outcome (Ng'ambi and Bozalek in press).

Thus, the main question currently shaping higher education responses is about the role that higher education should play, given that all students now own mobile devices and are socially connected, and that digital content is freely available, including massive open online courses (MOOCs) for those who wish to pursue them. The responses to this phase will define the future of higher education both globally and in South Africa for the next decade. There has been a clear shift in South African higher education from relatively low/poor ICT infrastructure, where institutions were solely responsible for both infrastructure and education provision, to a more cloud-based ICT infrastructure with 'unlimited' educational possibilities, and a higher reliance on low-cost, mobile, flexible, ubiquitous technology solutions that are often initiated and provided by academics and students. While large systemic shifts in the teaching and learning practices of institutions on the whole are not perceptible, multiple opportunities now exist for individual academics and students to shape their own learning and teaching

contexts. Furthermore, the importance of collaboration of HEIs across South Africa to design, share and develop professional development courses, such as postgraduate diplomas in higher education teaching and learning, including courses on emerging technologies, cannot be underplayed.

Conclusion

In this introductory article, the construct of learning with technology has been emphasised and considered from the South African context. This introduction has argued that three main threads are required to achieve meaningful learning with technologies: context, pedagogical creativity and technology. Context has been presented in two ways: the international trends and the South African landscape. The rationale of considering context broadly is that South Africa cannot be isolated from global trends. Pedagogical creativity takes cognisance of the learning goals, the prior knowledge of students and teaching strategies. Addressing participatory parity is a crucial consideration in the continuing unequal South African higher education landscape. Students' digital literacies in terms of the knowledge that they bring to the learning space, access to OERs, and the use of situated knowledge practices all have the potential to lead to transformative learning. Finally, higher education needs to understand the available technologies from the students' viewpoint, as well as the fundamental importance of user-driven initiatives and cloud-based educational possibilities for learning with technologies, towards achieving the intended desired attributes of graduates.

Acronyms and abbreviations

BYOD	Bring your own device
CPUT	Cape Peninsula University of Technology
HEI	Higher education institution
ICT	Information and communication technology
MOOC	Massive open online course
NMC	New Media Consortium
OER	Open educational resources
UCT	University of Cape Town
UFS	University of the Free State
Unisa	University of South Africa

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Models to support learning and teaching with technology

Alan Amory

Learning with technology should not be optional or an add-on in the 21st century. Technology gives unprecedented access to information. However, that adds a responsibility to work with students to engage critically with masses of information to ensure that they achieve the desired learning. A conceptually coherent teaching approach and the integration of appropriate and affordable technology at the design stage will achieve the best results.

Recommendations

- Use educational technology to encourage collaborative problem solving.
- Knowledge *production with* technology is more important than information *consumption from* technology.
- Student engagement with complex learning activities increases time-on-task, which fosters deeper learning.

Discussion and analysis

What do the works of educational theorists and practitioners of the past century (including John Dewey, Jean Piaget, Lev Vygotsky, Jerome Bruner, Paulo Freire, Terry Winograd, Seymour Papert, Lauren Resnick, John Seely Brown, Roger Säljö, John Biggs and Jean Lave) have in common? The learner is an active agent in the process of learning. In order to gain a deeper understanding of the use of technology in teaching and learning, a number of well-known models are explored.

Mishra and Koehler's TPACK Framework

This model is concerned with the complex interaction between content, pedagogy and technology, which can be defined as pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge (see Figure 1).

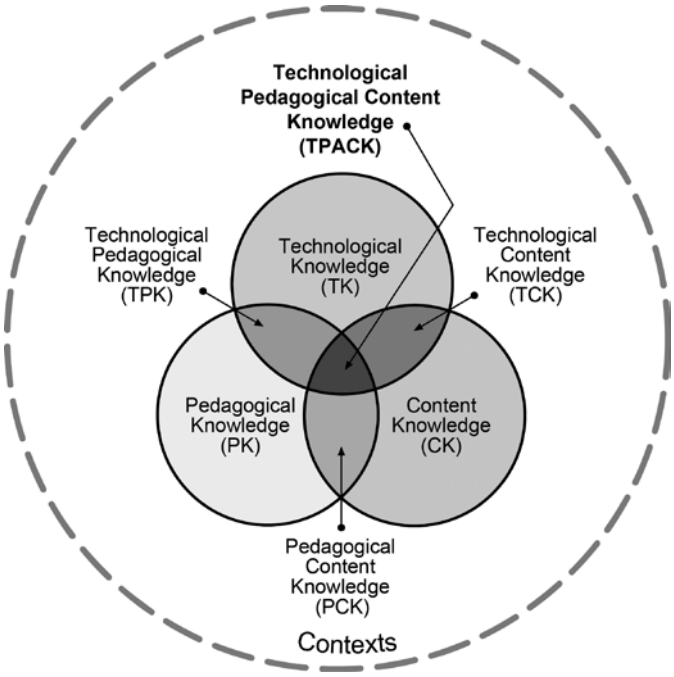

Figure 1: The TPACK Framework and its knowledge components

The knowledge components can be explained as follows:

- *Content knowledge*: Expert subject matter knowledge to be taught.
- *Pedagogical knowledge*: Processes, methods and practices associated with teaching.
- *Technological knowledge*: Technical expertise in using technology, tools and electronic resources.
- *Pedagogical content knowledge*: The way in which teachers are able to represent content knowledge in different ways to support students' prior knowledge.
- *Technological content knowledge*: An understanding of how to use a technological representation of content can influence the ways in which the content might be understood.
- *Technological pedagogical knowledge*: The way in which technology can change the way in which content can be taught.
- *Technological pedagogical content knowledge*: 'TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones' (Mishra and Koehler 2006).

While this model is widely used in primary and secondary teaching, teachers should be experts in content and pedagogical approaches. However, the use of this model might be difficult for those unfamiliar with theories of pedagogy. Furthermore, this model is difficult to use as an instrument to design teaching and learning with technology. The design alchemy approach is a learner-centred approach that is based on a number of pedagogical dimensions.

Rod Sims's design alchemy

Sims's (2014) model includes two components related to pedagogy and learning activity design. A number of different facets are interwoven to create an interesting pedagogical approach:

- Students are expected to be active to create artefacts.
- The learner lives in a specific personal context. Therefore, the context of the students' cultural perspectives, world views, realities and situations need to be considered.
- Tasks are problem-based in order to develop critical thinking and could include hypothesising, criticising, modifying, experimenting, manipulating, comparing and/or choosing.
- Social collaboration is important and individuals can play a number of roles as they work and learn from people. Any member can enact different roles (teacher, writer, learner, designer and builder) during a learning activity.
- The processes are emergent in that students and teachers/tutors/lecturers work together with technology to produce or analyse a product that includes the local situation, is bottom-up, interactive and knowledge generating.

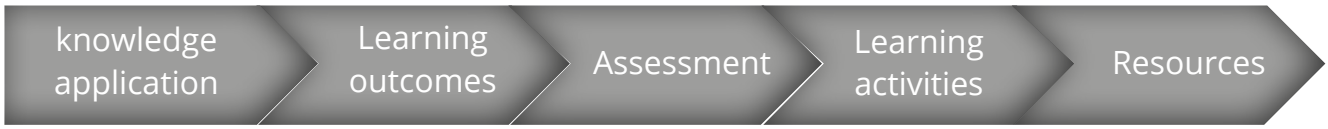

Figure 2: The design architecture

With respect to learning design (see Figure 2), the model suggests that the designer begins the process by defining the knowledge and skills required to complete the module, which informs the learning outcomes, assessment methods, learning activities and finally the resources. The interplay between pedagogy and design is well formulated. However, the integration of technology into the learning activity design is not well developed, which is carefully considered in Laurillard's conversational model.

Diana Laurillard's conversational model

Laurillard (2012) developed the conversational model, which includes interaction between teachers' concepts, teachers' constructed learning environments, students' concepts and students' specific actions (related to learning tasks). She stresses that, for higher-level learning, dialogue must take place at both a theoretical and a practical level. In face-to-face teaching, many interactions are so spontaneous and intuitive that they can be overlooked in the design of technology-supported teaching. Therefore, Laurillard made these interactions explicit and explored learning from a number of different positions, including learning through acquisition, inquiry, discussion, practice, collaboration and/or production. Each of these ways of learning is associated with different types of technology or media.

Learning through *acquisition* is the dominant form of learning worldwide and is an important component of formal education. It includes the narrative presentation of presentations, books and videos, or their presentation in digital form, such as podcasts, web resources and online videos. Students mostly play a passive role in this transmission-teaching mode.

In the learning through *inquiry* approach, students either work on their own or together to develop their own ideas. However, for such an approach to work, the teacher must be integral to the process to guide students to develop an appropriate understanding of a particular topic. Technologies that support this type of learning include online resources, digital libraries, websites and the use of search engines.

Learning through *discussion* is effective for conceptual development as the students are required to express, argue, defend and reconsider their ideas. The effective use of discussion requires a skilled teacher-facilitator. Online conferences, forums, chat rooms and social networking systems support this form of learning.

In the paradigm of learning through *practice*, students need to make use of their knowledge, skills and attitudes to solve a particular task. The teacher is often absent and students learn through doing (imitation or apprenticeship). This approach has always been an important part of our education system. Theoretical approaches to learning through practice include constructionism (students learning about the world by making something in the world), authentic and situated learning (part of constructivism and situated in a real-world context) and experiential learning (includes concrete experience, reflective observation, abstract conceptualisation and active experimentation). Intrinsic and extrinsic feedback to students is an important component of this approach. Technologies that are useful to learning through practice include adaptive tutoring programs, MicroWorlds, simulation environments, role-play simulations, serious games and immersive environments.

Often allied with learning through discussion is learning through *collaboration,* which has been shown to be a most beneficial teaching and learning technique. Laurillard describes learning through collaboration as a combination of learning through practice and discussion. Furthermore, the use of such an approach provides a technological model that could give learners intrinsic feedback that also promotes higher forms of learner interaction.

This conversational model clearly identifies pedagogical approaches and argues that specific approaches use technology in different ways.

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Blended learning with technology

Antoinette van der Merwe, Vivienne Bozalek, Eunice Ivala, Lynette Nagel, Marí Peté and Cassim Vanker

Blended learning is a well-known term, but not always well understood. This article seeks to provide some recommendations, a clear definition of this approach to teaching and learning, international trends, some affordances, as well as costs, some examples of its use within the different higher education contexts in South Africa, as well as a glossary and references for further reading.

Recommendations

- Re-evaluate the technological infrastructure and ecosystem to ensure that they support the blended learning approach. Furthermore, the integration of educational technologies into the classroom raises concerns about the impact on teaching and learning if the required resources and support are not available, as such an important consideration must go into the uptime, availability and support of the infrastructure. Universities must make choices about priorities within their own contexts. At the most basic level, where lecturers have low levels of computer literacy, a learning management system (LMS) is desirable. Two open-source platforms, Moodle and Sakai, are being used by South African universities for which no licence fees are paid. The commercial platform, Blackboard, which requires annual licence fees, is used by the majority of universities in South Africa.

- Provide professional development as a key element in the success of blended learning initiatives. Staff members need to be trained in the use of learning with educational technologies in a blended environment. Writing for the screen is another important skill. This includes the use of screen-friendly fonts, frequent summaries and white space. Brevity and clarity are important to keep the reader engaged while reading on mobile devices.

- Focus on blended learning design that aims to determine how the blend will work – which parts will be delivered face-to-face and which online. The learning design should start with the curriculum outcomes, and constructive alignment should be created with activities, content and assessment to ensure internal coherence, consistency and transparency. One of the most important functions of course design is to determine a navigation structure that ensures that the student is able to navigate the course with ease.

- Ensure that the two essential facilitation skills are established, i.e. the ability to establish a code of online conduct (including privacy and copyright) and boundaries around availability (how often students can expect a lecturer to respond, and how often a lecturer expects students to log in and contribute).

- Create social presence and engagement explicitly through visuals, voice and text-based interaction. Student engagement and agency are important for motivation. Formative assessment in the online curriculum supports individual progress (Anderson and McCormick 2005).

- Develop policies around remuneration for online facilitation, which could extend teaching hours beyond what some academics might consider reasonable.

- Choose learning technologies that are fit for purpose. Choices should reflect the value added through the delivery mode.

Definition

Technology has the potential to improve the scale, speed and efficiency of the teaching and learning processes if the focus remains on thoughtful and appropriate pedagogy (teaching approach) and not the technology as such. The evolution of computers in the 1980s set the ball rolling as organisations began to use technology as part of the teaching and learning process.

Blended learning may be defined as the thoughtful integration of classroom face-to-face experiences with technology-enhanced learning experiences. When the technologies used for education and communication outside the classroom are used to supplant some of the face-to-face work, reducing the time actually spent in the classroom, the result is a hybrid course.

The Online Learning Consortium (formerly Sloan-C) has recently updated and expanded its definitions of e-learning (Mayadas and Miller 2015) to allow for clearer distinctions in usage, and defines:

- 'hybrid' at the course level; and
- 'blended' at the programme level.

Many higher education researchers are critical of an institutionally derived, one-dimensional definition of blended learning that focuses on delivery mode without addressing the effectiveness of learning. Means and co-workers have published an empirical meta-analysis of research that shows that students in blended learning perform at least as well or better than students receiving exclusively classroom instruction (Means et al. 2009). They propose that students with online activities spend more time on their learning than classroom-only students. Some universities in the USA are presenting competency-based education (marketed as flexible options) that directly measures learning outcomes, not the time taken to achieve them (Kamenetz 2014). Such online degrees allow students to determine their own pace through coursework (http://flex.wisconsin.edu/). Flexible options are popular with non-traditional students who cannot attend university full time, as well as those who wish to fast-track through the programmes after the initial recognition of prior learning. Research can inform how online and blended learning can help more students earn their degrees more quickly.

Current international trends

The Community of Inquiry (CoI) framework theory, methodology and instruments are widely used in the design of online and blended courses, evaluating student satisfaction and researching online teaching and learning (Garrison et al. 2000). This seminal paper has to date (February 2015) been cited 2 590 times. Over many years, CoI has been validated through empirical research in learning theory in diverse disciplines and settings. The CoI website (Athabasca University, n.d.) hosted by Athabasca University contains invaluable resources for online educators.

An educational community of inquiry is a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding. The CoI theoretical framework represents a process of creating a deep and meaningful (collaborative-constructivist) learning experience through the development of three interdependent elements: social, cognitive and teaching presence.

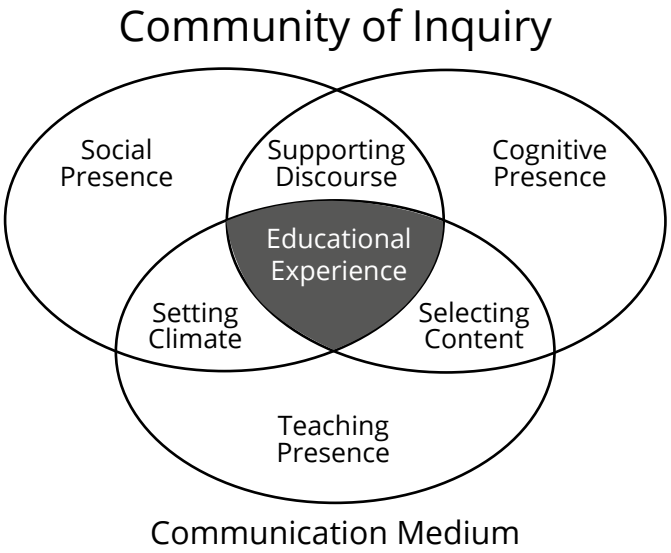

Figure. 1: The Community of Inquiry model (Garrison et al. 2001)

Social presence is the ability of participants to identify with the community (e.g. course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities.

Teaching presence is the design, facilitation and direction of cognitive and social processes for the purpose of realising personally meaningful and educationally worthwhile learning outcomes.

Cognitive presence is the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison et al. 2001).

Affordances

The affordances of blended learning and how they are described can vary according to the institutional context, as well as the conceptual frameworks used. Some of the affordances cited include that blended learning gives students access to flexible learning environments and enables them to voice their opinions, form communities of learning, employ a variety of learning styles, and repeat and reinforce learning (Gedik and Kiraz 2012). Adaptive learning programmes can furthermore allow students who need to improve a basic skill like literacy or numeracy, which is not addressed in the curriculum of their enrolled programme, to study and practise on their own and at their own pace until they attain the required standard. Advances in adaptive learning systems and platforms with their powerful feedback loops can also be used in blended learning environments for greater personalisation.

Gedik et al. (2012) consider a key benefit of blended learning for lecturers to be interaction with students in large classes. We also know that lecturers can manage teaching environments better with LMSs, by collecting assignments, marking quizzes automatically and providing immediate feedback, using an integrated grading system, tracking progress and setting up warning systems for early intervention to minimise the risk of students dropping out.

Gedik et al. (2012) consider some of the main challenges that blended learning poses to students to be time management, increased workload, cultural and personal barriers, such as familial and career pressures, and, perhaps most importantly and obviously, technical barriers. It would be safe to say that these challenges could also apply to lecturers' experiences of blended learning.

For an extensive examination of the affordances of blended learning, refer to 'The effectiveness of a blended learning approach in teaching management subjects at a university of technology in South Africa' – a Master's study conducted by Oellermann (2014), which is included in the suggested references for further reading.

Costs

Elements that involve costs include licensing, infrastructure, personnel, and professional development and support.

At the most basic level, an LMS is desirable. LMSs are available as both open-source and commercial products. Open-source products allow the university to access the original source code without any licence fees, whereas

commercial products do not grant access to their source code and have varying licence fees, depending on the product feature set. Each university has to decide for its own context what system it will choose. Many information technology (IT) departments will support only one LMS given their own constrained resources.

Two of the most common open-source e-learning platforms being used by South African universities are Moodle and Sakai, The most common commercial platform, Blackboard, is used by the majority of universities in South Africa.

Increasingly, emerging technologies and social media are also used. Learning design, course design and online facilitation skills can be learnt, and there are more and more courses available to academics in this area, most noticeably those offered free of charge by e/Merge Africa and the University of the Western Cape (UWC) locally, and by Leicester University's Institute of Learning Innovation internationally.

The *NMC Horizon Report: 2015 higher education edition*, published by New Media Consortium (NMC) and Educause (Johnson et al. 2015) has predicted a stronger move towards collaboration across higher education institutions (HEIs) in the next five or more years. Institutions are joining consortia to share resources and position themselves advantageously in relation to innovation and learning with technology.

In the Cape Town area, the four HEIs have collaborated in developing professional development short courses on using emerging technologies to improve teaching and learning. This initiative is one of a range of teaching and learning courses that have been offered since 2010 under the auspices of the Cape Higher Education Consortium. The Emerging Technologies course was collaboratively designed by teaching and learning specialists at the four HEIs and jointly delivered for academics across the four HEIs. It has been favourably received and continues to have a high take-up rate four years into its implementation.

Another collaborative initiative across three HEIs in the Western Cape has been the design, development and implementation of a Postgraduate Diploma in Higher Education Teaching and Learning. One of the elective modules focuses on teaching with technologies. This initiative is in the process of being taken further to ten HEIs in South Africa, who will collaborate on sharing resources for postgraduate diplomas in teaching and learning through a common platform. A Recognition of Prior Learning (RPL) online module is being planned for academics who wish to show that they do not have to do the Postgraduate Diploma in Teaching and Learning, owing to their knowledge and competence in the area of teaching and learning. These forms of collaboration will go a long way towards sharing resources across HEIs, rather than reinventing the wheel in each individual institution. Both facilitators and participants have reported the benefits of collaboration on course design, co-teaching and completing learning tasks (see Bozalek et al. 2013 and Ng'ambi et al. 2013 for more information on the collaborative endeavours in the Western Cape and their implications for participants, course facilitators and designers).

On an informal level, as part of priority training short courses at the University of Pretoria, lecturers may attend training in the LMS and a course on the facilitation of e-learning. Many universities offer this type of in-house professional development.

The Durban University of Technology (DUT) has been offering a course in web-based learning and teaching to its staff for some ten years. For a participating academic, the course of 120 notional hours results in a piloted online course and conference paper. Popularly known as Pioneers Online, the course is designed to equip participants with design, facilitation and research skills into web-based learning. Successful candidates obtain a university short course certificate. Owing to Pioneers Online being rooted in the communities-of-practice philosophy, and due to courses and projects such as Induction, Curriculum Renewal and General Education that have run in tandem, DUT now has an established culture of teaching innovation. At present, Pioneers Online has been placed on hold during the executive management's e-learning project, which is aimed at getting 50% of DUT's courses online and to strengthen the IT infrastructure and integrate IT systems. Therefore, training currently focuses on equipping as many academics as possible with basic e-learning skills. DUT has shared professional development expertise and resources through the South African Technology Network (SATN), e.g. by coordinating a Webinar Skills Project over a two-year cycle.

Application in different contexts in South Africa

There are a variety of innovative blended learning approaches at different HEIs in South Africa, including flipped classrooms, the use of mobile devices via ubiquitous Wi-Fi, e-mentoring programmes, tutorials, support for multilingualism and learning analytics. At many institutions, the use of blended learning has become the norm and is no longer only a novelty. It is impossible to provide an exhaustive list of all the applications because the use of blended learning applications is very context-specific within each HEI. One of the papers (Bozalek et al. 2013), which stems from a National Research Foundation (NRF) project entitled 'Emerging ICTs in higher education (2011–2013)' states that, while the use of educational technologies is increasingly common among educators, there is still little research on innovative uses of these technologies to transform teaching and learning. The paper foregrounds the contextuality of emerging technologies in terms of levels of institutional development, access to resources, discipline, group belonging and the individual motivation of respondents.

The following list outlines a few strategies that can be used to introduce blended learning into the classroom (IBM n.d.):

- *Moving assessment online:* Moving a test online is a great way to assess learner competency. Furthermore, the automated marking, tracking and reporting of scores reduces the complexities involved in managing large class sizes. Care has to be taken, though, that questions asked are testing higher-order thinking skills. It is also a strategy that requires an institution to have an LMS with a quiz tool or a specialised computer-based testing program.

- *Accessing published resource materials:* The library can collaborate to load resource pages. Students can also be directed to online resources that explore topics in greater depth. This reduces their reliance on the traditional single sources of knowledge such as the textbook. Many open educational resources are also available, such as animations, videos and so on, that can increase their knowledge.

- *Online coaching, tutoring and mentoring:* A great way to extend the learning experience is through the introduction of online mentors or coaches. Online mentoring and coaching provide support and guidance to students outside the classroom.

- *Email and messaging:* This method of blended learning is often overlooked, yet it is one of the most powerful ways of extending the learning experience. The use of distribution lists, task management, attachments and scheduling functionalities provides a rich platform for students to interact with the lecturer. Attention needs to be paid to what is scalable and what is sustainable: no lecturer can answer 3 000 emails a day.

Glossary

Course-level definitions (Mayadas and Miller 2015)	
Traditional classroom course	Course activity is organised around scheduled class meetings.
Synchronous distributed course	Web-based technologies are used to extend classroom lectures and discussions to students at remote sites in real time.
Web-enhanced course	Online course activity complements class sessions without reducing the number of required class meetings.
Hybrid course	Online activity is mixed with classroom meetings, replacing at least 20%, but not all required face-to-face meetings.
Online course	All course activity is done online; there are no required face-to-face sessions within the course and no requirements for on-campus activity.

Progamme-level definitions (Mayadas and Miller 2015)	
Traditional classroom programme	The programme may include a mix of traditional, web-enhanced or hybrid courses, but all courses require some face-to-face sessions.
Multi-format programme	A programme mixes, along with traditional classroom courses, other formats that use a variety of different delivery modes, web-enhanced, hybrid, fully online courses, synchronous distributed education, etc., without a specific access goal.
Blended programme	A significant percentage, but not all, of the credits required for programme completion are offered fully online. Typically, up to 30% of the curriculum may be offered as face-to-face or hybrid courses or other face-to-face formats, or as independent study.
Online programme	All credits required to complete the programme are offered as fully online courses. Students can complete the programme completely at a distance, with no required face-to-face meetings.
Flexible option competency-based degrees	These online degrees give students credits for pre-knowledge, measure the attainment of learning outcomes, and do not take completion of credit hours into account (Kamenetz 2014).

Definitions of associated terms	
Digital storytelling	Digital stories are short, first-person video narratives created by combining recorded voice, still and moving images, and music or other sound. The blended learning process involves the lecturer giving a lecture on a topic and giving students assignments that they submit in the form of a digital story. The process of making the stories involves writing a script, creating a digital audio recording of the written script, selecting images for the story on the Internet or taking own pictures, combining recordings and images using a multimedia format and adding background music. This blended learning approach develops students' creativity and authorship, encourages the development of multiliteracies (digital, visual and cultural), student engagement, collaborative learning and deep reflection on the subject matter.

Definitions of associated terms	
The flipped classroom	In the flipped classroom method of instructional delivery, the lecturer instructs lessons at home via video lectures, audio lectures, content-rich websites, online chats, etc., while classroom time is spent by students working on activities in groups, receiving the necessary support from the lecturer and peers. During the class activities, deep understanding of concepts, application and connection to content is made. In this pedagogy, students have a voice and are encouraged to debate, question, make decisions and make choices, and are supported in a learning environment.
Adaptive learning	Adaptive learning is an educational method that uses computers as interactive teaching devices based on artificial intelligence. Computers adapt the presentation of educational material according to students' learning needs, as indicated by their responses to questions and tasks. Learning is thus personalised, not generic. Many commercial providers, such as Pearson's, make use of adaptive learning technologies.

Acronyms and abbreviations

CoI	Community of inquiry
DUT	Durban University of Technology
HEI	Higher education institution
IT	Information technology
LMS	Learning management system
NMC	New Media Consortium
NRF	National Research Foundation
RPL	Recognition of prior learning
SATN	South African Technology Network
UWC	University of the Western Cape

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Digital literacies

Cheryl Brown and Tabisa Mayisela

The provision of access to computers is now a standard service of universities. Information and communication technologies (ICTs) are seen as a core component of learning with almost all students needing to use a computer in some way for their studies. However, higher education institutions (HEIs) tend to believe that all that is needed for students to use technology for their learning is provision of access. The question that arises is whether provision of access to technology is enough to guarantee students' use of ICTs for learning.

Recommendations

- The focus needs to be on successful learning practices. What do students need to survive and thrive as 21st-century learners?
- Digital literacy needs to be thought of as more than computer literacy, as the concept encompasses a range of practices, including computer literacy, information literacy, media literacy, communication literacy, visual literacy and technology literacy.
- There is a need to move away from conceptualising digital literacy as computer literacy, as the issue is not about the device. Many students interact with the internet via a cellphone very successfully, even before they have mastered a computer.
- Digital literacies need to be embedded into courses and subjects so that they can be learnt in the context of the discipline.

Analysis and discussion

Universities now provide access to computers as a standard service. Almost all students need to use a computer in some way for their studies, and ICTs are seen as a core component of learning. However, HEIs tend to believe that all that they need to do for students to use technology for their learning is to provide access. The question that arises is: Is access to technology enough to guarantee students' use of ICTs for learning? We would argue that it is not. Digital literacy is a cross-cutting multidisciplinary field. It is embedded in the entire learning process, from finding information to evaluating it critically, and being able to present it electronically and responsibly.

Research indicates that there is a small but consistent group of first-year students who have insufficient basic computer literacy skills when they arrive at university (Nash 2009), and that the majority of students – even those who are deemed to be computer literate – lack the most basic information literacy skills, and are extremely poor at finding and evaluating sources of information (Asher et al. 2010). Furthermore, even that group of students who are more acquainted with a variety of digital media lack the ability to transfer their technology skills into the academic context (Kennedy et al. 2010). It has also been noted that while many young people can operate a device, 'many teens are more likely to be digital naives than digital natives' (Hargittai 2010). These teenagers are the age group that is assumed to have grown up surrounded by technology, and to be digitally literate (Prensky 2001). The above implies that, in the dynamically changing world of ICTs and rapid information production, students need to constantly learn new academic skills in order to operate in a digital world.

Many learners enter further and higher education lacking the essential skills needed to apply digital technologies to their learning. The UK-based Joint Information Steering Committee (JISC), in its large project on digital literacy, noted that 'students who lack digital capital of all kinds – devices, know-how and positive experiences with technology – risk being marginalised' (Beetham and Sharpe 2011). In other words, digital literacies comprise those capabilities that fit an individual for living, learning and working in a digital society. These digital literacy competencies go beyond the ability to find, evaluate and use information (information literacy), and encompass communication, collaboration and teamwork, social awareness in the digital environment, understanding of e-safety and the creation of new information. Therefore, higher education cannot afford not to equip students with these skills.

Current international trends

Universities globally have shifted from talking about computer skills (functional IT use) to digital literacies and associated graduate attributes. Such literacies are now globally accepted to be a core need for students in higher education (Goodfellow and Lea 2013). In developing countries such as South Africa, an already complex requirement is made additionally complicated by a variety of ICT access considerations, not least of which are practical.

While on-campus bandwidth in South African universities is equivalent to that in European universities (Greaves

2014), and individual students have access to devices that vary dramatically in terms of functionality, off-campus bandwidth remains very uneven (DHET 2012). However, while physical access to ICT is a foundational component of digital literacies, students need to be able to move in the first instance (competence) to the level of digital practice, where they use ICTs to achieve their academic purpose and, ultimately, to the level where they become producers; not simply consumers of online content.

Using ICTs to create, design, plan and behave in ways that shape students' personal, academic and future professional lives is a form of digital literacy, as noted by Beetham and Sharpe (2011) in their Literacies Development Framework. Beetham and Sharpe's framework is, however, sometimes criticised at being too capabilities-focused and being focused rather narrowly on use (i.e. consumption) of technology, rather than a more proactive contribution or production using technology. Newman (2009) provides an alternative lens, considering digital literacy as involving knowledge and competency with digital tools, critical thinking and social awareness of technology. Notions of transliteracy – being literate across a variety of platforms – have also emerged recently (Wheeler 2012).

Current use in South African contexts

Those studies that exist examine students' general technology use (Thinyane 2010; Brown and Czerniewicz 2010), and the prevalence of social media use (Studentvillage 2009), while a few focus on specific formats: blogging (Cronje 2012); wikis (Rowe 2012); filming and editing with smartphones (Hassreiter et al. 2011); Visual Arts e-portfolio design (Noakes 2011; Noakes 2012.); video editing and production (Deacon et al. 2005); digital storytelling (Barnes et al. 2015), as well as music-making (Haupt 2008). Universities are beginning to adopt the terminology of digital literacy (University of Stellenbosch nd; University of the Witwatersrand nd), but probably have a long way to go in adopting practices that emphasise the fuller vision of what digital literacy encompasses.

Considerations informing integration

ICT literacy is not an isolated skill or need, and should not be treated as such. It makes sense, given the links between digital inclusion and social inclusion, that ICT literacy is tied up with other academic development issues. As boundaries between information literacy and other academic literacies become more porous, it is essential that librarians, educational technologists and academic literacy professionals work together to develop students' digital literacy within the context of their background and current discipline (Brown 2012:55).

Acronyms and abbreviations

HEI	Higher education institution
ICT	Information and communication technology
JISC	Joint Information Steering Committee

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Web 2.0 and social media: Essential tools for contemporary teaching and learning

Daniela Gachago and Eunice Ivala

This article briefly reports on the use of Web 2.0 tools and social media in higher education institutions, both in South Africa and around the world. For ease of reading, we have positioned our recommendations directly after the introductory section explaining what these tools are; supporting sections follow outlining the global and local contexts, as well as the advantages, challenges and costs of social media in a higher education context.

Recommendations

- Institutions should develop and implement clear policies and guidelines on the secure and effective use of Web 2.0 technologies for teaching, learning and research. These should be developed and continuously renegotiated in collaboration with academics, learners and support staff.
- Staff and students must be trained. We cannot assume that all staff and students have equal technical capabilities or access to technologies, which are still very unequally distributed.
- Staff and students should be made aware of their responsibilities through, among other things, conversations on social media literacy and the risks involved.
- Blocking the use of social media in university laboratories is ineffective and counterproductive; students will still access these tools on their mobile phones, but will be deprived of opportunities for more effective learning. Institutions should rather concentrate on promoting the effective and ethical use of these tools for teaching and learning.
- Institutions should provide stable internet services and Wi-Fi networks on campuses. Institutions should integrate Web 2.0 technologies with their learning management systems (LMSs) to ensure a seamless learning experience for their students.

Definitions: What are Web 2.0 and social media?

Web 2.0 is shorthand for the second generation of technologies enabled by the World Wide Web, which focuses not just on publishing and accessing information, but also on social sharing, including collaboration, user-generated content, social networking and other forms of participation. Web 2.0 tools and social media (the terms are often used interchangeably) allow participants – no longer just 'users' – to contribute to and draw upon distributed knowledge, expertise and mentorship collectively.

Web 2.0 technologies include:

- Social networks such as Facebook, Linkedin, Pinterest, and Google +;
- Media- and content-sharing sites such as YouTube, Vimeo, Flickr and Dropbox;
- Online collaborative tools such as Google Drive;
- Blogging platforms such as Wordpress. Edublogger and Blogger;
- Microblogging platforms such as Jaiku, Twitter and Tumblr;
- Content aggregators such as Feedly, Flipboard and Zite;
- Social bookmarking sites such as Diigo;
- Collaboration and project management tools such as Trello and Asana;
- Emerging forms of participatory media such as question-answer services like Quora (Veletsianos 2012:2).

Over the past ten years, Web 2.0 technologies have found their way into higher education, as both formal and informal learning tools. According to Hart (http://c4lpt.co.uk/top100tools/), the most widely used Web 2.0 tools for learning globally in 2014 were Twitter, Google Docs/Drive and YouTube. Wordpress, Dropbox, Evernote and Facebook are following suit.

In South Africa, WhatsApp is gaining momentum as a mobile chat tool and visual applications (apps) such as Instagram and Pinterest attract interest as well. Academics are also increasingly using Web 2.0 technologies for research, to follow experts in their field on Twitter, to share papers on academic.edu, to check their citation index on Google citations or to set up research blogs (Veletsianos 2012).

Research confirms the potential usefulness of social media, but South African institutions of higher learning still struggle to engage with it. Reasons include:

- fear of loss of control;
- privacy concerns;
- attachment to the perceived safety of a closed classroom;
- fear of cyber-bullying; and
- fear of the disruptive nature of these tools.

Some of these fears are well founded, but we believe that engagement, not avoidance, is the answer.

Global context

Higher education institutions (HEIs) around the world are increasingly integrating Web 2.0 technologies and social media in both informal and formal education. For many years, the yearly *Horizon Report* has flagged social media as one of the most influential (Johnson et al. 2014:8). The report emphasises that understanding how social media can be leveraged for social learning is a key skill for teachers, and that teacher training programmes are increasingly being expected to include this skill. Additionally, research is emerging to confirm the potential for social media in general, and Facebook in particular, to promote formal learning, such as a tool to:

- promote student engagement (Ivala and Gachago 2012; Junco 2012);
- improve academic performance (Junco and Cotten 2012; Junco et al. 2011);
- provide an LMS (Wang et al. 2011); and
- expand learning beyond the classroom and promote authentic learning contexts (Herrington et al. 2010) by, for example, using TED talks as 'expert input' in the classroom followed up by engagement with these experts via social media, or establishing 'virtual hallways' or 'informal rendezvous' (Heiberger and Junco 2011).

However, most researchers focus on social media functions within informal learning, as 'social glue' rather than supporting deep learning (Madge et al. 2009), emphasising social media's potential for improving students' social capital (Acosta 2014; Steinfield et al. 2008).

There is also awareness that social media is not ubiquitous and that there are digital inequalities among younger generations of university students, as well as older generations of university staff (Selwyn 2012). These digital inequalities are exacerbated by differences in socio-economic status, social class, race, gender, geography, age and educational background.

Internationally, social media is being used to:

- produce knowledge: young people are not simply passive consumers, but increasingly satisfy their desire for choice, convenience, customisation and control by designing, producing and distributing products themselves (Tapscott and Williams 2007);
- promote learning based on collective exploration and intelligence, distributed expertise, play and innovation (Thomas and Seely Brown 2011);
- engage prospective students and bridge the transition into first year; Marketing and Communications offices have employed social media experts to update not just websites but also Facebook pages and Twitter accounts to advertise or highlight events, warnings and achievements to reach students in multiple mediums (Acosta 2014; Madge et al. 2009);
- reach out to the community and allow the general public to gain insight into an institution's life (i.e. Vanderbilt University); and
- improve the digital and social media literacy of both staff and students.

South African context

In the past five years, the use of social media in South African universities has grown substantially. Various institutions have drafted policies and guidelines that focus mostly on policing the use of social media and managing access to these platforms in laboratories. There has, however, been little engagement with the potential of these tools for teaching, learning and research. Table 1 gives some examples of current uses for teaching, learning and research:

Table 1: How South African universities are using social media in teaching and learning

Institutional context	Application	Platform or tool used
Architectural Department, University of Cape Town (UCT)	First-year students create a private group, where lecturers are not involved, to share documents, images and jokes related to the field and to arrange lifts to hardware stores and studio clean-up days.	Facebook
Centre for Film and Media Studies, UCT	A Twitter backchannel is used during a seminar for classroom discussions and feedback.	Twitter
Higher Education Studies, Centre for Innovation in Learning and Teaching, UCT	Use a Facebook page or group as a way of encouraging past and current students to interact, keep in touch, grow a reflective practitioner mindset and establish a community of practice.	Facebook
Faculty of Engineering and the Built Environment, UCT	A backchannel is used in class to encourage participation, especially from students who are not confident enough to ask questions in class.	Backchannel-chat.com
Department of Biodiversity and Conservation Management, Faculty of Applied Sciences, Cape Peninsula University of Technology (CPUT)	Use of a closed Facebook group to allow students to connect during their workplace-based learning.	Facebook
CPUT First-year Experience (FYE), Fundani Centre for Higher Education Development, CPUT	Creation of videos containing information for first-year students on how to survive in the University, disseminated through the FYE YouTube Channel, linked from the University's Facebook page.	You Tube channel and Facebook
Department of Chemical Engineering, Engineering Faculty, CPUT	Use of a closed Facebook group to support Extended Curriculum Programme students with university work, through collaborative work and lecturer-student interactions on difficult concepts.	Facebook
Department of Architectural Design, Faculty of Informatics and Design, CPUT	Students keep personal blogs reflecting on their experiences in the workplace, which are accessible to other students. Use of a class blog and a closed Facebook group maintained by the lecturer to share content and communicate with students.	Blogger and Facebook
Faculty of Engineering, CPUT	Students connect in professional groups on LinkedIn to get feedback on their final projects.	LinkedIn
Public Relations Department, Faculty of Informatics and Design, CPUT	First-ever lecture done via Twitter globally, lecturers prepared a whole lecture split into posts of 140 characters, students engaged using hashtag (#).	Twitter
Department of Sports, Recreation and Science, University of the Western Cape (UWC)	Use of a wiki to allow students to create and share collaborative content, and a blog to create a space for discussion and reflection of learning.	Blogger and wiki space
Postgraduate Programme in Public Health, School of Public Health, UWC	Use of a Google group to connect distributed learners, to develop social presence of the course leader and students, and for enhancing peer-to-peer learning.	Google groups
Department of Social Work, UWC	Use of blogs for student reflections on clinical practice.	Blogger
Department of Physiotherapy, UWC	Use of Google Drive for the creation of student-generated lecture notes.	Google Drive
Military History, Stellenbosch University	Use of Facebook to facilitate lecturer-student and student-student communication. Link to relevant YouTube videos.	Facebook/ YouTube
Political Science, Stellenbosch University	Links to relevant material on YouTube from within the institutional LMS.	YouTube
EduTech, Stellenbosch University	Sharing of presentations used in staff development activities.	Slideshare/ YouTube
Department of Psychology, University of Pretoria	Use of Facebook for communication in first, second and third year with class representatives managing each page. Students are also encouraged to post videos.	Facebook/ YouTube
Community engagement modules, Faculty of Engineering, Built Environment and IT, University of Pretoria	Use of student-generated YouTube videos for the assessment of community engagement projects.	YouTube
Cape Higher Education Consortium (CHEC) Emerging Technologies In Higher Education short course	Use of Google Drive for sharing participant reflections and collaborative learning. Use of WhatsApp to facilitate peer support and communication between participants and facilitators.	Google Drive, WhatsApp

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For more case studies on how lecturers in South Africa use social media, see http://www.emergingicts.blogspot.com/p/guide.html.

Affordances and advantages of Web 2.0 and social media

One of the main advantages of using social media in teaching and learning is their participatory and collaborative nature, characterised by a shift in the locus of control from teachers to students. Use of social media tools is often initiated by students themselves, who already use them extensively in other areas of their lives.

Mobile apps such as WhatsApp, Mxit and WeChat have made these tools highly affordable in resource-scarce contexts such as South Africa. Steven Wheeler reflects on this in a current blog post (2015), where he argues that the combination of social media and mobile technology has changed educational technology forever.

The powerful combination or convergence of these two technologies has given learners everywhere the capability to discover, create, repurpose, share and amplify content. These two technologies, once combined, have opened up endless global networks of like-minded professionals, communities of practice and connections to virtually limitless resources.

Other benefits of using social media and Web 2.0 tools in educational contexts include the following:

- Enabling 'low bandwidth exchange' of information and knowledge.
- Establishing 'social glue' among learners (Madge et al. 2009).
- Offering new types of learning for new types of learners that reflect more flexible, fluid and accelerated ways of learning, such as multitasking – the 'digital juggling' of daily activities (Selwyn 2012).
- Encouraging learners' social autonomy, offering increased control over the nature and form of what learners do, as well as where, when and how they do it (Selwyn 2012:2).
- Creating less formal, two-way communication channels between the institution, lecturers and students (Johnson et al. 2014)
- Providing access to instant/up-to-date information: 'People increasingly rely on their Facebook and Twitter newsfeeds, for example, to stay up to date on major global events' (Johnson 2015).
- Providing a variety of resources (text, images, videos).
- Supporting and promoting the creation of learning communities outside the classroom.
- Bridging formal and informal learning: 'Students find it useful as it complements and extends their learning beyond the classroom and allows reflection not only on study matters but the way the [...] course is delivered', in particular for non-traditional students (Piela et al. 2014).
- Opening up learning spaces, for example, by supporting inter-institutional collaboration among students or engagement with communities outside the institution.
- Offering learners a more authentic/public audience.
- Providing students a relatively safe training ground for active citizenship in a global world.

Challenges of Web 2.0 and social media

- The discourse of 'digital natives', which portrays the current generation of students as having grown up with digital technologies and ubiquitous access to technology, hides the fact that, in South Africa, students have widely varying degrees of digital literacy and experience with digital technologies.
- There is research showing that what students do on social media is still very limited and focused on the consumption of information. Lecturers need to carefully facilitate a culture of participation.
- Knowing how to use a technology does not necessarily mean being aware of risks and ethical issues, including privacy and cyber-bullying (Church and De Oliveira 2013).
- Multitasking may be experienced as disruptive (Junco and Cotten 2012) – again, this is an aspect of social media literacy that needs to be learnt by both students and lecturers.
- Web 2.0 and social media tools are not controlled by institutions, but follow their own economic rationale. This means that the landscape is constantly changing, and that tools available for free today may require subscription or be defunct tomorrow.
- Cyber-bullying is a considerable challenge for lecturers and students alike.
- Information literacy – the ability to critically reflect on and analyse information found via social media – is essential.

The use of Web 2.0 technology may promote a copy/paste mentality in which learners become 'intellectual kleptomaniacs' (Keen 2007:23 cited in Selwyn 2012).

Costs

The costs of Web 2.0 and social media technologies include software licensing, hardware, network and server infrastructure, and training and support personnel. More specifically:

- Most of the Web 2.0 software used in teaching, learning and research can be accessed for free.
- Use of these tools requires Internet access and end-user devices such as desktop computers or tablets. South African universities currently vary considerably in their ability to supply and manage this supporting infrastructure.
- Currently the bulk of Internet access costs are borne by students themselves, who tend to use either mobile devices (phones and tablets) or their own computers at home.
- Students and staff need training on how to use social media and Web 2.0 safely and effectively for teaching and learning.

Glossary

Facebook	Social networking platform that allows users to share information, upload images and videos. Facebook pages and groups have become useful tools in education, as they allow engagement without lecturers having to 'befriend' their students. Issues of privacy are of concern.
Twitter	Microblogging service based on messages of 140 or fewer characters. Users can upload photographs, share private messages directly with particular users, or highlight posts by including a hashtag (#). For lecturers, the use of a course hashtag that students can follow makes it easy to share information and connect students to a wider community beyond their institution.
YouTube	Video-sharing site that allows users to upload and share videos. The site offers access to millions of educational videos and tutorials for self-learning opportunities.
WhatsApp	Mobile instant messaging app, allows set-up of groups, very resource-efficient sharing of multimedia (images, videos).
Instagram	Social photography and image sharing.
Pinterest	Enables users to create shareable pinboards on specific topics of interest, collect images and follow others. Both personal and group boards are supported.

Acronyms and abbreviations

CHEC	Cape Higher Education Consortium
CPUT	Cape Peninsula University of Technology
FYE	First-year Experience
HEI	Higher education institution
LMS	Learning management system
UCT	University of Cape Town
UWC	University of the Western Cape

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Personal mobile devices and laptops as learning tools

Cheryl Brown and Nicola Pallitt

Laptops and personal mobile devices (PMDs) have the potential to transform the traditional dynamics of learning spaces. Lecturers can engage students in new ways in the classroom and students can engage with technology in spaces other than a computer laboratory (e.g. architecture studio or lecture hall), which then transforms the traditional dynamics of that particular learning space. This enables a 'hybrid' teaching and learning space where different activities co-exist.

Recommendations

- Ensure that ubiquitous laptop or PMD use is an integrated part of the teaching and learning approach if the university is going to invest in the technology or require students to do so.
- Conduct an audit of student ownership of devices, and student and lecturer use of devices in the classroom. Each context will require a different teaching and learning strategy to match student ownership patterns.
- Approach PMDs and laptops from the perspective of enhancing rather than replacing. Lecturers need to be encouraged to design course activities and assignments that use laptops or mobile devices as academic resources with the potential to deepen student engagement.
- Balance whether you need computer laboratories or whether ubiquitous access to laptops, for instance, could reduce or eliminate that need, except for dedicated computer science programmes.
- Consider the infrastructure implications of bring your own device (BYOD): Wi-Fi in lecture halls and residences and fairly widely on campus, as well as additional plug points and charging stations on campus.
- Provide training to lecturers on the effective use of laptops or other devices in their teaching.
- Put a policy and security in place in the BYOD environment.

Discussion

PMDs such as smartphones and tablets are an important part of students' media ecologies. PMDs share some similarities with laptops, such as wireless Internet connectivity and relying on a battery to run. However, PMDs run on software that is installed by downloading applications (apps). This boundary is becoming increasingly blurred as lightweight laptops that are touchscreen and support traditional software in addition to apps are becoming more commonplace and affordable. Such devices are making a profound impact in university settings worldwide, both inside and outside the classroom. Despite this, laptop and tablet initiatives are still relatively novel across a range of South African higher education institutions (HEIs).

According to the 2014 report of the Educause Centre for Analysis and Research (ECAR), students reported no growth toward embracing PMD use in the classroom, although twice as many students were encouraged or required to use a smartphone in class compared to 2013 (this was still only 6% of students) (Dahlstrom and Brooks 2014). Educause, the US-based organisation that runs the ECAR surveys, is dedicated to the use of technology in education. Both students and lecturers are surveyed. The surveys are run internationally. Participating universities receive their own data, as well as the data of the whole sample for comparison. The University of Pretoria was the first South African university to participate in the student survey in 2013, and in the student and lecturer surveys in 2014. In the 2014 survey, with respect to mobile use in class, 67% of lecturers thought they had the potential to enhance teaching and learning, while 48% saw them as a potential distraction, so some lecturers ban mobile usage (9%), while others actively encourage it (18%). Students indicated that mobile access was important (42%) or very important (51%) to them. Student ownership of devices was captured as follows: smartphone (95%), laptop (92.9%), tablet (69%) and e-reader (22.8%). These statistics are probably well over the national average, so each university needs to audit its own students to produce actionable data for teaching and learning. Students claim to use their devices in class for class-related purposes: laptops are used in class by 49% of the students, although only 31.3% of lecturers encourage their use; 46% of students use tablets in class, although this is encouraged by only 37.7% of lecturers; and 73% use their smartphones in class, while

this is encouraged by only 16.3% of lecturers. The top five uses of mobile devices by students at the University of Pretoria is to access the learning management system (LMS) (77.3%), check grades (74.8%), communicate with other students (73%), look up information in class (61.5%) and capture static images of in-class activities (57.8%). The results of the ECAR survey can be accessed at http://www.Educause.edu/ecar and Dahlstrom and Brooks (2014).

As indicated in the ECAR results, mobile devices are often still viewed as unwanted distractions in the classroom, rather than critical learning tools. Recent research findings might reinforce this attitude: for instance, it has been shown that:

- multitasking is less productive;
- nearly all students will use mobile devices for non-class-related purposes when given the opportunity; and
- handwritten notes enable learning more than taking notes via a laptop (Dahlstrom and Brooks 2014).

However, it is important to recognise that 'such studies often focus on the pitfalls of replacing manual activities (such as taking notes) with technology rather than using technology in meaningful ways to engage students in the learning process' (ECAR 2014). Laptops and mobile devices can be used to enhance learning. Designing course activities and assignments that use mobile devices to deepen engagement for students is one way to harness the power of these tools as academic resources rather than distractions. The pervasiveness of PMDs and laptops also challenges conceptions of learning spaces.

Affordances

In the classroom: BYOD

BYOD refers to the practice of students bringing their own laptops, tablets, smartphones, or other mobile devices with them to class. This growing trend capitalises on the use of the Internet in the teaching and learning process (Johnson et al. 2014). This movement not only makes one-to-one (i.e. differentiated instruction) easier by simply leveraging the devices that students already have (Johnson et al. 2014), but also encourages lecturers to make use of such devices for active learning. Through using these devices, lecturers can increase active participation and engagement during lectures through the use of virtual classroom response systems and back channels. BYOD renders dependence on physical clickers in a lecture venue obsolete. Such systems allow a lecturer to collect and display responses from students in a lecture. Additionally, lecturers are able to engage students in activities that were once traditionally reserved for a computer laboratory. As a result, lecture venues are gradually changing into different kinds of learning spaces. It is essential in this new environment for the information technology (IT) department to have a policy on BYOD and ways of protecting the university's systems from possible viruses brought in by a variety of personal devices.

Beyond the classroom

Learning spaces, within the context of higher education, now extend beyond traditional, physical environments such as computer laboratories, lecture theatres and libraries. Such spaces are increasingly mediated by new technologies. Current research on learning spaces tends to prioritise the design of physical places (Oblinger 2006), view online and offline spaces as separate, i.e. physical places and electronic spaces (Jamieson et al. 2000), or distinguish between different types of learning spaces based on their possibilities for engagement (Savin-Baden 2008). Educational technologists are often confronted with formal versus informal dichotomies when discussing learning environments in higher education. We argue that the notion of learning spaces allows researchers to attend to the nuances of teaching and learning interactions with technologies in a variety of physical places. The physical place does not predetermine the kind of learning taking place. Conceptually, learning spaces are also well suited to seamless learning perspectives, where learning occurs 'across a combination of locations, times, technologies or social settings' (Sharples et al. 2012). Because lecturers are aware that student learning is less dependent on traditional learning spaces, variations on flipped classroom models of pedagogical interaction are also becoming increasingly popular.

Current international trends

McMahon and Pospisil (2005) studied a university-wide initiative involving the use of wireless laptops among undergraduate students across four campuses at Edith Cowan University (Western Australia's second-largest university). They report strong evidence of students' independent use of technology, but found that their value as a tool for learning was heavily influenced by the technical support provided for the laptops and the way in which tutors integrated the technology into their teaching. They argue that the two fundamental issues that impacted on this related to the quality of teaching and learning, and the quality of the university infrastructure. However, they argue that overall, their project survey indicated a strong positive response to the value of laptops helping students with their learning.

Current use in South African contexts

Universities in South Africa have, for the past decade, recognised the role of educational technologies as tools to facilitate teaching and learning (Czerniewicz and Brown 2009; Bozalek et al. 2013). While the integration of mobile learning in higher education is not new, in a resource-constrained environment, access to information and communication technologies (ICTs) cannot be assumed. Technologically immersed and savvy youths are in the minority and represent an elite group, rather than the majority (Brown and Czerniewicz 2010). This is equally an issue for staff at universities.

Internationally, access to mobile technology has been acknowledged as offering new opportunities for young people to enter the digital realm (UNICEF 2012), particularly for expanding teaching and learning. This potential has been recognised by the Department for Higher Education and Training (DHET), which is actively encouraging universities to expand online and blended learning (DHET 2013). Given the imperative to expand both access and success in the university and post-school sectors, the role

of technology in curriculum initiatives in improved success and graduation rates needs to better understood.

Given persistent socio-economic and location-based digital divides in South Africa, government needs to continue to pursue and create initiatives to optimise ICT access (UNICEF 2012). The complex relationships between students' access to ICTs, home language and socio-economic background are also relevant in the higher education sector (Brown and Czerniewicz 2010). Universities across South Africa have recognised this problem. ASAUDIT, the association of university IT directors in South Africa, through the purchasing consortium for South African HEIs (PURCO), has negotiated a cost-effective purchasing scheme for students to acquire laptops and tablets. Despite this, the outlay for poor students, in particular those on National Student Financial Aid Scheme (NSFAS) funding, represents a significant cost. The active, regular educational use and value of different technologies needs to be demonstrated before it can reasonably be expected that students (or government) acquire such devices. In recognition of the educational value of these devices, a number of universities have developed specific strategies to facilitate and investigate the use of PMDs in the classroom.

In 2013, the University of Cape Town (UCT) started the flexible learning pilot project, which involved mandatory one-to-one laptop access for 476 students in four undergraduate courses: first-year chemical engineering, physics and law, and second-year architecture. In order to facilitate ubiquitous laptop ownership across these courses, the university provided financial aid students with a laptop. Funding remains an issue as the pilot continues into its second year and seeks to explore how having a personal portable device (in this case, a laptop) can create an enabling environment for the innovative use of ICTs for teaching and learning.

In January 2014, the University of Johannesburg (UJ) became the first South African institution to embrace the use of mobile devices for teaching and learning (Amory 2014). UJ decided that the use of mobile devices (which it defined as laptops and other handheld devices, such as tablets and smartphones) would be compulsory for all 2014 first-year students, and provided substantial funding for NSFAS students. This was not without controversy as one can see comments on its Facebook page from students who themselves question the value of ICTs for education.

The newly established Sol Plaatje University in the Northern Cape offers another interesting approach with its first intake of 110 students in programme areas of computer and information science/ engineering, business, economics and management sciences, and education. All students have been sponsored with laptops and thus represent the first (albeit small) campus where one-to-one access can be assumed. The University has also saved on providing computer laboratory space.

Conclusions

- Increased mobility and personal ownership are highly valued by students and influence how they use technology to support their learning: not being tied down to a computer laboratory or campus; being able to work on assignments at home; accessing the internet; accessing online resources; and using software from a personal device.
- 'Hybridity' may be a challenge for lecturers and a distraction for fellow students if students are engaged in 'off-task' activities. However, once lecturers and students find new strategies to manage and integrate the device into teaching and learning, this can become less of an issue.
- Lecturers need training based on best practices for BYOD and flipped classroom models to be effective.
- Audio-visual resources, such as podcasts, screencasts and lecture recordings, are especially useful for second-language students who may need to revisit material. Such online resources assist lecturers in catering for the diverse needs of their students.
- The role of IT staff is still crucial, as widespread BYOD entails the need for Wi-Fi infrastructure in lecture venues, and additional plug points and charging stations on campus. Wi-Fi installation is expensive and the system needs licensing and maintenance after the initial capital costs.

Glossary

ASAUDIT	Association of University IT Directors
BYOD	Bring your own device
DHET	Department of Higher Education and Training
ECAR	Educause Centre for Analysis and Research
HEI	Higher education institution
ICT	Information and communication technology
IT	Information technology
LMS	Learning management system
NSFAS	National Student Financial Aid Scheme
PMD	Personal mobile device
PURCO	Purchasing Consortium for South African HEIs
UCT	University of Cape Town
UJ	University of Johannesburg

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Gamification

Dennis Kriel

One needs to make a distinction between the use of games in education and gamification. Games are common ways of passing the time and having fun. Gamification is more about using the elements of games that motivate people, and applying them to educational experiences. These elements can take many different forms, from short activities done in a face-to-face setting to large, open-ended digital experiences that are technology driven.

Recommendations

These recommendations focus mainly on how gamification can be applied on module level where it is most effective. To apply these recommendations, academic management needs to foster a culture of educational innovation and informed risk-taking among lecturers. The following measures to achieve this are recommended (Marquis 2013):

- *Turn grades into achievements:* Games consist of many small achievements that need to happen for larger objectives to be reached. By acknowledging smaller, more discrete units of learning, lecturers can better track progress and students can receive immediate feedback on their progress towards a larger goal. Moving towards an achievement-based model of education enables self-paced progress by the students.

- *Emphasise skills and knowledge over information:* With information freely and widely available from a huge range of connected portable devices, students do not need more information: they need practical skills and knowledge; in other words, actionable information. These essential skills can include critical thinking, technology literacy, problem solving, collaboration, self-directed learning and any specific skill needed for the field of study. An effective way of developing these skills is by implementing project-based learning where students need to deliver concrete outputs and create knowledge.

- *Make space work in your favour:* Lecturers are in control of the spaces where learning takes place. Every element in a module, from the physical space where learning takes place to virtual resources available to students, can support the learning objectives of a course. For instance, if physical spaces are designed to be flexible and adjustable, they can be used to increase interest and engagement from students by allowing more effective collaboration. Online spaces can be used in the same manner to add elements of surprise and fun to the module.

Definition

According to Burke (2014), the Gartner organisation defines gamification in general as 'the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals'. If this definition is explored with the specific focus on the gamification of learning, it contains the following elements:

- Game mechanics includes the key elements that are common to many games, for instance, points, badges and leader boards. By defining the elements that make games fun and motivate players to continue playing, they can be implemented in educational settings to have the same effect.

- Experience design describes the journey of the players, the setting of the game elements and the plot of the story with which they engage. Game elements are arranged into the system that coordinates with the learning that happens through a course.

- In a blended learning course, gamification is a way to engage with students digitally rather than to personally interact with them. This is achieved through the use of learning management systems (LMSs), smartphones, tablets or other digital devices.

- One of the main goals of gamification is to motivate people to change their behaviour or develop specific skills. In an educational context, gamification has the potential to influence class attendance, student engagement with course content and peer interaction.

- Gamification focuses on people achieving their goals. When students' goals are aligned with the goals of the organisation or institution, the alignment can be very effective.

Implementation

According to Burke (2014), gamification has just emerged from the 'peak of inflated expectations' and is now sliding down into the 'trough of disillusionment' (terms used by the Gartner organisation in its hype cycle: http://www.gartner.com/technology/home.jsp). Early successes in

using this technology were widely publicised as being the key to changing people's behaviour and motivating them to achieve the goals of an organisation or institution. As the technology developed, however, it became apparent that this can only be achieved through effective design and implementation.

To gamify a concept or course effectively, a five-step process can be followed:

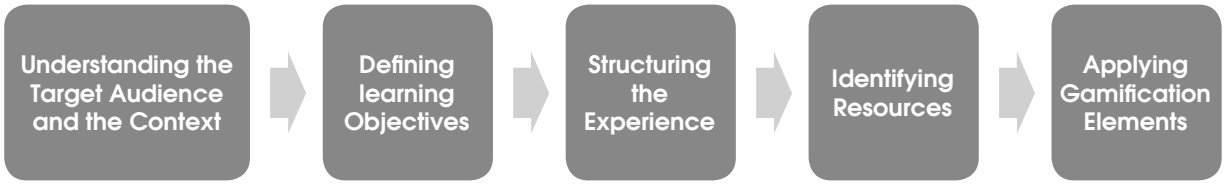

Figure 1: Five-step process of gamification (Huang and Soman 2013)

Elements of gamification can be harnessed for educational purposes in the following ways (Education Arcade 2015):

- *Progression:* to see success visualised incrementally
- *Levels:* to unlock content
- *Points:* to increase the running numerical value of your work
- *Investment:* to feel pride in your work
- *Achievements:* to gain public recognition for completing your work
- *Appointments:* to receive new challenges
- *Epic meaning:* to achieve something sublime or transcendent
- *Collaboration:* to work with others to accomplish goals
- *Virality:* to be incentivised to involve others
- *Cascading information theory:* to unlock information continuously
- *Bonuses:* to receive unexpected awards
- *Countdown:* to tackle challenges in a limited amount of time
- *Discovery:* to navigate through your learning environment and uncover pockets of knowledge
- *Loss aversion:* to play to avoid losing what you have gained
- *Infinite play:* to learn continuously until you become an expert
- *Synthesis:* to work on challenges that require multiple skills to solve

These gaming elements should be explicit throughout a course in order for students to engage with them consciously. The aim of gamification in learning is to create fun. It does not imply coercion or hidden agendas: 'Gamification is the craft of delivering all the fun and addicting elements found in games and applying them to real-world or productive activities' (Chou nd). Yu-kai Chou calls this 'human-focused design'. He gives ten examples of gamification in education settings that will be game changers in the coming years (http://www.yukaichou.com/gamification-examples/top-10-education-gamification-examples/#.VcYIrrUaIqQ).

Costs

Operational costs involved in the successful implementation of gamification, be it for a module, to develop a specific skill in students or to cause a change in behaviour, is dependent on the experience and skills of instructional designers within the organisation and their ability to apply gamification. The lack of mobile technology in the hands of students does not have to be a hindrance for successful implementation as long as it is planned. Most LMSs already include gamification tools that do not require additional licence fees: for instance, Blackboard's achievements (badges) system. Therefore, the costs involved in the successful implementation of this technology are mostly dependent on the time spent on careful planning and preparation.

Benefits of gamification

Within games, students experience opportunities of autonomy, competence and relatedness (Ryan and Deci 2000). Gamification has the potential to:

- increase the fun and enjoyment of lectures and course material;
- give students ownership of their learning;
- make learning and progress more visible;
- inspire students to find intrinsic motivators for their learning; and
- make a course seem less daunting to students as it is broken down into achievable tasks.

According to the well-known game designer, Jane McGonigal, games have the potential to engage students, whom she describes as 'urgent optimists', to be part of the 'social fabric in blissful productivity', while they are looking for 'epic meaning' (McGonigal 2011).

Conclusion

Successful implementation of gamification in education requires purposeful planning and continuous adjustment, driven by reflection and feedback. Nevertheless, it has the potential to transform information delivery from

a mundane task into an addictive learning experience. Students can acquire skills and knowledge by using learn-by-failure techniques that minimise negative emotions. Increased motivation can result in prolonged engagement with the content of the module by repeating activities until students have achieved mastery. Gamification is a powerful strategy for increasing student pass rates and successful course delivery.

Glossary

LMS	Learning management system

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E-portfolios

Nicola Pallitt, Sonja Strydom and Eunice Ivala

There is increasing interest in the process of maintaining an electronic portfolio (e-portfolio) and the role it can play in student learning. This interest has been driven by a greater awareness of student-centred and lifelong learning, graduate attributes and professional development, both locally and internationally.

Recommendations

- Curricular integration and implementation that takes both technology and pedagogy into account is key. E-portfolios take on various forms and can be created using institutional platforms, open-source applications (e.g. Mahara), or free or paid commercial tools (e.g. a blogging platform like Blogger or WordPress). Despite the choice of platform or tool that may look different visually, the e-portfolio concept is shared in practice. This shapes the affordances to a large extent, rather than by default of the technology.
- For successful e-portfolio integration at institutional or programme level, an appropriate technology-based intervention or platform should be selected, staff members with varied and specialised skills should actively participate in the e-portfolio programme, a marketing initiative should be considered to promote the e-portfolio to students and other role players, and appropriate support initiatives should be implemented to assist students with technical and reflective needs.
- Additionally, a detailed plan should be presented on how the particular programme will be evaluated in terms of implementation and impact (Reardon and Hartley 2007).

Definition

An e-portfolio is a 'purposeful collection of information and digital artefacts that demonstrates development or evidences learning outcomes, skills or competencies' (Cotterill 2007). Some researchers prefer to refer to an e-portfolio concept (Faulkner 2010), pedagogy and/or practice, rather than a particular online system or tool. Although e-portfolios have been defined in various ways, the emerging consensus is that the term encompasses both a process and a product (JISC 2014). Barrett (2011) argues that emphasis should be placed on the process of learning instead of the role of a particular technology. From a teaching and learning perspective, students use e-portfolios to engage in a learning process and collect and organise forms of digital evidence (artefacts) that demonstrate learning outcomes, skills and competencies.

Current trends internationally

Both internationally and locally, the use of e-portfolios appears to be most commonly used in professional degrees (education, architecture, health sciences, engineering, graphic design). This may be due to the presence of professional bodies and standards for quality assurance and accreditation that are used to guide criteria for selecting and presenting evidence on an e-portfolio. Some of these fields also have a history of paper-based portfolios, and e-portfolios can be used to enhance the reflective or evidence-based learning and showcasing aspects of portfolios. More recently, there has been a trend towards career portfolios, encouraging professionalism through the showcasing of employability and graduate attributes. Locally, paper-based portfolios still continue to be the norm, with a few cases of the use of e-portfolios.

Affordances

E-portfolios are different to traditional, paper-based portfolios in that they:

- can be more easily shared, stored and updated;
- include a range of multimedia (embedded in text or hyperlinked);
- provide opportunities for just-in-time reflective practices;
- increase potential for collaborative learning; and
- promote immediate feedback.

It is important to note that the digital medium does not erase the challenges of paper-based portfolios. For example, students still battle with reflective writing, how to select artefacts to include as appropriate forms of evidence and providing constructive feedback to peers.

E-portfolios have multiple purposes, benefits and challenges, depending on their context of use. At programme level, it may be used to track student development and connections over time, across courses and programmes, and to instill values of lifelong, self-directed learning and professional development. At course level, e-portfolios may be introduced under the

auspices of professional benefit, formative and summative assessment, continuous professional development and/or career planning. In other spaces, such as teacher education, the main purpose may be reflective practice as student teachers are encouraged to reflect on their learning.

In terms of assessment, paper-based portfolios and e-portfolios can be used in many ways, depending on what assessment strategy is advocated and the learning theory implicit therein (for more on this, see Kooperberg 2014). However, in many spaces, the focus tends to be on the end product (destination) rather than the process (the journey). Creating an e-portfolio involves engaging in reflective practices that help to support and synthesise formal and informal learning, professional development, graduate attributes and lifelong learning.

Within the learning process, users are expected to store digital resources and develop a digital archive of evidence that is selected for a particular purpose. Users motivate the inclusion of selected artefacts and support such selections with critical reflections. Essential to e-portfolio practice remains the collaborative aspect where users give and receive feedback and participate in a collaborative process in order to present to a particular audience. The particular e-portfolio (product) can celebrate learning, serve as evidence of personal planning, demonstrate newly acquired skills or attributes or supplement a job application (BECTA 2007).

Specific types of e-portfolios can be defined in part by their purpose (such as presentation, application, reflection, assessment and personal development planning), pedagogic design, level of structure (intrinsic or extrinsic), duration (episodic or lifelong) and other factors. Four types of e-portfolios are usually used in higher education:

- *Working portfolios*: These portfolios are also known as development or process portfolios, where students are supported in their planning, organisation and development of learning.
- *Assessment portfolios*: These portfolios provide teachers with an alternative way of assessing selected learning outcomes other than the standardised examinations, tests and assignments. Such portfolios could also be appropriate for final programme assessment.
- *Presentation portfolios*: This type of portfolio is normally associated with a professional development portfolio where students demonstrate their achievements, skills and competency. These types of portfolios are regularly presented at the completion of a particular programme or course.
- *Hybrid portfolios*: It is rare in practice for portfolios to only be used for one particular purpose. Teachers often decide to combine the features of certain portfolios (Jimoyiannis 2012).

E-portfolios are often confused with other tools. Table 1 explains how these online repositories, online CVs, LinkedIn and blogs differ from e-portfolios.

Table 1: Some of the differences between e-portfolios and other tools

Online repository	A decontextualised collection of student work presented as links to documents and other artefacts.
Online CV	A digital version of a CV in a traditional format or presented visually as an infographic.
LinkedIn	A social networking service used for professional networking.
Blog (or weblog)	A public online space featuring regularly updated posts or diary-like commentary in reverse chronological order, usually written in a conversational style. This form is often used for idea or field logs and reflective writing.

However, these forms can become intertwined and may be considered as part of a broader e-portfolio ecology, but they do not necessarily qualify as e-portfolios in their own right. Students may wish to share their e-portfolio as a link on LinkedIn, add their online CVs to their e-portfolio, etc. The boundaries between these forms are blurring, as blogging platforms may be appropriated to create e-portfolios, and LinkedIn and other existing tools are continually adding new features that make them more e-portfolio-like.

Costs: licensing, infrastructure, personnel

Costs depend on the choice of platform (commercial licence, commercial but free to use, or free open-source solutions), which involve different forms of support, training, resource development and marketing. Making this decision depends on sustainability and scale, i.e. the number of students supported and whether e-portfolios are integrated at course, programme, faculty or institutional level. At both a strategic and programme level, it remains imperative that role players clearly conceptualise how e-portfolios could be sustainably integrated into existing and lifelong learning practices (Jimoyiannis 2012).

From a pedagogic perspective, challenges are often associated with the conceptualisation and meaning of reflection and the role of users and academics within this particular learning environment (Jimoyiannis 2012). Student support should not only aim to develop reflective, self-assessment and metacognitive skills, but also appropriate digital literacy skills to sensibly utilise chosen platforms for these learning practices (Goldsmith 2007). User-friendly platforms that do not require too much training are preferred, as complex systems can detract from the learning process. Attention should also be paid to student motivational factors for the successful integration of such learning practices (Tosh and Werdmuller 2004). Support initiatives should also be in place regarding the development of academics' digital literacy skills. Appropriate training and support resources should be in place before students are introduced to e-portfolios.

Application in different contexts in South Africa

The uptake of the e-portfolio concept by local higher education institutions (HEIs) has been most common in professional degrees, thus mirroring international trends. Table 2 provides a selection of local HEIs (four well-resourced HEIs in the Western Province) and course contexts where e-portfolios are currently being used. Details provided suggest that, in addition to being meaningfully integrated into professionally oriented programmes, the application of e-portfolios is small-scale across institutions. It is generally seen as something not feasible for rollout among undergraduate students on a massive scale.

Table 2: Current use in South African contexts – a regional perspective

Course context, faculty, name of South African HEI	Aim of e-portfolio integration	Number of students	Platform or tool used
Postgraduate Diploma e-Marketing course BUS4074S, Commerce Faculty, University of Cape Town (UCT)	Students build their own personal online brand and publish small authentic learning tasks that can be viewed by industry partners.	94	WordPress
Online Learning Design Postgraduate Diploma EDN4501W, School of Education, UCT	Students present their learning design as an e-portfolio, bringing together different aspects of their design thinking.	20	Students may choose, but typically Weebly, Google Sites, WordPress or Wix are used.
Professional Ethics in Physiotherapy PHT402, University of the Western Cape (UWC)	Students used blogs as learning portfolios, and aggregated content from around the web to support their claims of learning.	56 undergraduate Physiotherapy students and 28 qualified physio-therapists from around the world	WordPress
Architectural Technology, Cape Peninsula University of Technology (CPUT)	Students develop portfolios of their projects, particularly of those done during their work placements. There is a multimedia dimension to the e-portfolio in architecture and design.	60 undergraduate students	Blogger
Graphic Design, CPUT	As there is no institutional e-portfolio platform for CPUT, students built their own online presence to showcase their work and promote their skills to employers. They also archive their design work.	10 Bachelor of Technology students (E-portfolio is not mandatory in the curriculum, so this is student agency, although all students have to build a paper-based portfolio that is exhibited for assessment at the end of their year of study.)	Personal websites, design portfolio websites such as Behance, Deviant Art and Carbonmade
Industrial Psychology 152 (Occupational Therapy), Faculty of Economic and Management Sciences, Stellenbosch University	Students are encouraged to actively reflect on the content of the module and engage in the application of theory. They post their reflections (guided by posted questions) on the e-portfolio system, Mahara. Honours students then act as assessors and review the short reflections, posting comments and asking questions.	300 students from various programmes, including industrial psychology, business management sciences, human resource management, philosophy, politics and economics	Mahara

Course context, faculty, name of South African HEI	Aim of e-portfolio integration	Number of students	Platform or tool used
Postgraduate Certificate in Education, Faculty of Education, Stellenbosch University	A pilot group of students were equipped with tablets to use during their school practice visits in the third term. Students had to complete weekly reflections and also comment on each other's posts (reflections) during their time in school.	11 Postgraduate Certificate in Education students	Blogger

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Glossary

Alternative assessments	Measure high-level cognitive skills, such as problem-solving, real-life application of skills and knowledge and the ability to defend positions. Examples of these are assessments that see the process of learning as valid and take account of students' prior and/or situated knowledge, and often involves the production of a product or artefact.
Student-centred learning	An instructional approach in which students influence the content, activities, materials and pace of learning. It places the student in the centre of the learning process. The instructor provides students with opportunities to learn independently and from one another, and coaches them in the skills they need to learn effectively. If employed properly, it leads to increased motivation to learn, greater retention of knowledge, deeper understanding and more positive attitudes towards the subject.
Reflective learning	Learning through reflection, linking prior knowledge and experience to theoretical concepts. A student-centred approach that acknowledges knowing, being and doing as part of the reflection cycle.

Acronyms and abbreviations

CPUT	Cape Peninsula University of Technology
HEI	Higher education institution
UCT	University of Cape Town
UWC	University of the Western Cape

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Open educational resources

Cheryl Hodgkinson-Williams and Glenda Cox

This article provides a brief overview of open educational resources (OERs), and recommendations for their adoption in higher education institutions (HEIs) set again the current trends internationally. The specific OER affordances are highlighted, as well as their associated costs and particular cost reduction possibilities. OER adoption in various contexts in South Africa is provided to showcase the initial benefits and challenges identified so far.

Recommendations

Although most of the research on the adoption and impact of OERs has to date been conducted in countries in the global North, initial indications of the benefits of OERs suggest the following:

- HEIs should consider OERs as a way to reduce student out-of-pocket costs, improve the quality of curriculum development, publicise their institutional intellectual capacity to a global audience and make research more accessible to the general public. The latter is perhaps of greatest importance on the African continent and in the case of developing nations.
- Academics should think about disseminating their original teaching materials to a worldwide audience in order to increase visibility of their work, while still receiving attribution. Academics should regard OERs as a way to customise teaching materials to suit their specific curricula and context, including legal translations and the incorporation of context-specific examples or illustrations.
- Scholars, career guidance teachers and parents should reflect on OERs as a way of understanding higher education subjects and career opportunities to optimise the subject choice selection for the first year of tertiary studies.
- Students should use OERs as a way to reduce their out-of-pocket costs for expensive textbooks and to download and legally retain digital copies or low-cost hard copies of educational materials.
- Student funding agencies should think about OERs as a way to reduce the funding distributed for expensive textbooks.
- Graduates should consider OERs as a way of keeping up to date with the latest developments in the field to improve the currency of their knowledge and skills, thereby enhancing their employability.
- Commercial enterprises, government departments and non-governmental organisations should take into account the development of OERs in partnership with HEIs as a way of providing good-quality in-service training that can be used in higher education programmes as well.

Definition

OERs can briefly be defined as 'teaching, learning and research resources that reside in the public domain or have been released under an intellectual property licence that permits their free use and/or repurposing by others'. The most frequently used intellectual property rights mechanisms used to indicate the permissions for the creation and reuse of OER are Creative Commons (CC) licences. These indicate the original authors' permissions for reuse (copying), revision (customisation, including translation) and remixing (or combination with other materials), which allow for the legal redistribution and retention of the original or adapted materials.

Current trends internationally

Along with other 'open initiatives', such as open-source software, open access, open data and open educational practices, OERs are increasingly becoming a visible phenomenon around the globe. As an indication of the expectation of the potential benefit of OERs to widen access to quality education and make it more affordable, the United Nations Educational, Scientific and Cultural Organization (UNESCO) released the Paris OER Declaration at the World OER Congress in June 2012, following on earlier calls for opening up education, e.g. the Cape Town Open Education Declaration, funding allocated to OER development in the USA and more recent priorities identified by the European Commission.

According to the Scholarly Publishing and Academic Resources Coalition (SPARC) (2015), students can access OERs online free of charge, download and keep a digital copy, and print or purchase a low-cost hard copy, while lecturers can tailor and share OERs to perfectly suit their curriculum, and share their innovations freely. Academics can disseminate their work to a worldwide audience, while still receiving attribution; educational institutions can leverage OERs to reduce student out-of-pocket costs; and entrepreneurs can build businesses around OERs by offering value-added products.

The platforms for curating and distributing OERs include institutionally based repositories (e.g. the University of Cape Town (UCT)'s DSpace at OpenUCT and the University of Pretoria's UPSpace), institutional websites (e.g. UCT's Physics website), open repositories (e.g. OpenStax) and/or cloud-based services (e.g. You Tube, SlideShare). Many of these repositories, websites or cloud-based platforms are indexed and aggregated by OER portals (e.g. OER Commons, MERLOT), providing a mechanism for publicising OERs. OERs have been made available through a range of OER global initiatives, repositories and portals (e.g. Massachusetts Institute of Technology (MIT)'s Open Courseware, Open University's OpenLearn, Washington State's Open Course Library, WikiEducator and OERu).

Lecturers can produce their own OERs individually or work with colleagues in the institution to design, create and curate (i.e. store and make visible through accurate metadata) OERs on institutional websites, open repositories and/or cloud-based services.

Institutional support for lecturers (and even students) to produce OERs includes knowledge of CC, copyright (and in particular, knowledge of copyright of images) and metadata standards (i.e. tagging to increase discoverability).

Affordances

OERs exhibit a number of affordances, the most important of which are the following:

- Adaptability or customisability of existing educational materials
- Flexibility of selection, reuse, revision and/or remixing
- Visibility, findability/discoverability and searchability of materials
- Collaboration on the development of materials
- Productivity of the material development process
- Accountability of the material developers to whom the materials will be attributed
- Scrutiny of OERs that hopefully encourages enhancing the quality of the materials
- Shareability or spreadability of materials on a global scale
- Scalability of reach to anyone with internet connectivity and a device that allows reading, watching, responding to and/or adapting materials

Costs: licensing, infrastructure, personnel

As OERs require a freely available CC licence, there are no additional licensing costs for creating them. In terms of infrastructure, it would be ideal if the HEI concerned was able to host its academics' OERs on an institutional repository (e.g. OpenUCT at UCT or UPSpace and AfriVIP, the African Veterinary Information Portal, at the University of Pretoria) or even within the institutional learning management system (LMS), as long as the permission is set to 'public'. If the institution does not have its own repository, or suitable LMS, there are global open repositories to which academics can contribute their OERs (e.g. MERLOT, OpenStax CNX). Whether academics contribute to their own institutional repository or to an open repository, a Google search is likely to find the resource relatively easily.

The platforms for curating and distributing OERs include regionally based repositories (e.g. OER Africa), institutionally based repositories (e.g. DSpace at OpenUCT and UPSpace), institutional websites (e.g. UCT's Physics website), open repositories (e.g. OpenStax CNX) and/or cloud-based services (e.g. YouTube, SlideShare). Many of these repositories, websites or cloud-based platforms are indexed and aggregated by OER portals (e.g. MERLOT), providing a mechanism for publicising OERs.

In terms of personnel, it would be advisable to have someone who is familiar enough with the CC licences to advise academics on the appropriate choice of licence for specific materials, as these can differ according to topic (e.g. medical procedure) or to type of material (e.g. music, video). This person does not need to be a qualified lawyer, but rather someone who has an interest in intellectual property rights. He or she would need a good understanding of the Guidelines for CC in South Africa and be able to develop relationships with the CC Regional Coordinator for Africa, the CC Legal Lead and Public Lead in South Africa, as well as with the department at the particular HEI tasked with contracting and checking intellectual property. The person should have knowledge of metadata standards (i.e. tagging to increase discoverability) and strategies to deal with embedded copyright (i.e. copyrighted images included in teaching materials). This support is variable and often depends on the importance placed on OER contribution by the top management at an institution. Sharing experiences of strategies that are successful, in addition to strategies that are unsuccessful, will help move the open agenda in South Africa forward.

Developing OERs does not need specific software, although it is good practice to save the resources so that they are readable and editable in open software (e.g. OpenOffice) if the licence specifies that derivatives are allowed.

Application in different contexts in South Africa

In South Africa, there are a growing number of OER initiatives, repositories and/or portals (e.g. UCT's OpenUCT, the University of Pretoria's AfriVIP, and the University of South Africa (Unisa)'s Unisa Open). A number of HEIs have OER policies and/or strategies, which are often linked to Open Access policies (e.g. UCT, the University of the Witwatersrand and Unisa). Unisa and North West University partner with OERu, and Unisa and the University of Pretoria have worked with OER Africa.

For example, at UCT, lecturers can produce their own OERs individually or they can work with colleagues in the institution to design, create and curate (i.e. store and make visible through accurate metadata) OERs on their institutional websites, open repositories and/or cloud-based services. UCT academics hold copyright of their teaching materials, but this is not the case at other institutions in South Africa. At Unisa, guidelines and procedures have been put in place to manage academics' contribution of their teaching materials as OERs.

Glossary

Metadata	A set of data that describes and gives information about other data.
Repository	A central location in which data is stored and managed.

Acronyms and abbreviations

CC	Creative Commons
HEI	Higher education institutions
LMS	Learning management system
MERLOT	Multimedia Educational Resource for Learning and Online Teaching
MIT	Massachusetts Institute of Technology
OER	Open educational resources
SPARC	Scholarly Publishing and Academic Resources Coalition
UCT	University of Cape Town
UNESCO	United Nations Educational, Scientific and Cultural Organization
Unisa	University of South Africa

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Massive open online courses

Laura Czerniewicz, Andrew Deacon, Mary-Ann Fife, Janet Small and Sukaina Walji

Massive open online courses (MOOCs) are a flexible and open form of self-directed, online learning designed for mass participation. There are no fees or entry requirements and no formal academic credit is available. The number of universities offering MOOCs worldwide is growing as institutions experiment with MOOCs in the semi-formal education space, and explore new types of accreditation. While MOOCs are relatively expensive to produce, South African institutions could consider how the MOOC format might meet their conditions and needs, and look to developing MOOCs that are relatively inexpensive, not always high-tech, and in collaboration with other institutions.

Recommendations

- *MOOCsWatch:* MOOCs in their present form are morphing into a variety of formats and models as purposes and possibilities become clearer and their place in the online landscape solidifies. The changes are ongoing, and it is essential that institutions remain alert to these changes and interpret them in the light of local conditions.
- *Collaboration:* Given how expensive MOOCs can be to produce, institutions should identity areas of mutual interest in the South African context and work together to develop them. Gateway MOOCs and postgraduate literacies are immediate possibilities, but there are others.
- *Mind the copyright:* Institutions need to increase their capacity in dealing with copyright issues both as users and as developers.
- *Experiment:* New forms of online education, including MOOCs, are the way of the future. Institutions should experiment with possibilities that suit their own conditions and needs. These may be low-key and relatively inexpensive, not always high-tech.

Definition and characteristics

MOOCs are a flexible and open form of self-directed, online learning designed for mass participation. There are no fees or entry requirements and no formal academic credit is available. While completion rates are low (on average 10% - See http://www.katyjordan.com/MOOCproject.html) owing to varying motivations for enrolling in MOOCs, absolute numbers of participants completing these courses are usually high. While access to the course material is free, MOOC platform providers often offer certificates of completion at a cost. MOOC platforms provide institutions with cloud-based hosting environments for delivering courses, offering scale and functionality, while the institution provides the course material and reputational value.

The major English-medium MOOC platform providers are Coursera, edX, Canvas and FutureLearn; there is a multitude of smaller platforms. Each platform has its technical infrastructure and business model; some platforms align themselves with institutions, whereas others allow individual educators more freedom.

Affordances of MOOC technology

- *Educator involvement:* While educators are involved in the design and production of MOOCs, their involvement during the running of courses is minimised because of the lack of formal assessment or formal academic credit.
- *Engagement:* It is possible to engage with a large number of students via discussion forums.
- *Rewatchablity:* Students are able to watch and re-watch lecture videos.
- *Scalability:* MOOCs are designed to reach a large number of students.
- *Assessibility:* Most MOOC include in-video concept-check questions with immediate feedback, as well as peer review.
- *Customised learning experience:* The participant can learn at his or her own pace and choose which material to engage with.

Trends

While traditional online courses are not new, the success of the present format is a recent phenomenon; in 2014, the number of universities offering MOOCs doubled to 400, resulting in a doubling of the number of cumulative courses, to 2 400 (https://www.class-central.com/report/

moocs-stats-and-trends-2014/). The first large open online course recognised as an MOOC was conceived by the University of Manitoba in 2008. Wide public interest in MOOCs followed later in 2011 with an open online course in artificial intelligence by Stanford University and the Massachusetts Institute of Technology (MIT). This course attracted over 160 000 students from more than 190 countries. The largest platform provider was in Coursera, with a third of all MOOC courses on offer. MiriadaX became the first non-US MOOC provider to cross a million registered users, tapping into the large Spanish-speaking market worldwide. The top three subject areas in 2013 and 2014 were in the humanities, computer science and programming, and business and management (https://www.class-central.com/report/moocs-stats-and-trends-2014/).

MOOCs in the broader higher education landscape

In the curriculum landscape, MOOCs are located in the non-formal space. A number of interesting experiments are taking place with MOOCs in the semi-formal space, exploring new types of accreditation.

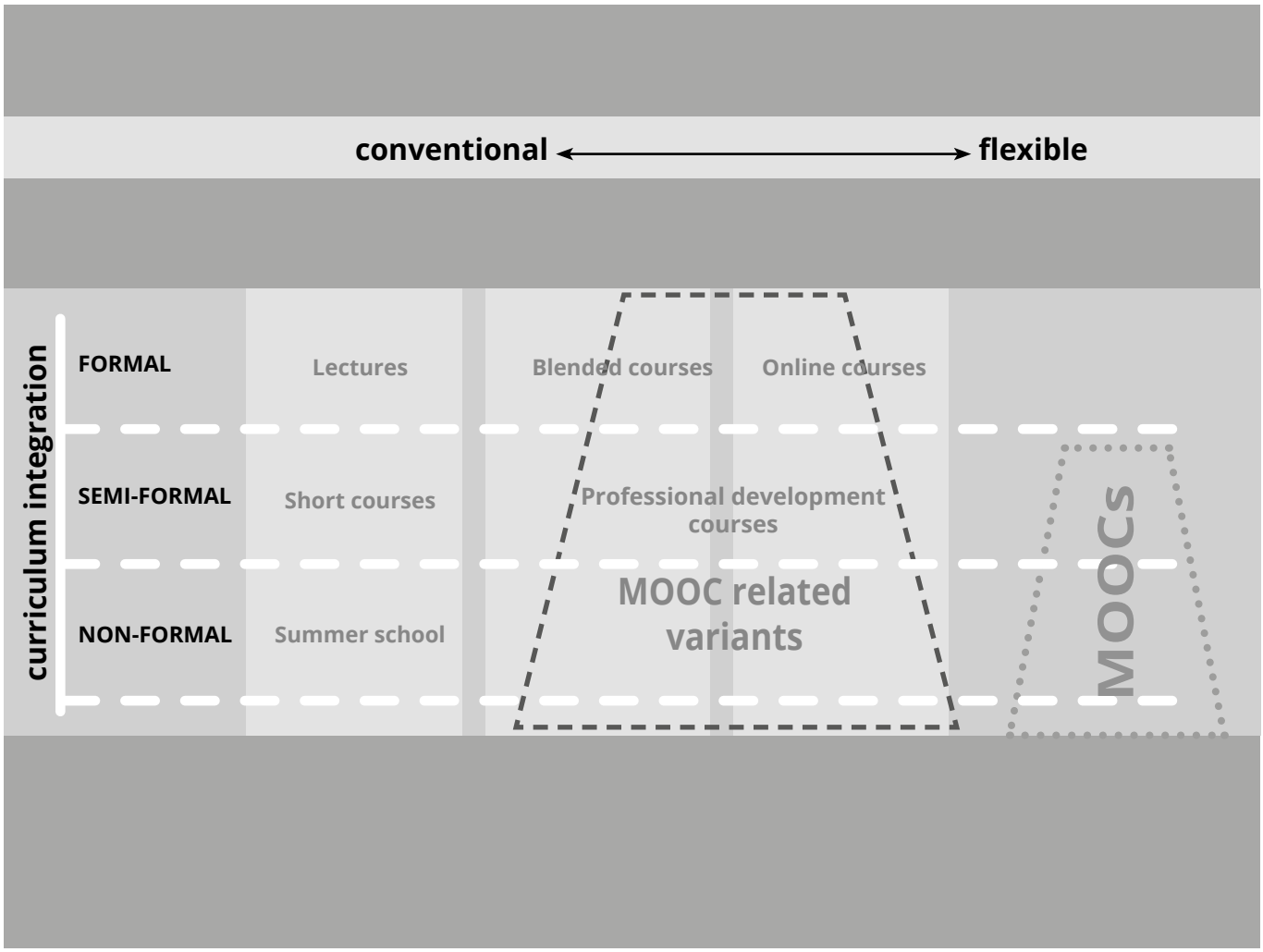

Figure 1: The curriculum landscape

While MOOCs are a form of online course, they differ in several ways, as explained in Table 1.

Table 1: Differences between formal online courses and MOOCs

	Online courses	**MOOCs**
Cost to user	Fees	No fees; possibly certificates and/or support
Entrance requirements	Yes, as per conventional courses	None
Scale	Limited; capped by resources available for support and assessment	Thousands; savings due to limited lecturer support
Lecture role	Responsible for curriculum alignment, quality assurance and support	Flexible role in terms of the curriculum; limited individual support
Copyright	Largely proprietary; some open	Content may be proprietary or open; user-generated content often copyrighted to the MOOC provider
Providers	Distance education providers	Traditional residential research universities partnered with private companies
Analytics	No, not usually	Yes, one of the promises
Certification	Conventional	Non-conventional
Quality assurance	Aligned with the usual formal courses' quality assurance processes	As per non-formal offerings

Categories of MOOCs

MOOCs can be differentiated in terms of the strategic goals that their aims address. A primary distinction is between inward-facing courses (aimed at existing students) and outward-facing courses (aimed at participants with no connection to the university). A further distinction is made between the following categories, with categories 1 and 5 representing outward-facing and 2, 3 and 4 representing inward-facing courses.

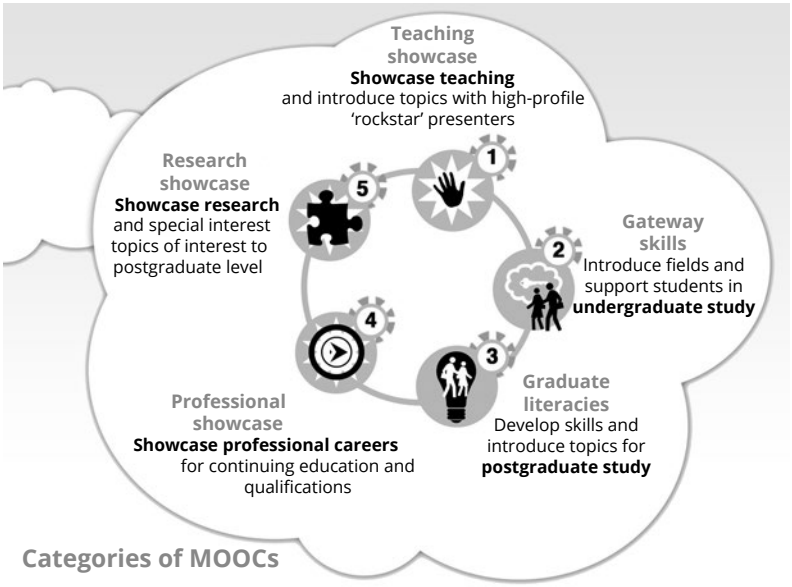

Figure 2: Types of MOOCs

Category 1: *Teaching showcase:* General interest course in which an institution's teaching is showcased with the aim of raising the appeal or reputation of the institution

Category 2: *Gateway skills:* Aimed at prospective undergraduate students with the intention of preparing/upskilling prospective students for a particular area of study

Category 3: *Graduate literacies:* Develops students entering the postgraduate level of study with the necessary skills, such as proposal writing, research methods and statistical analysis

Category 4: *Professional skills*: Focuses on professional certification and professional development

Category 5: *Research showcase:* Aimed at raising the appeal of the institution as a centre for research excellence

Emergent forms of MOOC-type courses

As shown in Figure 1, emergent MOOC-type forms are being explored, spawning new acronyms and buzz words. Some of these are as follows:

- MOOC: Massive open online course
- Open boundary course: Both formally enrolled students and outsiders study the course together, although with different levels of educational support
- SPOC: Small private online course
- MOC: Massive online course
- Wrapped MOOC: An MOOC that is adapted for paying students or included as part of an existing course for enrolled students

Applications of MOOCs

The application of MOOCs in a South African context, as elsewhere, spans a continuum of formal and informal education sectors, as well as the workplace learning/continuing education sector. On one end, MOOCs can be viewed as standalone learning opportunities that may function as either informal learning or, conversely, as 'standalone' or independent/alternative form of a qualification. In contrast, MOOCs could be integrated into formal education or workplace learning/continuing education, even utilising new forms of certification.

MOOCs and the formal education sector

Participating in MOOCs does not confer formal university credit: this form of educational delivery can therefore not be seen to contribute to expanding formal learning opportunities on a par with a university or further education qualification, in the way that qualifications offered by the University of South Africa (Unisa) do. Specific types of MOOCs are likely to have a role to play in the performance, success or throughput rates of formally enrolled students in South African universities; in the categorisation of MOOCs shown in Figure 2, MOOCs that provide gateway skills or opportunities to develop postgraduate literacies could play a part in improving the educational outcomes of currently enrolled students (as reflected in poor throughput rates/high dropout rates). Wrapped MOOCs also provide opportunities for enriching and supplementing courses; these can be used in different ways, either as the course supplemented in various ways or as a resource[3]. SPOCs are also a valuable way of gaining free access to world-class expertise, when local face-to-face experts draw on and add contextualised knowledge. Examples include HarvardX Law courses run across the world as SPOCs.

Workplace and non-formal contexts

While the MOOC movement is emergent, global trends have made it evident that one clear application of MOOCs is workplace or corporate training, where MOOCs may provide opportunities for students to enter the workplace through exposure to new fields or the gaining of specific skills – often in emerging industries. The MOOC platform providers are beginning to offer learning pathways of certification (Coursera specialisations or EdX xSeries), which, while not akin to university credits, may offer alternatives to qualification. The trend for students to showcase their MOOC certificates on CVs, job portals or personal profiles (such as LinkedIn) is apparent. Another related application is MOOCs that offer continuing professional development (CPD) opportunities. MOOCs that cater to this sector offer more structured qualifications, but at relatively low cost, thus increasing accessibility. Some MOOC providers are calling these 'nano-degrees'. In adopting this model, South African institutions could forge connections with industry organisations to cater for sector needs and in areas of skills shortages.

Costs of MOOC production

The costs of producing an MOOC vary considerably, and as yet, there is no viable business model to recoup all the expenses incurred in production. The sale of certification generates some income and extensions to this aspect of the model (e.g. the introduction of linked courses in a programme of study) and new uses of MOOCs (add-ons, paid-for additional services) are being explored with some success by institutions globally. Some of the international platforms (Coursera and FutureLearn) do not require any upfront financial contribution from the partner universities, as they operate on the assumption that the courses flighted on the platforms will be generating an income in the future that will be shared between the platform and the university partner. EdX is a non-profit venture and requires partner university contributions to fund its operations. Some universities fund their MOOC programmes through donor funding.

The major cost drivers in MOOC production and delivery are:

- the number of faculty members, administrators and instructional support personnel participating in the process;
- the quality of videography;
- the nature of the delivery platform;
- technical support for participants;
- programming for special features, such as computer code auto-graders, virtual labs, simulations or gamification; and
- analysis of platform data.

MOOC production teams that have been described seldom included fewer than five professionals and, in at least one instance, over 30 people were involved. Course length is not a reliable predictor of costs (Hollands and Tirthali 2014:134).

The main costs around MOOCs from an institutional perspective are as follows:

- *Institutional infrastructure:* Setting up procedures for

[3] See https://shanaligovender.wordpress.com/2014/10/02/seminar-wrapping-moocs-for-students-in-the-global-south-last-day-unleashing-the-power-of-online-networks-for-elearning-in-africa/ for an elaboration of this point.

decision making about platforms and the selection and quality assurance of courses is time consuming for a range of institutional personnel (from university leadership to legal advisors). Initial upfront investment may be required for some international platforms (which could be sourced from donor funding). Establishing some capacity to support course production is essential (staff with online learning design and video production capacity) – although there is a range of options, from repurposing existing internal units to setting up regional collaborations between institutions for shared capacity development to outsourcing these roles to private providers.

- *Educators:* Depending on the type of course and the support available, academics typically report spending between 100 to 400 hours in the process of production (Hollands and Tirthali 2014). Unlike traditional courses, the bulk of the inputs is done in production, while significantly less time spent while the course is running. Effectively, teaching time is being built into the course during production. In some instances, academics will require funding to pay for someone to teach in their place for the period devoted to production. Given that course production does not offer any academic career rewards, motivation to spend time producing an MOOC rather than other academic activities will have to be considered.

- *Support staff:* Generally, MOOCs require a support team of learning designers, video production specialists and academic content assistants to work on creating the course content. The actual costs will depend on the nature of the particular course – however, it can be assumed that a single course will require the inputs of a team of two or three support staff for several months.

- *Production:* MOOCs on the major international platforms favour short video-recorded lectures as the main media for the content. High-quality video is costly and requires access to equipment (which can be hired or bought). The actual cost per minute of video will depend on the style of the segment, whether a cheaper screencast or high-production video. These costs range widely from R2 000 to R12 000 per short video. When estimating this cost, the staffing and equipment (filming studio or video camera, sound and lighting) are included. Outsourcing to a commercial video production company or hiring contractors for intensive film shoot days are alternatives to fully investing in capital equipment and personnel.

- *Course material:* If specific course material that is under copyright licence is required, costs may be incurred in buying the rights to use it. Generally, open-source material or originally produced material is favoured in the production of MOOC.

It is difficult to accurately cost a single MOOC because of the huge variety of types of courses. Reports released by Northern universities range from $39 000 to $325 300 (Hollands and Tirhali 2004:138).

Caveats and concerns

There are several concerns about MOOCs, most of which have been alluded to. In short, the issues that may be of concern include the following:

- *Forms of certification:* For some, lack of certification or the emergent nature of new forms of certification may be a concern.

- *Digital and critical literacies:* Research has shown that participating in MOOCs requires critical and digital literacies, i.e. skills and competences to thrive and learn in a digital environment (BIS 2013).

- *Connectivity:* Most MOOCs include video, and assume good reasonably priced connectivity and bandwidth, thus limiting possible participation for many South Africans, especially in rural areas and away from formal institutions.

- *Language:* MOOCs are delivered primarily in English, although globally, language-specific platforms are emerging, especially in European languages (Spanish and French).

- *Copyright:* MOOCs and other online courses change the rules of engaging with copyright in numerous ways (the student body extends beyond the university, user content is generated, etc.). It is a more complex intellectual property environment.

The last word – create! It is important for local universities to participate as producers, not simply as consumers of MOOCs from elsewhere.

Acronyms and abbreviations

CPD	Continuing professional development
MIT	Massachusetts Institute of Technology
MOC	Massive only course
MOCC	Massive open online courses
SPOC	Small private online course
Unisa	University of South Africa

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Distance education and supporting technologies for open and distance learning

Maria Madiope and Devan Govender

Learning with technology and online education are not synonymous with distance education or even open and distance learning (ODL). Traditionally, distance education is associated with lecturers and students being separated in space and time (asynchronous). Online education is often offered to full-time contact students or students who attend compulsory block period lectures, as well as working online. Where fully online programmes are offered for distance education, they have the advantage of allowing synchronous contact through technologies such as Skype, Blackboard Collaborate or Adobe Connect. It is easier to create a social presence as a lecturer online than it is in paper-based distance education. In South Africa, it is important to pay attention to the context of students and their access to technology if they are offered via distance education in an online medium only. Changing paper-based delivery to online delivery is a complex issue as the skills needed to write study guides are not those needed to design online sites or to facilitate online; furthermore, the production and storage infrastructure of distance education is different from the technology infrastructure required by online delivery.

Recommendations

The following are recommended to promote technology-enhanced teaching and learning within higher education institutions (HEIs) in South Africa that are contemplating fully online distance education:

- Involve academic staff in decision making about delivery modes and choice of technologies.
- Choose appropriate technologies aligned to learning outcomes within a sustainable model of technology acquisition, support and maintenance.
- Embed technology-enhanced teaching and learning at the teaching and assessment policy level of an institution so that it becomes entrenched and engrained among all stakeholders.
- Provide upfront investment.
- Put the right infrastructure in place and ensure that students have access to hardware and connectivity.
- Provide instructional design staff to assist lecturers to develop their programmes and plan sufficient time for the development (12 to 18 months).
- Establish designated staff development units to ensure adequate and sustained opportunities for the continuous professional development of all staff, including their academic, professional and administrative development, specifically in the design and development of online programmes and the facilitation of online learning. For example, at the University of South Africa (Unisa), the Directorate for Curriculum and Learning and Centre for Continuous Professional Development are available, and most universities have dedicated teaching and learning centres.
- Initially, undertake business process mapping and business (re)engineering to evaluate the capacity and efficiency of technology-based systems, processes and procedures that impact on technology-enhanced teaching and learning practices.
- Where possible, reward academics (not necessarily in monetary terms) for promoting full online teaching and learning as they have to spend odd hours supporting students enrolled in online modules.
- While disciplinary-based research is important, encourage research on pedagogy. In particular, monitor the implementation of new courses, gather and analyse data, and adjust it as necessary.
- Promote the use of open educational resources (OERs) and massive open online courses (MOOCs) where possible, but provide the skilled resources for adapting them to suit the outcomes of the programme.

Definitions

There is currently no universal definition of ODL. The Commonwealth of Learning (CoL) (2000:2) states that:

> The term open and distance learning and its definition are relatively new in the field of education, having gained prominence only in the past 15 to 20 years. The language and terms used to describe distance learning activities can still be confusing, and there are geographical differences in usage.

The lack of universality of a definition of ODL stems from the contestation that that higher education provision via distance is context-specific, country-specific, continent-specific, governmental-support-specific and so forth. The contextual environmental differences for ODL provision are based on an HEI's vision, mission, strategic goals and objectives, resource availability, teaching strategy, etc. To illustrate this point, it may be worthwhile to consider Unisa's (2008:2) definition:

> Open and distance learning is a multidimensional concept aimed at bridging the time, geographical, economic, social, educational and communication distance between student and institution, student and academics, student and courseware, and student and peers. Open and distance learning focuses on removing barriers to access learning, flexibility of learning provision, student-centredness, supporting students and constructing learning programmes with the expectation that students can succeed.

From Unisa's definition alone, it becomes clear that ODL is not a traditional form of higher education provision, but a complex one that involves a systemic approach to ensure that the student is at the centre of instruction and that all is done to ensure that the student is supported adequately to ensure success.

Analysis and discussion

One of the main complaints about ODL is the fact that it does not replicate the social environment of a lecture hall where peer collaborative learning can be promoted synchronously. In fact, some scholars argue that ODL institutions pay scant and minimal attention to promoting technology-enhanced solutions to bridge the transactional distance between the ODL institution and the student. It must be pointed out that the law of supply and demand is making synchronous and asynchronous technological solutions far more affordable than was the case in the past. The technologies in question range from sound, video, mobile, audio, instant messaging, social media platforms, podcasting, vodcasting, video conferencing, teleconferencing, computer-based conferencing and the like.

In their study on student support services in higher education, Harvey et al. (2006) identify a number of challenges that impact on student support, retention and achievement in ODL. They go on to argue that social and academic integration, the mismatch between student expectations and experiences, lack of appropriate academic study skills and the importance of student support are the primary student support challenges that must be mitigated to ensure student success in ODL (Harvey et al. 2006:56).

It is a myth that all technological solutions within ODL provision are costly and unaffordable. In this regard, university administrators, policy makers and decision makers must take responsibility for embedding technology-enhanced teaching and learning as a viable and innovative solution within their institutional goals and objectives to improve the quality of teaching and learning. Given this context, it might be useful to consider goals 4 and 5 of the US Department of Education's National Education Technology Plan (US Department of Education 2012), which supports the assertion that HEIs would have to begin to leverage technology to improve learning outcomes and the cost-effectiveness with which those greater outcomes are achieved. Goals 4 and 5 further stress 'the use of technology to improve institutional cost management and enhance collaboration between education sectors on increasing higher education readiness. It also recommends a transition to competency-based assessment to accelerate the adoption of the flexible, affordable e-learning opportunities' (US Department of Education 2012:1).

The US Department of Education (2012) also encourages HEIs to consider 'courses and other learning resources made freely available in the public domain that academics can adapt and repurpose as needed'. In keeping with this strategy of affordance, Unisa is currently embarking on a major initiative to popularise the use and adaptation of OERs to increase affordable access to high-quality learning materials.

The Department of Higher Education and Training (DHET), in its *White Paper for Post-School Education and Training* (2013:53) states that:

> Information and communication technology is increasingly becoming a critical ingredient for meaningful participation in a globalised world. It is also an indispensable infrastructural component for effective education provision, and is central to the notion of opening learning opportunities in the post-schooling sector, especially for the network described above. Currently, ICT access is extremely uneven, making it impossible for education and other providers to fully harness the potential of using ICT to support teaching and learning, particularly at a distance. South Africa's goal will be to ensure that this infrastructure is extended equitably to all post-school students. Recent increases in the availability of bandwidth, cloud services and affordability of end-user mobile devices such as laptops, tablets and smartphones make this goal attainable.

The current trend in higher education is also about embracing the philosophy and strategy of MOOCs. The International Council for Open and Distance Learning (ICDE) (2014:9) notes that the term massive open online courses was coined in 2008 to refer to 'a web course with potentially thousands of participants that people could

take from anywhere across the world'. MOOCs are based on an extensive and diverse set of content, contributed by a variety of experts, educators and instructors, and aggregated into a central repository that can be accessed anywhere and anytime (ICDE 2014:9).

The initiatives in employing technology-enhanced teaching and learning discussed above are in keeping with current trends, models and paradigms around innovative higher education teaching and learning in an ODL context. In its publication *Distance higher education programmes in a digital era*, the Council on Higher Education (CHE) (2014:7) argues that ODL should be based on the following:

> The way in which we use digital technology models particular values and uses for our students, and places particular kinds of demands on both them and their lecturers. Therefore, we need to make conscious choices to use suitable technologies in appropriate ways, taking cognisance both of our learning purposes and the technology profile of our target students and staff. The integration of supporting ICTs cannot simply replicate traditional practice: it takes conscious decision making and action to use the affordances of ICT to change the practice of teaching. Technology therefore needs to support the teaching and learning process and not drive it.

In support of promoting technology-enhanced teaching and learning, the DHET (2013:53) states that it will improve information and communication technology (ICT) access by:

- developing an integrated ICT plan that will provide strategic direction to the DHET for the improvement of equitable access to and use of appropriate technology across the post-school education and training system;
- prioritising collaboration with the Department of Communications and other government departments and stakeholders to facilitate increased bandwidth and reduced costs for educational purposes, with particular emphasis on reaching those in more remote areas;
- engaging with stakeholders to negotiate easier access to and reduced costs for Internet-enabled devices;
- bidding for funds to ensure that a comprehensive, enabling ICT infrastructure is put in place for all providers of post-schooling, particularly providers of distance higher education; and
- facilitating the shared establishment and management of ICT-enabled, networked learning support centres in areas where home-based provision is likely to be difficult in the short to medium term (DHET 2013:53).

The challenge of changing from paper-based to online teaching and learning currently poses some challenges at Unisa. The challenges are multifaceted and range from apathy among academics, technophobia among some academics, inconsistent infrastructural support, etc. These are challenges that are not only peculiar to Unisa, but arise among many other ODL HEIs throughout the world. In order to encourage academics to adopt online teaching, there must be a 'carrot approach', where academics are afforded some rewards and benefits. The rewards and benefits need not be financial, but could incorporate non-monetary rewards such as flexibility of working hours, allocating teaching assistants, allocating more e-tutors, etc. These advantages will serve as an incentive to academics to embrace online teaching more readily.

Currently, the Department for Curriculum and Learning Development (DCLD) at Unisa plays a valuable role in encouraging academics to adopt online teaching and learning. The education consultants from the DCLD ensure that academics are reminded about the advantages of online modes of delivery. Some of the advantages advocated to academics are the following:

- longer scheduling dates for module development that are offered online or blended as compared to print-based modules;
- the ease with which additional resources can be uploaded for student engagement;
- peer learning among students through discussion forums;
- e-portfolio assessment;
- non-venue-based examination opportunities in an online and blended environment;
- non-reliance on the South African Post Office (SAPO) to deliver study material and therefore no impact of annual strikes by the SAPO; and
- full training and development to all academics for online module design and development, online assessment, on-screen marking and e-tutor support.

South African practices

Unisa was designated as the only dedicated distance education public institution some years ago, but other universities were also approved to offer certain programmes by distance, usually teacher-upgrading programmes. The private higher education sector continued to grow its distance offerings. More recently, particularly in postgraduate and continuing education sectors at public universities, a more hybrid model has begun to develop, particularly in relation to the affordances of technology.

As Unisa has been a major distance education provider for some years, examples of its practices are given below:

- In its effort to harness the immense potential of ICT to provide its students with an inherently online teaching and learning experience, Unisa has introduced seven signature courses. Signature courses are fully online, mediated through online technologies. Teaching assistants have been appointed for student support as this is important during the implementation phase. Assessment is conducted online. From 2013, any student enrolling for a new undergraduate degree will be required to register for and successfully complete

one compulsory online module per college. The appropriateness of the pedagogical approach used in the signature courses has been acknowledged by the CoL. According to the adjudicators, Unisa's signature courses represent the best interactive online courses designed during 2013.

- Unisa has developed an e-tutor model that provides online tutor support to students. The e-tutor model was implemented in 2014 and targets all NQF Level 5 and 6 modules in 2015. The model is based on one e-tutor supporting 200 students in a module. The e-tutor enrols for an e-tutor skills course that must be completed online. Upon passing the skills course, the e-tutor is appointed.

- In keeping with the promotion of technology-based teaching and learning as espoused by the DHET (2013), Unisa currently employs a range of technologies to mediate teaching, learning and assessment. To mention a few, Unisa employs a dedicated learner management system (LMS) called myUnisa to promote online teaching, learning and assessment. This LMS is based on open-source software powered by SAKAI. The LMS is used to support all online, blended and print-based teaching modes of delivery. The module site for print-based modules makes use of default tools on the LMS such as a welcome page, announcement page, calendar, etc. The blended and full online modules make use of all tools embedded within the LMS, ranging from announcements to blogs, wikis, a grade book, etc. In order to ensure that all students have access to Unisa's study material, students enrolled for blended or fully online modules also receive the online study materials in print format.

- Unisa also employs a range of other popular technologies, such as podcasts and vodcasts.

- Unisa has embarked on 'on-screen marking', where examiners are able to mark assignments and tests online using a pdf-based on-screen marking software application. Grade book is a formative assessment tool that is embedded in myUnisa. E-portfolios are also used in postgraduate modules for non-venue-based summative assessment.

- Unisa is currently in the research phase of investigating the possibility of integrating MOOCs into its curriculum offerings at qualification and module level.

Stellenbosch University has for a long time been using satellite technology to support its distance programmes. North West University has a partner in Open Learning that provides venues for contact tuition and this university has recently increased lecturer 'presence' though its interactive whiteboard system.

Acronyms and abbreviations

CHE	Council on Higher Education
CoL	Commonwealth of Learning
DCLD	Department for Curriculum and Learning Development
DHET	Department of Higher Education and Training
HEI	Higher education institution
ICDE	International Council for Open and Distance Learning
ICT	Information and communication technology
LMS	Learner management system
MOCC	Massive open online courses
ODL	Open and distance learning
OER	Open educational resource
SAPO	South African Post Office
Unisa	University of South Africa

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Professional development for teaching with technology

Detken Scheepers

Most South African universities provide professional development opportunities for their academic staff. It is one of the accreditation criteria for the Council on Higher Education (CHE) as it is considered a critical element of quality assurance. Increasingly, with the introduction of online learning management systems (LMSs), an array of web-based tools and a variety of technology available in classrooms, that development has to include working with technology to promote learning.

Recommendations

- Make support and professional development for teaching with technology available to academics. A support helpline, online support documentation, and training and coaching should be available.
- Build in a reward system to motivate academics to implement technology in an innovative way to support the achievement of learning outcomes, e.g. it should count towards promotion, an award could be instituted.
- Make training in digital literacy available as a prerequisite during probation, but open to all, and make training in the facilitation of e-learning available as well.

Discussion and analysis

The successful implementation of educational technologies depends on the lecturers using these technologies. It is a daunting task to keep abreast of the ever-increasing number of innovations that may be used in education. In addition to the explosion in educational technologies, most academics do not have much teaching preparation or experience when they are appointed, and base their understanding of effective learning on what they experienced during their student life. As a large number of lecturers do not have previous experience as students in the use of educational technologies to guide their teaching practice, they tend to transfer their traditional beliefs of teaching to these technologies. It is therefore critical to provide support and professional development opportunities to assist lecturers to engage in 'pedagogical problem solving' when they implement new technologies within their disciplines (Kreber and Kanuka 2006).

Frameworks

Two frameworks are used in the following discussion to highlight a holistic approach to the professional development of staff within an institution to use educational technologies. The first is that of Baran and Correia (2014), and the second is that of Knight et al. (2006), who use Engestrom's activity theory.

Baran and Correia (2014) propose a nested professional development framework for online teaching that considers the interconnectedness of three levels: teaching, community and organisation (Figure 1). At the teaching level, professional development opportunities should support lecturers with pedagogical inquiry into the use of the technology within their specific contexts, acquiring the necessary technological skills to use these technologies, as well as design and development support to design appropriate learning opportunities. Professional development opportunities that address these needs are typically presented by units of instructional designers, library specialists and/or audio-video producers in formats that range from one-on-one assistance to reference manuals, showcases and workshops that are typically presented within an institution (Baran and Correia 2014).

The community component of the framework advocates the expansion of academic development into the communities in which lecturers work. While there is a natural tendency to seek help from support personnel, research (Baran et al. 2013) indicates that lecturers adapt better to the online teaching environment if they belong to both informal groups and formal, organised social networks and communities of practice, as these environments assist lecturers through the experimentation with technologies, exchange of ideas, advice and continuing dialogue on the topic.

The organisational level introduces the key motivational role that institutional support and recognition play to support lecturers' participation, commitment and sustained interest in online learning. A reward system that acknowledges the extra effort and commitment of lecturers to develop online courses has proven to be highly motivating to academics. Baran and Correia

(2014) list the following rewards described in the literature: acknowledgement of leadership, value towards promotion, financial incentives, release of time for course development and public acknowledgement.

Another important factor is organisational culture. A positive organisational culture that 'respects and rewards online teaching, and makes it accessible and flexible' is key to motivating lecturers to increase their use of online technologies.

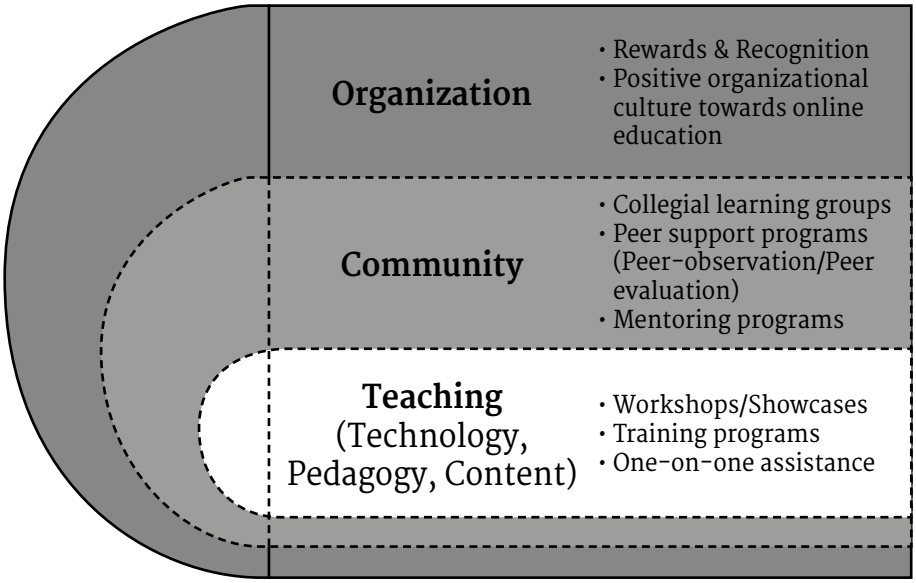

Figure 1: Professional development framework for online teaching (Baran and Correia 2014)

Knight et al. (2006) used Engestrom's activity theory (2001) (Figure 2) to interrogate the impact of context and community on professional development programmes. They implemented this theory as follows: The subject can be seen as the educational development event/resource, which has better educational practice as outcome. Aspects that impact on the degree to which these outcomes are achieved are determined by the tension created between the mediating tools (design of the professional development intervention) and the rules and division of labour (current working practices of a department/faculty), as well as the community in which the lecturer works. These studies have found that the context and community in which lectures find themselves impact on the effectiveness of professional development opportunities. Conversations within non-formal and social learning environments, such as learning 'on-the-job', discussions with co-workers and own student experiences, influence the effectiveness of academic development initiatives.

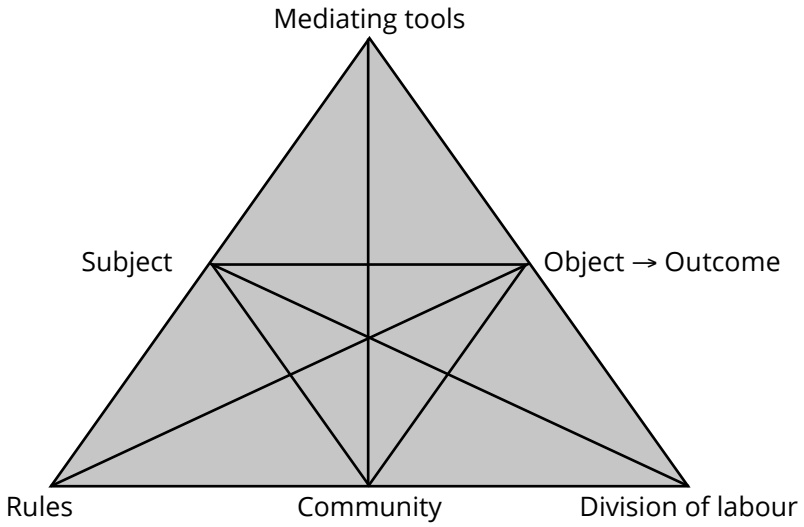

Figure 2: Engestrom's activity theory (In: Knight et al. 2006:135)

Another vehicle that academic staff can use for their own professional development in the implementation of education technologies is Scholarship of Teaching and Learning (SoTL). This engagement with pedagogical problem solving may result in their own growth in understanding of the effective use of education technologies, while contributing to the knowledge base of educational technologies (Kreber and Kanuka 2006).

South African perspective

Professional development and support for the use of educational technology within South African higher education vary according to the vision, policies and context of the institutions, the philosophy of the academic support departments, as well as the number of available e-learning/educational technology support staff.

Limited reward systems are in place to motivate academic staff to make better use of the technologies. Those that are in place vary between time off to develop online courses, showcase events where champions present their work, and awards to academics who implement technology in an innovative way. The only national award that is available is the annual National Excellence in Teaching and Learning Awards of the Higher Education Learning and Teaching Association of South Africa (HELTASA) and the CHE.

Common institutional formats of professional development opportunities include hands-on, contact short courses on how to use the technology, online documentation to support, and training sessions presented to specific academic departments. One aspect of these sessions that requires special mention is the fact that many academics or academic administrative staff members do not have the necessary computer literacy and information literacy skills that are required to implement educational technologies successfully. Only the University of Cape Town and the University of Pretoria provide online courses on the facilitation of e-learning. The massification of higher education in South Africa, as well as the pressure to produce high-quality research, impact on the permanent academic staff's availability to attend these initiatives. Academics who are contracted on a part-time basis seldom have the opportunity to attend these events as their remuneration packages do not include time for professional development.

A few formal under- and postgraduate qualifications exist that address the use of computer-mediated education in South Africa, provided by the faculties of Education at the universities of Pretoria, Johannesburg, Cape Town and the Witwatersrand. Most of the instructional designers/education technologists within the universities have postgraduate qualifications in the use of educational technologies, while very few academic staff members enrol for these qualifications.

An informal community of practice for instructional designers, known as UP-TU-JU, was established in 2006 in Gauteng and has grown into a national group that meets twice a year. The meetings focus on the best practices for the application and implementation of new educational technologies in higher education.

Recently, MOOCs on how to integrate educational technologies or how to design blended learning courses have broadened the horizons for academic and academic support staff to learn how to implement these technologies.

Acronyms and abbreviations

CHE	Council on Higher Education
HELTASA	Higher Education Learning and Teaching Association of South Africa
LMS	Learning management system
SoTL	Scholarship of Teaching and Learning

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Best practices for learning analytics initiatives in higher education

Dolf Jordaan and Antoinette van der Merwe

This article aims to summarise international best practices for implementing a learning analytics (LA) strategy in a higher education institution (HEI). Universities have always collected data for reporting purposes. LA collects data while students are learning, enabling targeted interventions with potentially at-risk individuals or students with the ability to excel. LA has been made possible by the widespread use of technology, particularly learning management systems (LMSs) that enable the electronic collection of data. Such data can be combined with more traditional sources of data, such as student demographics or academic success plus qualitative information to produce analyses for decision making.

Recommendations

- Evaluate the current institutional readiness using available institutional readiness instruments to ensure that any solution chosen suits the context.
- Initiate LA at institutional level only if the institution is ready to make the investment and commitment (Bichsel 2012).
- Follow a specific project-orientated pathway. Identify an all-inclusive stakeholder team, set the objectives and determine where to begin through consultation (Diaz and Fowler 2012).
- Institutions should not only focus on tools and systems, but also on the expertise (analysts), process and policies. Invest in people and not only in technology, but plan for infrastructure that supports analytics across the institution (Bichsel 2012).
- Consider current policies to address ethical issues in learning analytics and challenges in context-dependent and appropriate ways (Prinsloo and Slade 2014; Prinsloo and Rowe, this volume).

Definition

Learning analytics is recognised as an emerging field, but one that will dominate higher education in the foreseeable future. Various efforts have been made to provide a distinctive definition.

A publication from the Educause Learning Initiative (ELI) (Barneveld et al. 2012) suggests that, as a new field, a variety of terms are adopted to describe concepts and processes linked to LA in education. This is the reason why the ELI paper (Barneveld et al. 2012) proposes that analytics should be viewed as 'an overarching concept', and defined LA as 'the use of analytic techniques to help target instructional, curricular and support resources to support the achievement of specific learning goals'. This definition must be read within the proposed ELI conceptual framework for positioning analytics within the education domain, to understand the varied and overlapping definitions of analytics in this domain. The scope of this article does not allow a detailed explanation of concepts such as business, academic, learning and predictive analytics, but it is important to note that each has its own level of focus. A table that contains an overview of the conceptual and functional definitions of the various types of analytics applicable to education is available in an ELI report entitled *Building organisational capacity for analytics* (Norris and Baer 2013), and will provide an overview of each type of analytics level of focus. There is a close link, according to Barneveld et al. (2012), between the Scholarship of Teaching and Learning (SoTL) and analytics, as LA can supplement the established theory and practice of SoTL. Therefore they have the opportunity to inform each other.

A Joint Information Systems Committee (JISC) publication (Cooper 2012) notes that any attempt to provide a detailed definition will be difficult as there are different perspectives or commercial motivations to emphasise a particular focus area or nuance. JISC focuses on the concept of 'actionable insights' as a substitute for decision making as an outcome of analytics (Cooper 2012). JISC's emphasis on actionable insights points to the essential characteristics of analytics, which are more about a personal and organisational perspective of how data can be used within the context of the HEI to yield benefits. The JISC views analytics as something people do. Its description of analytics is therefore as follows: 'Analytics is the process of developing actionable insights through problem definition and the application of statistical models and analysis against existing and/or simulated future data'.

The Society of Learning Analytics Research (SoLAR) (Siemens et al. 2011) divides analytics within the education sector into two categories: learning and academic analytics. The definition for LA as defined by SoLAR is often quoted in publications. SoLAR (Siemens et al. 2011) defines LA as follows:

> Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs. Learning analytics is largely concerned with improving learner success.

Discussion and analysis

Learning is associated with interactions between students, facilitators and the applicable content or subject matter. The effectiveness of the learning can be influenced by, among others, the course design and how the interactions meet the needs of the students to achieve personal goals and specific course outcomes. The success of any initiative to improve the course design or measure the success of the interactions was traditionally limited to the data that were available, such as the grades of the students at the completion of the course. The use of data available in educational technologies, such as LMSs, provides opportunities to improve teaching and learning through the use of LA. According to Greller and Drachsler (2012), the datasets available within an LMS offer opportunities for the implementation of early warning systems. This increases the importance of LA and that is why it is increasingly being recognised by governments, educators, funding agencies, research institutes and software providers.

The growth of interest in LA in higher education is also linked to the emergence of 'big data' in every industrial sector. 'Big data' is a phrase that describes structured, semi-structured and unstructured data available through the electronic traces that everyone leaves behind when working online. It is characterised by volume, velocity and variety. Norris and Baer (2013) indicate that analytics and big data offer the potential to identify promising practices, effective and efficient models, and powerful innovations to sustain higher education for the future. The use of data and analytics to produce new insights based on in-depth analysis of data has provided new opportunities for higher education. LA may improve education and specifically higher education as it provides lecturers, students and decision makers with actionable insight into classroom activities, both face-to-face and online, as well as into the impact of course design on student success (Siemens et al. 2011).

Learning analytics:

- reduces attrition through early detection of at-risk students and generating alerts for learners and educators;
- personalises and adapts learning process and content, ensuring that each learner receives resources and teaching that reflect their current knowledge state;
- extends and enhances learner achievement, motivation and confidence by providing learners with timely information about their performance and that of their peers, as well as providing suggestions on activities and content that address identified knowledge gaps; and
- makes better use of teacher time and effort by providing information on which students need additional help, which students are candidates for mentoring others, and which teaching practices are making the biggest impact (Siemens et al. 2011).

Additional benefits also include the impact on the curriculum development process. Higher-quality learning design and improved curriculum development processes through the use of data generated during real-time instruction and learning activities contribute to the cycle of curriculum improvement. The data available through interactive visualisations give students and educators the ability to 'zoom in' or 'zoom out' on data sets, depending on the needs of a specific teaching or learning context. Access to benchmarking tools helps students to evaluate their progress and determine which activities are producing the best results (Siemens et al. 2011).

With the hype focusing on big data and analytics, the tendency may be to focus on the software available in the market. Organisational capacity-building for analytics will only succeed if it is linked to a structured implementation of a major change management programme at all levels within the institution. Norris and Baer (2013) indicate that the selection of the correct software is not sufficient to achieve student success goals. They state that:

> The truly strategic issue facing higher education today is not just the availability of particular tools, applications and solutions: It is the ability of individual institutions and the higher education industry as a whole to deploy/acquire in a purposeful and continuous manner the full set of organisational capacity and behaviours needed to optimise student success.

An ELI report, focusing on organisational capacity-building (Norris and Baer 2013) specifies a combination of the following five factors that leading institutions have used to optimise student success:

- Technology infrastructure, tools and applications (IT intensity and ease of data capture, plus data availability)
- Policies, processes and practices (data-driven mindset incorporated in processes)
- Skills of faculty, staff, students and other stakeholders (talent)
- The culture and behaviours (data-driven mindset)
- Leadership at the institutional level (talent and mindset)

In order to understand the impact of leadership in organisational capacity, Norris and Baer (2013) propose three levels of student success analytics. These levels are as follows:

- Level 1: Static reporting
- The leadership focus is on data and reporting
- Level 2: Dynamic analysis and intervention
- The leadership focus is on supporting evidence-based decision making
- Level 3: Optimisation

Strong, committed leadership makes analytics a strategic imperative for the institution

According to Crow (2012), an example of institutional success is Arizona State University. The president made analytics a central component in a university-wide change to focus on improving student performance and retention, while also ensuring that the needed support is provided. The University launched newer academic departments and programmes to support the institutional strategy.

Greller and Drachsler (2012) developed a framework that includes six critical dimensions related to an LA initiative. Each of the dimensions must be addressed in order to institutionalise an LA initiative successfully. Figure 1 illustrates the framework.

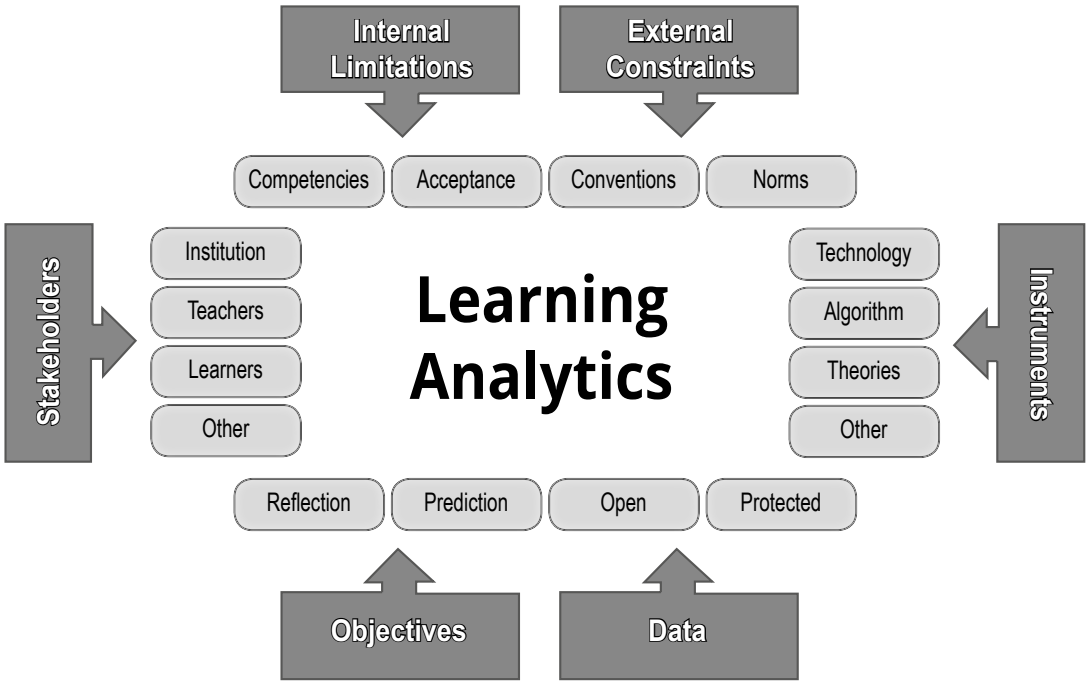

Figure 1: Critical dimensions of learning analytics (Greller and Drachsler 2012:44)

The growth of interest in LA within higher education can also be linked to the substantial strides made by solution providers. Norris and Baer (2013) provide the following insights about solution provider offerings and strategies, based on their recent research:

- New functionalities, applications, solutions and consulting services are available from enterprise resource planning (ERP) and LMS solution providers that offer student success/retention solutions.
- New firms offering student success/retention solutions are gaining traction in the market. ERP and LMS providers are also marketing student success/retention solutions.
- New vendors with an analytics focus have emerged in many categories.
- Acquisitions and consolidations have continued, such as Blackboard, which acquired iStrategy and embedded its pre-packaged analytics applications into an expanded Blackboard Learn offering that can extract data from major ERP systems and the Blackboard LMS. SunGard signed a memorandum of understanding with the Purdue Research Foundation to continue to develop the Course Signals product from Purdue. SunGard and Datatel consolidated into Ellucian. This will also have implications for the marketplace.
- New LMS alternatives with embedded analytics are proliferating, both as open-source software and in the cloud, such as Instructure/Canvas, LoudCloud, Moodlerooms and others.
- Consulting services are becoming a more significant component of analytics offerings for many vendors, and these services go beyond implementation to focus on know-how in leveraging analytics solutions to advance retention and student success.
- A number of cloud-based analytics applications and services demonstrate the cloud's potential to leverage vendor infrastructure, solutions, processes, cross-sector linkages and know-how. Pearson/eCollege is achieving some especially interesting outcomes in this area, conducting analytics across its constellation of cloud-based clients.
- The need for improved visualisation, recognised by many vendors, is being incorporated in next-generation tools such as the IBM and Desire2Learn partnership.

Institutional leadership will continue to ask questions about solutions that deliver student-success solutions based on return-on-investment criteria. The number of solutions will not only increase, but will become more sophisticated and more robust as new analytics applications and solutions emerge (Norris and Baer 2013).

Case studies

In South Africa, there are few case studies to take note of as the field is new. The University of Pretoria is perhaps the most advanced in the field. It uses Blackboard Learn as its LMS and has licensed the Analytics for Learn product. Blackboard Learn already includes a Retention Centre that can deliver basic LA information for individual modules, and this is included in the licence. However, to look across modules and provide data and dashboards to a variety of stakeholders (students, lecturers, deans, faculty student advisors and the University's executive management), Analytics for Learn is a more powerful tool. The University of Pretoria piloted Analytics for Learn in 2013 and rolled it out in the Faculty of Economic and Management Sciences in 2014 to support its tracking and retention project: within six weeks of its launch, first-year students began to receive notices of not engaging sufficiently and information on whom to contact (tutors, advisors) or notices of congratulations on doing well and encouragement to keep it up. An area for improvement would be the inclusion of students' continuous assessment marks on the LMS as the current system involves data of number of times accessed, time spent on the LMS and tools used. In 2013, the University of Pretoria also launched the first South African Higher Education Learning Analytics event in collaboration with the Learning Analytics Summer Institute (LASI13) at Stanford, and followed this with an event linked to the Southern African Association for Institutional Research (SAAIR) conference in Pretoria and the Learning Analytics Summer Institute (LASI14) at Harvard. A number of workshops have subsequently been held across the country to introduce the concept to the leadership at other universities.

Norris (2011) provides a summary of first-generation LA systems within higher education. For-profit universities such as the University of Phoenix, Capella University and the American Public University System (APUS) were among the first institutions to adopt LA. The latter is an example of advanced implementation as it pulls data daily from an extensive data warehouse, compares it by using statistical measures and semantic analysis engines, and presents results in a visual format. The value of APUS lies not only in the daily ranking of the entire student body according to probable success with coursework, but also in the immediate interventions that are executed. The system costs millions of dollars to develop and costs millions to run annually, so it is perhaps not an approach to be emulated by South African universities.

An often-cited and large-scale LA success story is Purdue's Signals system, based on Blackboard Learn. In an Educause blog entry, Caulfield (2013) critically reflects on the Signals system and describes it as:

> a software product developed at Purdue University to increase student success through the use of analytics to alert faculty, students and staff to potential problems. Through using a formula that takes into account a variety of predictors and current behaviors (e.g. previous grade point average, attendance, running scores), Course Signals can help spot potential academic problems before traditional methods might. That formula labels student status in a given course according to a green-yellow-red scheme that clearly indicates whether students are in danger of the dreaded DWIF (dropping out, withdrawing, getting an incomplete, or failing).

Norris and Baer (2013) indicate that Purdue University estimates that it has improved retention in Signals courses by 20% and four-year degree completion rates by 4%. As the system is using data from Blackboard Learn, South African universities using Blackboard Learn could produce similar 'signals' for their students to help them take responsibility for improving their own success. LA does not have to be about what the university can do for its students in terms of interventions; it can be about promoting self-directed learning.

A traditional higher education institution, Rio Salado College in Arizona, implemented LA and predictive modeling (Norris 2011). Its software focuses on information such as log-in frequency, the pace of a student's work in the first eight days of class, and student involvement in discussion forums. While the Rio Salado College is not focusing on students' grades as an indicator of success, other systems, such as the Louisiana State University system, include grades as part of the analysis. The LA system of Louisiana State factors in grade data; where grades are high, but a student's participation is low, the software ignores the concern, sending out a caution only when both are low. This possibility also exists within Blackboard Analytics for Learn. Some universities are using predictive modeling to identify at-risk students; others use it as the basis for e-advising, and recommending courses to students on the basis of what they have already passed.

During the last two years, greater numbers of HEIs have started to pursue LA initiatives. In the USA, the University of Central Florida, the University of Wisconsin-Madison and the University of Maryland, Baltimore County have frequently been cited as examples of LA projects. These institutions are pursuing analytics in a range of ways, such as using built-in products from LMS vendors, third-party analytics products, in-house-developed solutions, or solutions offered as a service by another company or some combination of these four ways.

Key findings

Research in the USA, in particular, has led to some useful findings for anyone wanting to implement LA at a South African university:

- Analytics requires a culture of inquiry and it is a journey from data ownership to stewardship (Oblinger 2012).
- Analytics requires new skill sets (Oblinger 2012).
- A changed-leadership approach provides a framework to create a climate of transformative change (Diaz and Fowler 2012).

- Effective implementation of LA must be accompanied by a compelling vision, supported by a data and communication strategy, and an inclusive approach of all stakeholders (Daniel 2014; Diaz and Fowler 2012; Norris and Baer 2013; Crow 2012).
- Analytics programmes are most successful when they are viewed as an investment rather than an expense (Bichsel 2012).
- The involvement of information technology (IT) services departments in planning for data collection and use is deemed critical (Daniel 2014), but IT services should not govern LA (Diaz and Fowler 2012).

What one can glean from these findings is that we need executive leadership: an acknowledgement that LA is an investment that will yield gains in student success, expertise in analytics and the breaking down of silos of data to enable the integration of data.

Challenges

International research also points to some key challenges:

- Creating a culture within institutions to adapt processes and accept the importance of data implies adopting new processes and change management (Daniel 2014).
- Analytics implies additional costs on already constrained budgets within higher education (Daniel 2014).
- Data systems are seldom interoperable and a successful analytics implementation will rely not only on data integration, but also on quality of data (Daniel 2014).
- HEIs lack the availability of dedicated data management experts to produce needed datasets in a timely manner (Buerck and Mudigonda 2014).

South African universities have additional contextual challenges relating to backlogs in infrastructure on-campus and student access to computers and the internet off-campus. The integration of legacy student systems with new analytics software is also a challenge, even in well-resourced universities. One change in culture would be putting all continuous assessment marks into a central grade centre to allow for the tracking of student progress – many lecturers traditionally keep such marks on their own computers rather than entering them centrally. Finally, analytics expertise is a scarce skill in South Africa, so an increase in the production of data scientists is needed, not only for analytics in higher education, but also for the growing use of big data in business and government.

Acronyms and abbreviations

APUS	American Public University System
DWIF	Dropping out, withdrawing, getting an incomplete, or failing
ELI	Educause Learning Initiative
ERP	Enterprise resource planning
HEI	Higher education institution
IT	Information technology
JISC	Joint Information Systems Committee
LA	Learning analytics
LASI	Learning Analytics Summer Institute
LMS	Learning management system
SAAIR	South African Association for Institutional Research
SoLAR	Society of Learning Analytics Research
SoTL	Scholarship of Teaching and Learning

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Recommended reading/resources

JISC Cetis Analytics Series. Available at: http://publications.cetis.ac.uk/c/analytics.

Educause Library: Learning Analytics. Availability at: http://www.Educause.edu/library.

Journal of Analytics: Available at: http://learning-analytics.info/.

Ethical considerations in using student data in an era of 'big data'

Paul Prinsloo and Michael Rowe

Learning with technology enables the collection of data on students at a level unprecedented in face-to-face tuition and paper-based academic administration. Universities see the advantage in tracking students' engagement and progress, particularly when it comes to putting interventions in place for at-risk students. Our use of these data should be legal, ethical and seen as fair use by students. At no time should it cross the boundaries into the realm of 'creepy', a word used by Gartner analyst Frank Buytendijk in several of his presentations at the Gartner ITExpo in Cape Town in September 2014.

Recommendations

It is recommended that:

- higher education engages critically with the potential and perils of big data;
- the collection, analysis and use of student data be understood as a moral practice and duty;
- students' agency and participation in the collection, analysis and use of their data are recognised and protected;
- student identity and performance are accepted and analysed as temporal, dynamic constructs;
- student success is interpreted as a complex and multidimensional phenomenon; and
- higher education institutions commit to the transparent collection, analysis and use of student data.

These recommendations are explained in detail below.

Discussion and analysis

It is difficult, if not impossible, to assess the scope and permanency of the changes facing higher education (Altbach et al. 2009). While many factors contribute to the dynamic higher educational context, the impact of technological advances on the curriculum cannot (and should not) be underestimated. Amid these changes, higher education institutions (HEIs) are increasingly accountable to more stakeholders than ever before and must provide evidence of the institutional processes linked to student success, along with the need to optimise the collection, analysis and use of data that serve to inform decision making. It is important to remember that, fundamentally, the collection, analysis and use of student data are activities to improve students' learning and their chances for success (Booth 2012).

As higher education increasingly integrates digital systems into teaching and learning processes, the amount of data generated increases exponentially. As data increase in volume, velocity, variety, scope, resolution, flexibility, scalability and indexical properties (Kitchen 2014), so do the extent and complexity of the associated ethical issues and challenges (Slade and Prinsloo 2013). So, while big data in the educational context are imbued with almost magical properties by many academics – together with mainstream media, some authors are calling for a more skeptical and critical approach to its use. Siemens and Long (2011) describe the need to use data for (better) decision making as one of the most dramatic factors shaping the future of higher education. It is becoming increasingly clear that, while quantitative research and analysis provide much-needed information, it is primarily information about 'what is happening' and not necessarily 'why'. Qualitative data, on the other hand, explains *why*. They uncover the behaviour and motivation behind those actions.

In 2014, the Open University published its policy on the ethical use of learning analytics (Open University 2014), becoming one of the first universities to articulate this important perspective. There are still very few HEIs that have responded to the fast-changing data environment with its different legal and ethical issues (Prinsloo and Slade 2013), with current data protection regimes failing to address the complexities and different nuances of an ethical use of student data (Prinsloo and Slade 2015). For example, while most HEIs address the issue of the use of student data for research purposes, very few explicitly inform students that their behaviour may be monitored or provide students with the opportunity to opt out of these processes. In research contexts, students may opt out as objects of research, and institutional ethical clearance processes make informed consent and anonymity non-

negotiable (unless the latter is waived by the participant himself or herself). (See, for example, a recent and fairly comprehensive overview of the ethical issues and research into the ethical issues in learning analytics by Niall Sclater (Sclater 2015).)

Stewart (2014) writes: 'Thanks to the proliferation of personal computers, smartphones and wearables, we generate 2.5 quintillion bytes of data a day. That means, every two days, human beings create more data than they did from the dawn of civilisation up until 2003'. Kitchen (2014) states that data have changed from being a scarce commodity to a situation where the 'production of data is increasingly becoming a deluge; a wide, deep torrent of timely, varied, resolute and relational data that are relatively low in cost and, outside of business, increasingly open and accessible' (Kitchen 2014:xv). Big data, as a phenomenon, are therefore characterised by increased volume, the possibility to examine and profile entire populations instead of samples, fine-tuned resolution, strong relationality, increased velocity, wide variety, and high flexibility and scalability (Kitchen 2014). As HEIs move increasingly online and into the digital space, the characteristics of big data will add levels of complexity never before seen in this context.

It is therefore crucial that we take note of the warning that we should not accept the simplistic premise that 'more data = better data' at face value. Data are not neutral, raw or exempt from being shaped and framed by technical, ethical, economic, philosophical and political interests. It is impossible to separate data from the epistemologies, contexts, assumptions and power relations that were used to select, process and analyse them (Gitelman 2013; Kitchen 2014). There is increasing consensus that the way data are 'ontologically defined and delimited is not a neutral, technical process, but a normative, political and *ethical* one that is often contested and has consequences for subsequent analysis, interpretation and action' (Kitchen 2014:19; emphasis added).

Most authors agree that we are, indeed, facing a data revolution, one that higher education cannot and should not ignore. HEIs increasingly have access to disparate data sources, inside and outside the conventional boundaries of student information and learning management systems (LMSs) (Prinsloo et al. 2015). This raises ethical concerns and questions such as the fact that, firstly, students have not provided consent to harvest information outside the scope of the learning contract with the institution and, secondly, the danger of context-collapse. Higher education may therefore make decisions regarding students' applications for access based on digital assemblages without students knowing the reasons or rationale (Solove 2004).

Recommendation 1: *Higher education engages critically with the potential and perils of big data.* There is no question that higher education should collect, analyse and use students' digital data (Slade and Prinsloo 2013). It would be irresponsible and unethical for higher education not to do so, as HEIs are accountable for the effectiveness and efficiencies of the programmes and resources used (Prinsloo and Slade 2014). However, we must remain critical and even skeptical regarding our ontologies, epistemologies and assumptions regarding data. 'We need to be cognisant of the impact and unintended consequences of our assumptions underpinning the algorithmic turn in higher education' (Prinsloo et al. 2015:294) (also see Danaher 2014; Napoli 2013), as 'bad use of data can be worse than no data at all' (Kakaes 2015.) It is also crucial that we shy away from the belief that our students' digital profiles or footprints present a complete picture of their potential and the challenges they face. Several authors (Cloggy 2011; Duval nd) have cautioned that learning analytics can very easily serve to bureaucratise students' learning even further, or serve a panoptical purpose and culture of increasing surveillance rather than empowering students and their institution to facilitate more appropriate choices.

Recommendation 2: *The collection, analysis and use of student data be understood as a moral practice and duty.* Amid the many constraints and challenges facing higher education, it is crucial that we are reminded, especially in the South African context, of education as a *moral* practice. While higher education cannot ignore the need for accountability and increased effectiveness and efficiency, we should, in equal measure, be concerned about the *appropriateness* of our curricula, assessment methodologies and pedagogies. As Biesta (2007) has warned, something may be very effective and efficient without being moral. In the context of the collection, use and analysis of student data, it is therefore important to realise, firstly, that increased knowledge about our students increases our responsibility to them and, secondly, to use our increased knowledge and understanding to serve *learning* (Gašević and Siemens 2015). We should not assume that knowing more about our students may, necessarily, result in more just decisions. There is ample evidence of how increased surveillance and gathering of personal information can actually result in unjust and unfair decisions and the marginalisation of those who are already vulnerable (Henman 2004).

Recommendation 3: *Students' agency and participation in the collection, analysis and use of their data are recognised and protected.* Students are not passive recipients of services, but active agents in a reciprocal relationship with the institution. Students' agency with regard to the collection, analysis and use of their data is much wider and more nuanced than simply needing to provide consent. Learning analytics should be student-centric in that it should not conceive students as data objects. Rather, our policies and frameworks must allow students to have access to, and permission to edit, additional contextual information associated with the 'hard' data that will allow HEIs to have a more holistic picture of students and their learning. Students' learning journeys are more than the number of clicks, logins or time spent looking at online content. What possibilities emerge when students can edit the data that institutions gather about them? Should students be able to set the permissions on which data sets the institutions can use and for what purposes? (Kruse and Pongsajapan 2012; Prinsloo and Slade 2014). These, and other questions, should serve to guide decision making about students' role in the use of their data by HEIs.

Recommendation 4: *Student identity and performance are accepted and analysed as temporal, dynamic constructs*. Learning analytics can provide snapshots of individual students at a particular moment in time, but often with no context. 'Students should be allowed to evolve, and adjust and learn from past experiences without those experiences

becoming blemishes on their development history' (Slade and Prinsloo 2013:1520). Students' digital records should not be permanent 'tattoos' that follow them for the rest of their lives (Mayer-Schönberger 2009:14) and data collected should therefore have an agreed-upon life span and expiry date, perhaps even determined in collaboration with the student.

Recommendation 5: *Student success is interpreted as a complex and multidimensional phenomenon.* Student success is the result of 'mostly non-linear, multidimensional, interdependent interactions at different phases in the nexus between student, institution and broader societal factors' (Prinsloo 2012). In the context of big data and learning analytics, we shall therefore have to move beyond claims of causality and rather attempt to understand relationships between different variables at different points in a student's journey. One of the big promises of big data is the increasing use of algorithmic decision making. What happens when algorithms – supposedly neutrally coded – make choices that reflect social contexts that are inherently biased? For example, if an algorithm is tested or trained using baseline data that reflect an existing bias towards a minority, the algorithms will tend towards that same bias. What are the implications for this in education? What are the challenges that emerge when our 'neutral' code makes unfair decisions about students? This might, for example, have an impact on admissions processes, as the systems for student admissions become increasingly dependent on computer ranking and other methods for sorting through applications (Danaher 2014; Henman 2004).

Recommendation 6: *Higher education institutions commit to transparent collection, analysis and use of student data.* It is becoming clear that different data sources are harvested and combined, often without regard to the original context (Kitchen 2014). This 'context-collapse' that takes place amid increasing concerns regarding pervasive surveillance and privacy (Prinsloo 2014) highlights the issue of increasingly asymmetrical power relationship between students and institutions (Davis and Jurgenson 2014; Vitak 2012). Therefore, HEIs should be transparent about the type of data collected, for what purposes, by whom, and the measures that will be taken to protect individuals' identities. It is also increasingly apparent that students should be informed about the implications of their sharing of personal information in other online contexts – perhaps those that are not even related to their academic lives – and how this information may be used by higher education to make decisions around access, curricula and support within the academic context. It is therefore clear that the notion of informed consent is more nuanced than thinking in terms of the binary of opting in *or* out (Prinsloo and Slade 2015). There is also increasing concern about the re-identification of de-personalised data (Tene and Polonetsky 2012).

It is also crucial that HEIs in South Africa engage with the Protection of Personal Information Act, Act 4 of 2013 (Government of South Africa 2013) to ensure compliance.

Current trends internationally

Although there is an increase in theoretical and conceptual research regarding the ethical collection, analysis and use of student data in an era of big data, there are very few current examples of how institutions respond to the ethical challenges and issues (Slade and Prinsloo 2013; Prinsloo and Slade 2015). The ground-breaking work of the Open University in this regard may point the way to how to approach the ethical collection and use of student data (Open University 2014), taking into account the recommendations presented above.

Affordances

Despite and amid a sobering reflection on the realities facing the realisation of the potential of learning analytics in higher education, it is clear that the appropriate and intelligent collection, combination, analysis and use of student data can inform and increase the effectiveness and efficiencies of higher education (Siemens and Long 2011; Prinsloo and Slade 2014).

Costs: licensing, infrastructure, personnel

The costs, infrastructure and personnel involved in ensuring the ethical collection and use of student data relate mostly to policy and staff development, and possibly operational structures and processes to oversee the implementation of policy and regulatory initiatives. If a commercial data analytics program is used, licensing will become a factor. Most HEIs use some form of business intelligence program that might or might not be built into the general IT provision. Blackboard users have the Retention Centre for basic analytics or can acquire Blackboard Analytics for Learn. Online software comes with licensing cost implications. Possibly the greatest gap in the system is the availability of data analysts and data scientists, people who can interpret data and make actionable recommendations.

Application in different contexts in South Africa

All public higher education institutions collect data for reporting to the Department of Higher Education and Training (HEMIS data). These data are normally highly aggregated so individual student information or formative interventions to improve pass rates, for instance, are not the focus. Of course, the underlying demographic and module success data exist and could be extracted, integrated and manipulated using business intelligence tools. In many ways, though, HEMIS data are summative and not that useful for student success in a formative phase, although historical trends might be useful in predictive algorithms, with all the inherent dangers discussed above.

Many universities enable their students to apply online and interact online for all their academic administration. Student interactions in this environment can be tracked. Most universities also provide an online LMS for their students and data are produced each time the student enters the system. Some universities or individual modules might use Facebook, Twitter, Google or any of a number of web-based technologies, and everything leaves a trace. To what extent can data generated by social media be ethically integrated with other data to profile students?

Many South African institutions are already experimenting with home-grown or commercial online student tracking systems that will identify student engagement while they are learning in order to put timely interventions in place.

One example is the use of Blackboard's Analytics for Learn at the University of Pretoria. The most effective use of these data would be to alert students themselves to the fact that they are not engaging sufficiently or achieving well enough relative to fellow students. The alert could be accompanied by recommendations to interventions that are in place, such as tutorial groups.

A South African Survey of Student Engagement (SASSE) was developed at the University of the Free State (UFS) and piloted a couple of years ago with the support of the Council on Higher Education. It is based on the original survey in the USA that has also been contextualised for countries such as Australia, Hong Kong and Ireland. There is a companion lecturer survey (LSSE). The SASSE was relaunched in 2014 and administered online. The UFS is busy engaging with institutions that participated on the results. Each institution receives its own raw data and care should be taken in its responsible and ethical use.

Student surveys are popular instruments for gathering data on students. For instance, in the SASSE suite, there is a survey for students just starting (BUSSE), as well as a module survey (CLASSE). The University of Pretoria has its own Student Academic Readiness Survey (STARS), implemented during the registration period. Students self-identify aspects such as study skills, time management, family support, etc. As a result of the survey, students might be allocated a mentor or be referred to faculty student advisors for support. Each student receives his or her own profile online as well.

Glossary

The primary concept to understand is 'big data' and how it differs from the data that we might have gathered on students in the past. It is the wealth of data generated by the use of technology for administrative or learning purposes. The ethical collection and use of student data in an era of big data are inherently multi- and intra/interdisciplinary. Therefore, it is almost impossible (and possibly counterproductive) to attempt to define the different concepts and terms used in the disparate discourses. The Open University (2014) briefly describes learning analytics, defines an intervention, as well as data, and specifically sensitive data, and the notion of informed consent. The list of references and readings below provides a rich source of information. Interested individuals and institutions are invited to consult the reading list.

Acronyms and abbreviations

BUSSE	Beginning University Survey of Student Engagement
CLASSE	Student Engagement Module Survey
HEI	Higher education institution
LMS	Learning management system
LSSE	Lecturer Survey of Student Engagement
SASSE	South African Survey of Student Engagement
STARS	Student Academic Readiness Survey
UFS	University of the Free State

References and resources for further reading

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