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CHAPTER 12

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Learning technology in developing nations

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12.1 Introduction

This chapter focuses on the use of technologies for learning with a particular emphasis on environments that are characterized as being affected by resource constraints. While these environments may be seen as posing barriers to pedagogical uses of information and communication technologies (ICTs), an increasing number of both educators and students are pushing back on these barriers, exploiting emerging technologies to enhance either teaching or learning practice. For this reason, uses of technologies in resource-constrained environments are not uniform, which raises a need to understand these differences. Thus, this chapter addresses the following fundamental questions: *how is learning with technology in resource-constrained environments theorized? what are the challenges experienced in resource-constrained environments? how are educators in resource-constrained environments using emerging technologies to mitigate the constraints?* In responding to these questions, the chapter proposes a Triadic Zone of Proximal Development (Triadic ZPD) as a useful framework for guiding pedagogical practices involving learning with technologies in resource-constrained environments.

Keywords

learning technologies, information and communication technologies, resource-constrained environments, mobile learning, developing nations, educators, massive open online courses, emerging technologies, triadic zone of proximal development, pedagogy

Introduction

Although this chapter is entitled 'learning technology in developing nations', we wish to alert the reader upfront that the focus of the chapter is on learning *with* technology, rather than 'learning technology' and that the notions of 'developed' and 'developing' are highly contested and that we use the term 'resource constrained' environments instead of 'developing nations'. In other words, this chapter is about *learning with technologies in resource-constrained environments*. With regard to the notions of 'developed' and 'developing', the current world economic crisis and the austerity measures being placed on various Northern countries makes these categories problematic, as some of these areas are now experiencing resource constraints, traditionally thought to be limited to Southern contexts. 'Developing nations' also assumes the homogeneity of what exists inside national boundaries, which is erroneous. South Africa, India and Brazil are cases in point, where there are extreme inequalities in access to and success in education within these countries themselves (Bozalek et al. 2007; Rohleder et al. 2008) - at best they can be regarded as both 'developed and 'developing' (Krauss 2013; Traxler & Ng'ambi 2012). This is true of other northern countries such as the United States and the United Kingdom, where, for example, the school one attends largely determines one's path in education and the suburb in which one lives determines which school one has access to - thus although these countries may be considered 'developed' resources are not evenly distributed. In this chapter, instead of using the notions of 'developed' and 'developing' we refer to resource-rich and resource-constrained environments. To this end, in this chapter we address the following questions:

- How is learning with technology in resource-constrained environments theorized?
- What are the challenges experienced in resource-constrained environments?
- How are educators in resource-constrained environments using emerging technologies to mitigate the constraints?

The chapter is structured as follows: first an overview of learning in resource-constrained environments is described, followed by an elaboration on the construct of learning with technologies, then an overview of the theoretical perspective that we propose as useful when considering learning with technologies in resource-constrained environments. We then go on to discuss the educational challenges in resource-constrained environments and how technologies have been used in these environments for the purposes of learning. We emphasise the importance of ascertaining and using local and prior knowledges, and then proceed to look at various contemporary uses of technology including mobile devices, do-it-yourself (DIY) citizenship, open educational resources (OER), massive open online courses (MOOCs), cloud-based tools and connected and unconnected devices. We return to our pedagogical model and elaborate on how this may be used to incorporate social and cultural capital, pedagogical goals and technological tools in order to promote enhanced and contextually sensitive approaches to learning using the affordances of ubiquitous technology

12.2 Learning in resource-constrained environments

Currently there is a global crisis, with education facing economic austerity measures. In countries such as South Africa, the education system still faces systemic challenges largely attributed to the legacy of the apartheid system even twenty years on (see for example Akoojee and Nkomo 2007; Bozalek and Boughey 2012; Scott 2012; van der Berg 2007). Most schools, especially in resource-constrained environments where there is a heavy dependence on donors, have tended to become a dumping ground for obsolete equipment and mismatched expectations (United Nations Children's Fund, 2013; West and Chew 2014).

Although there is an increasing support and use of technologies to promote learning, the lack of pedagogical guidelines have tended to lead to most educators integrating technologies in their teaching without an explicit pedagogical rationale (Bryant et al. 2014; Njenga and Fourie 2010; Ng'ambi Bozalek and Gachago, 2013a &b). The consequence has been that uses of technologies have not always yielded transformative learning outcomes. It was against a similar background that Gulati (2008, 8) asks a profound question as to whether use of ICTs can benefit those who are resource poor and have limited or no access to paper-based modes of distance education delivery. Although the answer seems to be an obvious 'yes', a detailed response is not a straightforward one. In considering Gulati's question, we glean from the literature that although business sectors in most locations have been quick on the uptake and continue to exploit the availability of ubiquitous technologies (Corea 2007), most educational institutions have not responded with the same impetus and commitment. In cases where at strategic institutional levels there has been enthusiasm and commitment, there has been inertia in the general uptake at practitioner level (Ng'ambi and Bozalek, 2013). Another challenge facing the higher education sector is pressure from international ratings that have tended to reward research hence publications at the expense of teaching and learning (Johnson et al. 2014).

A further challenge has been misinformation that if a school in a particular place has been successful and they have computers, then putting computers at another school in location x will have the effect of making it just as successful. This brings us to the important distinction between access to technologies and the actual acquisition of learning and qualitative educational outcomes (United Nations Children's Fund, 2013). The UNESCO study across seven resource-constrained countries on mobile technologies for reading, similarly acknowledges that mobile devices in themselves will not necessarily promote literacy - as they describe it '[d]eriving meaning from a text is a deeply complex act that does not happen through exposure alone' (West and Chew 2014, 18). This study assessed 4000 users across seven resource-constrained countries- Ethiopia, Ghana, India, Kenya, Nigeria, Pakistan and Zimbabwe. In another large scale UNESCO Institute for Statistics (2012) study of ICT integration into education in 38 Caribbean and South American countries, the importance of teachers' preparedness and knowledge to integrate technology into their teaching was foregrounded. This suggests a need for pedagogical knowledge for educators to teach *with* technologies and learners to learn *with* technologies.

12.3 Learning *with* technologies

Learning technologies are defined in the 2014 Horizon Report to 'include both tools and resources developed expressly for the education sector, as well as pathways of development that may include tools adapted from other purposes that are matched with strategies to make them useful for learning' (Johnson et al. 2014, 35). Thus learning technologies may include badges for credit, Massive Open Online Courses (MOOCs), mobile learning, personal learning environments etc. However there are also many technologies not specifically designed with the purpose of learning in mind such as cloud computing, mobile apps, social media, tablet computing and other technologies that are now being appropriated for learning purposes. It is our contention that *pedagogical* considerations are paramount when considering learning with technologies, as has been pointed out by many writers in the field of educational technologies (see for example the discussion in Ng'ambi, Bozalek and Gachago 2013a & b). This is why we prefer the notion of learning *with* technologies rather than *learning technologies*. Meaningful learning requires learning tasks that take cognisance of a learner's prior knowledge, learner's competencies, and available technologies to the learner.

12.4 Meaningful learning within a Triadic Zone of Proximal Development

Our view of learning with technologies in general and in resource-constrained environments in particular, is one that takes cognisance of prior knowledge including digital competencies that learners bring with them to formal learning environments such as schools or universities. For example, a resource-rich institution located in a resource-constrained environment and which draws learners from such environments, is likely to have learners whose pre-exposure to technologies could disadvantage their ability to fully exploit the affordances of technologies provided by the institution. It is for this reason that Panofsky and Vadeboncoeur (2012) argue that the relational context of the Vygotskian Zone of Proximal Development (ZPD) is enriched when a parent shares information about a child with a teacher who becomes 'equipped with *insider* knowledge and equipped with additional tools, including knowledge that enables her to better care and guide the child' (p.196). In this way, the initial relational distance between a teacher and a child tends to reduce by the cultural and social input from the parent. Panofsky and Vadeboncoeur (2012) define cultural capital as 'the knowledge of and from the educational system' (p.197) shared between parents and children, through family activities, however we prefer Jenkins' (2002) notion of embodied cultural capital which is defined as a long-lasting disposition of the mind and body as evidenced through skills, competencies, knowledge and self image. Our argument is that the embodied cultural capital of learners from resource-constrained environments, if exploited could reduce the distance between a learner and meaningful learning. Pachler et al. (2010) show how cultural practices of using mobile devices in everyday out of school life differ from cultural practices of teaching and learning in the school environment. According to Pachler et al. (2010), structures of what they call *mobile complex* entangle learners. These assimilated practices that learners acquire become embodied cultural practices that could be useful to reduce transactional distance between the learner and the pedagogical goal.

Although Panofsky and Vadeboncoeur use the notion of Triadic ZPD to refer to the child, teacher and parent, we find their framework useful to explain the role of embodied cultural capital in reducing the 'transactional distance' (Moore 1993, 22) between a learner and the learning tasks. Moore (1993) defines transactional distance as the psychological or communication gap that a learner needs to overcome in order to engage meaningfully in a learning process. As Panofsky and Vadeboncoeur (2012) put it - 'without a home-school relationship that provides enabling conditions for the child, without a joint proleptic view, many low-income children experience material constraints that establish barriers, rather than pathways for success in schooling' (p. 196). We rephrase this to read, without learner - embodied cultural capital - learning goals; many learners from resource-constrained environments may experience learning challenges rather than succeed in schools.

We infer from Panofsky and Vadeboncoeur that the embodied cultural capital of learners in resource-constrained environments influences the extent to which technologies enhance teaching and learning practices. This view is supported by a study in higher education that sought to empower educators to teach with emerging technologies which reports that, in the quest to make the course meaningful and relevant to participants, the delivery of the course continued to be adapted as facilitators became aware of the participants' teaching challenges (Ng'ambi, Bozalek and Gachago 2013a). This study showed that the facilitators' awareness of cultural and social capital and the resultant steps to deal with the issue reduces the relative distance and enhances meaningful learning.

12.5 Integrating home and school cultures

There is an increasing penetration of technologies in different societies in the world, and they are not only becoming increasingly easier to use (Brown 2002) but also provide avenues to learn from different information sources through subscription to news services or 'following people' in social media e.g. Twitter. Certain technologies are ubiquitous in particular communities at different times. For example, technologies that are ubiquitous in South Africa may differ from those in the United States. In Africa, a learner might have a mobile phone as the sole technology they own. It therefore stands to reason that what is ubiquitous among middle class scholars or students may be quite different to what working class students have access to.

One of the challenges facing education systems in resource-constrained environments is that there is often a disjuncture between the culture of student lives at home and the culture of learning at school. For example, in their study of emerging technologies and practices at South African Higher Education institutions, Bozalek, Ng'ambi and Gachago (2013) observed significant differences between technologies that students were using and for which they were competent users, from technologies that institutions provided, which students did not own themselves. Rather than becoming a vehicle for student success, the latter becomes a barrier to success especially for students from a low socio-economic class whose only access to these technologies become institutional computer laboratories. Meaningful integration of learning technologies in resource-constrained environments thus needs to take cognisance of what students already know, what they need to know to reach their full potential, what technologies they currently have

access to and plan a pedagogy that exploits both the technologies and practices from the sociocultural context of students. In the large UNESCO study of 4000 people across seven resource-constrained countries (West and Chew 2014) on how technology can facilitate reading reported on earlier, mobile devices were identified as one tool that can provide access to books for marginalized groups such as women and children. The importance of exploiting the possibility of making books accessible to these marginalized groups becomes an important consideration in increasing literacies in resource-constrained environments. The Horizon Report (2013) for Latin American higher education found that primary and secondary education sectors in Brazil were more innovative in using emerging technologies for teaching and learning than is the case in higher education sector. This is likely to mean that students entering higher education in these countries would be disappointed in their expectations of teaching and learning with technologies (Johnson, Adams Becker, Gago, Garcia, & Martín, 2013).

While taking into account the embodied cultural capital of learners has potential to reduce relational distance between learner and teacher, in order to ensure pedagogical effectiveness, an understanding of the affordances of technologies and effectivities is required.

12.6 The importance of affordances and effectivities

It is not enough to improve access to technologies without attention to how they will improve people's lives educationally. The capabilities approach (Sen 1999; Nussbaum 2011) would see a resource-rich environment as one that provides the resources to be able to achieve what people regard as valuable in terms of what they are able to be and to do- such as the acquisition of critical literacy and numeracy skills. Thus, the use of technologies for any particular purpose requires human agency to decide what needs to be done and the appropriateness of the technologies to mediate the realisation of the set goal. Technology can be seen as a device or technique or a practice that mediates the accomplishment of a user's intention (agency). Each technology is designed to function in a particular way to achieve a specific objective. Affordances are the action possibilities provided by technologies that allow a user to do certain things in certain ways (Bower 2008; Gibson 1977). James Paul Gee (2014) stresses the point that unless an individual can perceive the possibilities technology provides, the technology is unlikely to be used effectively. He refers to the necessity for 'effectivities' for the person to take advantage of the affordances or possibilities of a technology for learning in his or her environment. As he puts it: '[e]ffectivities are the set of capacities for action that the individual has for transforming affordances into action' (Gee 2014, 35). Traditions and cultures are important influences on how technologies are used. For example, when using a mobile phone to take a photo, and then posting it on an Instagram¹ or on Facebook or as a tweet, other users, both known and unknown to the person posting the image, see it on their mobile devices within seconds, post a comment and or 'like' the image. Although this type of community engagement / interaction provides a new form of citizenship and new ways of learning that are unprecedented in education, it exemplifies one's effectivity.

¹ <http://instagram.com/>

12.7 Exploiting local knowledge

The 'transplantation' of western models of industrialization, without considering issues of culture, traditions, skills and needs to resource-constrained environments can have disastrous consequences - such as the transportation of MOOCs to African countries with no consultation about local needs for education (see for example, Barlow, 2014 for a critique of MOOCs as tools of colonialism). The taken-for-granted assumption that western values are necessarily superior is a form of what Gayatri Spivak (1988) refers to as 'epistemic violence' where western knowledges are used to subjugate local and marginalised knowledges is seriously problematic. Community-based knowledges contributing to improve social practices such as building township shacks, becoming a successful entrepreneur or farmer, are useful contributions to society, but not formally acknowledged as such. The use of technologies to help capture baseline knowledge about these practices would narrow the gap between knowledge that is valued in schools and universities and local day-to-day knowledges. Technology has the potential to capture progression in knowledge construction and make this become a useful educational resource, e.g. using mobile phones to record progression of the building of a shack. Using these resources, higher education students enrolled in programmes such as Architecture, could have an assignment to run a MOOC on a topic that is relevant to the community. This approach to technology mediated teach-back models has potential for institutions to engage in socially responsible ways and contribute to finding appropriate technologies while exposing students to 'real-world' community-based challenges.

Teachers and students, exposed to the use of computers outside school, are most likely to use the computers at work. For example, a study by Ogembo, Ngugi, and Pelowski (2012) on the challenges facing rural primary schools in Kenya regarding computerisation, showed that only eleven percent of the schools had only one ICT-savvy teacher and that all of the teachers required further training. Furthermore, the infrastructure of the schools mitigated against the adoption of computerization - factors such as lack of electricity, access to the internet, and the lack of adequate physical space led the researchers to the conclusion that the adoption of mobile devices such as cell phones would be a better option in these circumstances. This underscores the need for participatory design approaches (Krishna and Walsham 2005), focusing on familiar technologies which are appropriate to the environments under consideration, and the creation of safe spaces for both teachers and learners to play with the technologies in order to be comfortable and to learn with the technology. Importantly too, there should be a consciousness of how certain groups such as women and children are discouraged from using technological devices, deepening digital divides for learning with technology (United Nations Children's Fund, 2013; West and Chew, 2014). These tendencies, unless guarded against, have the danger to focus on equity and social inclusion in educational endeavours.

In the famous hole in the wall project, Sugata Mitra (2003), investigated the extent to which poor children with no prior exposure to a PC and without a teacher, taught themselves how to use a technology². This project is an example of how children in resource-constrained environments are potentially capable if given opportunities. The lesson from this that it is important to be

² <http://www.edutopia.org/blog/self-organized-learning-sugata-mitra>

sensitive to learners' prior knowledge and cultural capital and that marginalization of prior knowledge is a recipe for failed interventions.

12.8 DIY citizenship and the maker movement

A major challenge facing the education sector is the lack of participatory parity - the ability to participate on an equal footing with one's peers (Fraser 2009), which is evidenced through unequal balance in both access to knowledge and in knowledge production (Bozalek et al. 2007). Most knowledge produced in resource-constrained environments has not been well documented and tends to be marginalized. The consequence is a homogenous knowledge production. Though desirable, it is difficult and time-consuming to create heterogeneous knowledge production spaces and while the affordances of emerging technologies provide ways of accomplishing this, including maintaining a record of digital expressions, realizing these outcomes is a difficult process.

The do-it-yourself (DIY) or maker movement is becoming more prominent in education (Ratto and Boler 2014; Sharples et al. 2013). DIY encourages citizens or learners to participate in making new things through collaboration and innovation. However, while the underlying motivations upon which this movement is based are commendable, it seems largely to have been initiated in northern contexts or in situations where there are assumptions about digital access and competence, with some exceptions (see for example a citizen journalism project in a marginalized South African community in Bozalek et al. 2013). The notions of 'digital citizenship' and 'active citizenship' could have important empowering effects for marginalized communities across North and South contexts as Castells (2012) has shown in his work on social movements using mobile devices. In resource-constrained environments, both the private and public educational institutions will need to explore how these new forms of social movements can be translated into educational outcomes in creating knowledge sharing environments to cultivate a culture of active digital citizen.

In the context of a Triadic ZPD, active citizenship adds a layer of complexity especially when dealing with multiple online identities for both students and teachers. It is an increasing challenge to teach learners with multiple identities and for educators to engage with social scholarship using social media themselves (Greenhow and Gleason 2014). To meet diverse learning goals dictated by multiple-identities, there are implications on how we teach because learners are continuously searching to satisfy their different 'lives'. For these learners, DIY, maker movement projects and MOOCs might be an attractive option both in pursuit of fun, excitement, and diversity of learning goals.

12.9 Insensitivity to prior knowledge

While authors such as Barlow (2014) and Moensa et al. (2010) attribute the failure of ICT projects in resource-constrained environments to insensitivity to local contexts, we argue that in addition to this, failure of learning with technologies is also due to insensitivity to the prior knowledges of learners. For example, in resource-constrained environments, it is not unusual for some first-year

students to use a computer for the first time. However, these students who are generally competent users of the mobile phones can use social networking software but not have had opportunities to use a computer. The problem arises when such competencies are not recognised or exploited. It is therefore no surprise that such students may be perceived to be 'underprepared' because their prior competencies appear not valued. These assumptions, such as Information and Communication Technologies (ICTs) being singly associated with computers, require critical engagement. At most institutions in resource-constrained environments, the majority of students access the Internet from computer laboratories provided and maintained by institutions, which are often booked out and not available for all students to use (Rohleder et al. 2008). If mobile devices which students had access to were used instead, this would also lead to more equity epistemological access for students to learn.

While the mobile penetration in resource-constrained environments is hailed as a success story, the uses of mobile devices have been limited to social interaction and not as tools for active citizenship or for pedagogy (Ally and Tsinakos 2014). One of the mediating tools in a Triadic ZPD in resource-constrained environments are mobile phones/devices. In these environments, mobile learning is therefore is arguably a logical option.

There are four trends in learning with technologies in resource-constrained environments: mobile learning, open educational resources, massive open online courses, and cloud-based tools.

12.10 Mobile learning – an ignored obvious choice

As of May 2014, there are nearly 7 billion mobile subscriptions worldwide, which is equivalent to 95.5 percent of the world population. The mobile penetration in developed countries is 120.8 percent, which effectively means one mobile subscription per person. Compared to the developing world, the mobile penetration writing this chapter is 90.2 percent. Africa has relatively the lowest mobile penetration worldwide at 69.3 percent (Global mobile statistics 2014). However, mobile phones are ubiquitous technologies in resource-constrained environments and have the highest penetration rate of any technology in history but remains as one of the unexplored device for educational purposes. Minges (2012) observes that in developing countries access to mobile communication is high and continues to rise, and that the potential for mobile phones is unquestionable. However, it is difficult to keep track of the actual uses of mobile phones as Bell (2008) rightly observes: the potential uses of digital devices are multiplying, example, a mobile phone becomes a camera, an internet connection, a TV, a GPS device, a game console and so on. For this reason, Bell, poses a fundamental question: how do we handle ways that devices are talked about, written about, thought about; how do certain discourses take hold, and help to shape technologies and uses?

In order to make the most of the affordances of mobile learning, Siff (2006, 7) postulates an institutional mobile technology strategy aiming at improving student retention, creating community, leveraging resources, providing high-quality teaching, learning and research and playing a positive role regionally. Higher Education Institutions (HEIs) in resource-constrained environments may have to consider exploiting the success of cellular technology for teaching and

learning, and would need to engage with pedagogical considerations when using mobile learning (Park 2014).

Despite mobile phones mediating communication, strengthening or weakening social networks among members, they also fundamentally change the way social networks function (Aker and Mbiti 2010; Castells 2012). Aker and Mbiti stress the need to understand the effects of mobile phones on these networks.

In most resource-constrained environments, the diffusion of the cellular (mobile) phones has been remarkable. However, although mobile phones widely used, there is still acute gender gaps in mobile phone ownership, with women less likely to own a mobile phone than a man and less likely to have a smartphone, as noted in the UNESCO study on the focus of educational potential of mobile technologies for reading using mobile devices (West and Chew 2014). However, in a benchmarking and monitoring study on 38 countries in Latin America and the Caribbean on integration of and access to ICTs in education, gender was not found to be a significant exclusion factor, with girls gaining access to ICTs in education (UNESCO Institute for Statistics 2012) .

The rapid growth of mobile learning activity across Africa has ranged from a replication of experiences and challenges elsewhere, to responding to specific challenges of social infrastructure or specifics of local culture, to representing localized versions of global challenges to working with social entrepreneurs which support indigenous languages, traditional pedagogy and informal knowledge (Traxler and Ng'ambi 2012). For example, the CSIR's Meraka Institute in South Africa developed an online math tutoring service, Dr Math, to support secondary school learners with Mathematics (Botha and Butgereit 2012). At the University of Cape Town, the Dynamic Frequently Asked Questions (DFAQ) (Ng'ambi 2005) was used to exploit students' communicative competence with Short Message Service (SMS) hence empowered underprepared and marginalized students to anonymously post questions. Other examples include the use of social media for social construction of knowledge (Rambe 2012). As of 2014, Edmodo³ is one the fastest growing mobile Learning Management Systems in education in resource-constrained environments. The Obami⁴ social learning platform is becoming popular in South Africa and other parts of Africa. Both Edmodo been used in a postgraduate course and Obami in a pre-service teachers course at the University of Cape Town.

Although these examples were designed and implemented in resource-constrained environments, they are built around a universal learning design that sees the need for changing the learning environment to adapt to the learner and not vice versa (Burgstahler 2010; Leibowitz and Bozalek in press). Since no learning design fits all, the appropriateness of learning technologies for the most constrained and marginalized contexts needs to be taken as the norm. These ideas will be useful not only to these contexts, but will provide accessibility and enhancement of learning in other contexts too. For example, the DFAQ tool designed to empower silenced and marginalized voices in South Africa (Ng'ambi 2005) has been integrated in the Sakai Learning Management System as a Q&A tool for all to use at the HEI in which it was developed.

³ <https://www.edmodo.com/>

⁴ <http://www.obami.com/>

Universal learning design principles are also assumed in the conceptualisation of Open Educational Resources (OER) as these resources are meant to be customisable remixed and re-purposed for different pedagogical contexts, but their uptake has been constrained by social practices.

12.11 Open Educational Resources - OER

Although OER are increasingly discussed in higher education globally, and gaining popularity in Africa, Pauline and Wilson (2012) lament that institutional cultures and lack of policies are hindering wide adoption of OER. For example, institutions continue to reward academics for publishing in accredited journals and hence discouraging publication in Open Access journals. However, policies are slowly beginning to change. Ng'ambi and Luo (2013) report that the University of Ghana, and Kwame Nkrumah University of Science and Technology have developed institutional policies to guide the creation and use of OER, and methods of equating OER output to research publication. A study on researchers' attitudes towards freely and openly sharing and disseminating agricultural research output conducted in 2011, revealed that institutional requirements and policies influenced researcher's choices on whether or not to share openly. This is consistent with the influence of cultural capital in a Triadic ZPD.

Diallo, Thuo and Wright (2013) report that at the African Virtual University (AVU) the OER related activities are embedded in the AVU policies. Thus, the formulation of OER policies is critical in nurturing an institutional culture which both students and staff can draw on in their actions. Sometimes, it is exposure to resources or awareness of the affordances of the technologies that facilitates learning with technologies. For example, across Africa there are OER repositories at the disposal of educators (see Table 1). These resources are available to both teachers and learners, but availability does not necessarily mean being used. However, educators have opportunities to use these resources to enrich their teaching practice and learners could access the resources to enhance their learning experiences.

Table 1: OER repositories for educators and learners

Resource	Description
Open Resources for English Language Teaching (ORELT) portal	This supports teachers in junior secondary schools' classroom learning activities.
Siyavula – technology powered learning	This supports collaboration among teachers. Consistent with the name “Siyavula” which means, “we are opening” in Nguni the portal aims to enable teachers to use technologies to openly share their teaching resources.
Mindset	This award winning not-for-profit organization initiative, Mindset Network, provides educational resources to support formal curricula in education including health

education.

Teacher educators from across sub-Saharan Africa	This international research and development initiative, TESSA, brings together teachers from sub-Saharan Africa to develop and openly share educational resources.
Teachers' domain – digital media for the classroom and professional development	This teachers' portal supports teachers by providing resources in different disciplines such as mathematics resources.
African Virtual University	This AVU platform provides conference facilities to support both online and blended courses. (NB: institutions do not need to own and maintain their own platforms).

While the merits of OER are not in question, Ng'ambi and Luo (2013) question sustainability of OER particularly at institutions where social behavior and social practices appear opposed to the culture of sharing, as well as a lack of knowledge to use them. In a recent study, Mtebe and Raisamo (2014) report that a lack of access to computers and the Internet, as well as low bandwidth, absence of policies and lack of skills to create and use OER were the main barriers to using them in 11 HEIs in Tanzania. In a South African study on the use of OER across 17 HEIs Lesko (2013) found that it was mainly a lack of knowledge related to OER and their usage and infrastructural challenges which were the main challenges.

The UNESCO Institute for Statistics (2012) study in Latin America and the Caribbean found that 24% of the 38 countries indicated that they had policies on OER .

Another related phenomenon facing challenges of institutional cultures, norms and debates are the MOOCs.

12.12 Massive Open Online Courses (MOOCs)

MOOCs are open access informal online courses but when aligned to a formal course may also provide an opportunity for independent learning without the constraints of class size (Sharples et al. 2012). There is an increase in popularity of MOOCs in higher education (Baggeley 2013). The premise of MOOCs is widening access to education at no cost to the learner initially, but to get the credit for the course, and to get textbooks, there may be some costs to the learner. The consequence of a changing business model and the availability of platforms for online courses, has led to institutions with resources, particularly elite institutions in the United States, to widen

their influence by offering MOOCs thereby disrupting the traditional approaches to teaching and learning (see for example the article in the New York Times, 31 October, 2013 reporting about new configurations of MOOCs run by elite US institutions in 40 countries across the world). Some examples of MOOCs are: Coursera (<https://www.coursera.org/>) and Edx (<https://www.edx.org/>). EdX is a brainchild of Harvard and MIT that was created to openly and freely offer higher education courses in the form of MOOCs to students around the world.

Aguaded-Gómez (2013) cautions that MOOCs risk becoming like a fast-food outlet - 'McDonaldised' or commodified and imbued with a westernized bias of training and culture, and hence calls for socio-culturally sensitive MOOCs. Viewed through the lens of Triadic ZPD, some MOOCs may foster cultural imperialism as the principles governing these MOOCs could be inconsistent with cultural and social capital of learners and educational institutions in resource-constrained environments - as Barlow (2014) has noted. Where there are limited resources to support teaching and learning for registered students, it would be unnecessary extravagance for an institution to invest in running a MOOC. It is therefore no wonder that currently MOOCs are offered by well-resourced elitist institutions and as long as the cost of broadband remains high, the motivation to produce MOOCs in resource-constrained environment will remain a pipe dream.

Although the weaknesses of MOOCs have been identified as 'access, content, quality of learning, accreditation, pedagogy, poor engagement of weaker learners, exclusion of learners without specific networking skills' (BIS Research Paper No 130, 2013, 4), it is possible that in resource-constrained environments, MOOCs could be used for socially good purposes. For example, if properly planned and resourced, MOOCs could be used to promote better pedagogical practice to those who are working at the coal-face of education, such as teachers in schools needing to upgrade their knowledge and skills. Thus, MOOCs could be used to address issues on both a global and local level by addressing common needs, and allowing for participation and networking across geographical contexts. They would however have to address context-specific learning needs and it should be remembered that internet access is required to attend a MOOC, and this is not commonly available in resource-constrained environments.

12.13 Educators shift to cloud-based tools

While an increasing number of African universities use LMSs or VLEs, only a fraction of the features of these systems is used⁵. In a postgraduate program that drew on students from South Africa, Congo DRC, Botswana, Sudan, Zimbabwe, Uganda and Kenya, Ng'ambi (2011) posted reading materials and assignments on the LMS and observed that some students had intermittent access to the Internet, and when they had access, the low bandwidth limited use of the LMS. The lack of interest as a factor is also reported in Bozalek, Ng'ambi, and Gachago's (2013) study which found that lecturers' personal interests and passions were the primary motivation for using

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<http://www.oerafrica.org/technology/UsingTechnologyHome/LearnerManagementSystems/tabid/895/Default.aspx>

emerging technologies for teaching. Peluso (2012, 126) cautions, in defense of educators, that 'Not every teacher has the opportunity or background to know how to incorporate technology into their classroom, yet many attempt to do so without having a clear understanding of the implications for learning'. In a study that sought to model effective ways of teaching with emerging technologies, Ng'ambi, Bozalek and Gachago (2013b) show how shifting the focus from LMSs to cloud-based tools motivated educators because these tools had both social and academic uses thereby providing educators many pedagogical options. Educators are likely to use technologies they are aware of, and have most access to, and instant messaging, social media and social networking are used often presumably because of low-bandwidth and accessibility on most mobile phones (Bozalek, Ng'ambi and Gachago 2013).

One of the advantages of cloud-based tools is that they are not controlled or regulated by institutions. When these tools are augmented with mobile devices/phones for which students do not only own but are competent users of, creates useful learning opportunities regardless of whether students are attending contact or distance education.

12.14 Learning through connected devices 24/7

There is an increasing blurring between notions of 'distance' and 'contact' education, as many traditional distance education institutions are using technologies to increase contact with students, and traditional 'contact' institutions are accepting too many students to provide any meaningful one-on-one contact (Woo et al. 2008). With the use of technologies, students enrolled in traditional distance learning courses may have more 'contact time' with resources, tutors and support staff than even those at contact institutions. As a consequence, technologies used to support distance students are being appropriated for large classes at traditionally contact institutions. Both distance and contact institutions realize the need to reduce the distance between a student and instructors. In resource constrained environments, where students not only own mobile phones but are also connected 24/7, the use of mobile devices as learning technologies is a logical option. Park (2014) in his discussion on good pedagogy with mlearning proposes four principles 1) a great deal of communication and interaction between learners and teachers. 2) the learners are involved in collaborative projects where they can learn from each other, 3) learning materials or rules of activity are delivered through mobile devices and 4) the transactions take place mainly between learners and the teacher is minimally involved in facilitating group activities.

One of the advantages of using connected devices (i.e. connected through a mobile service provider or a wireless hotspot) is that it enables real-time engagement with resources, peers and teachers. However, there are non-connected devices that are also useful depending on the design of learning tasks such as using podcasts as supplementary resources.

12.15 Pedagogical choices for teaching with technology

The decisions that inform pedagogical choices are usually premised on three perspectives: associative, cognitive and situative (Mayes and de Freitas 2004). The associative perspective is

task-focused, objective driven and describes learning as a set of competencies. The cognitive perspective aims at helping to acquire skills on how to learn and is aimed at developing autonomous learners. The situated perspective focuses on exploiting learning relationships with peers to engage in authentic practices to solve realistic problems. It can be inferred from these three perspectives that pedagogical uses of emerging technologies tend to focus on what happens in the classroom while being mindful of the environmentally imposed constraints. These perspectives impact pedagogy as Mayes and de Freitas (2004,13-14) elaborate:

The *associative view* emphasises

- Routines of organised activity
- Clear goals and feedback
- Individualised pathways and routines - matched to the individuals prior performance

The *cognitive view* emphasises

- Interactive environments for construction of understanding
- Teaching and Learning activities that encourages experimentation and the discovery of broad principles
- Support for reflection

The *situative view* emphasises

- Environments of participation in social practices of enquiry and learning
- Support for development of identities as capable and confident learners
- Dialogue that facilitates the development of learning relationships

The above perspectives provide a way of making the assumptions that underpin the teaching strategies explicit. These assumptions are then mapped to the affordances of technologies, e.g. cloud-based tools.

We have already sensitized the reader to the reality that most curricula are designed in insensitive ways that accommodate the learning needs of already privileged learners whose out of school knowledge is closely related to what is valued as useful knowledge. Furthermore, the knowledges of learners who grow up in communities which differ from what is regarded as the norm - i.e. who are not white, male, middle class, western, heterosexual, able-bodied etc., is neither validated nor is it closely aligned with school or university knowledge. This challenge typically describes the situation most prevalent in resource-constrained environments. These learners are subjected to the same curricula, taught in the same way, and assessed in the same way that their privileged peers are. It is clear that the learners whose out of school exposure is closely aligned with the school knowledge more are likely to succeed under these circumstances. In order to address this challenge, in this chapter we have proposed the Triadic ZPD framework (see Figure 1) as it provides a way of appropriating the learning with technologies that take cognisance of learners prior knowledge and competencies with ubiquitous technologies in the design of learning tasks. This is particularly significant in that in growing up in various cultural milieus in resource-constrained environments predisposes learners to certain knowledges including technologies ubiquitous in those environments. It follows that prior knowledge could inform choice of examples, and existing competencies with ubiquitous technologies may remove the learning barriers that arise from practices such as unfamiliar examples used in a task, use of technologies that learners only access at school and which are inaccessible outside school hours, and learning outcomes

that learners see as having no relevance to their own world-views.

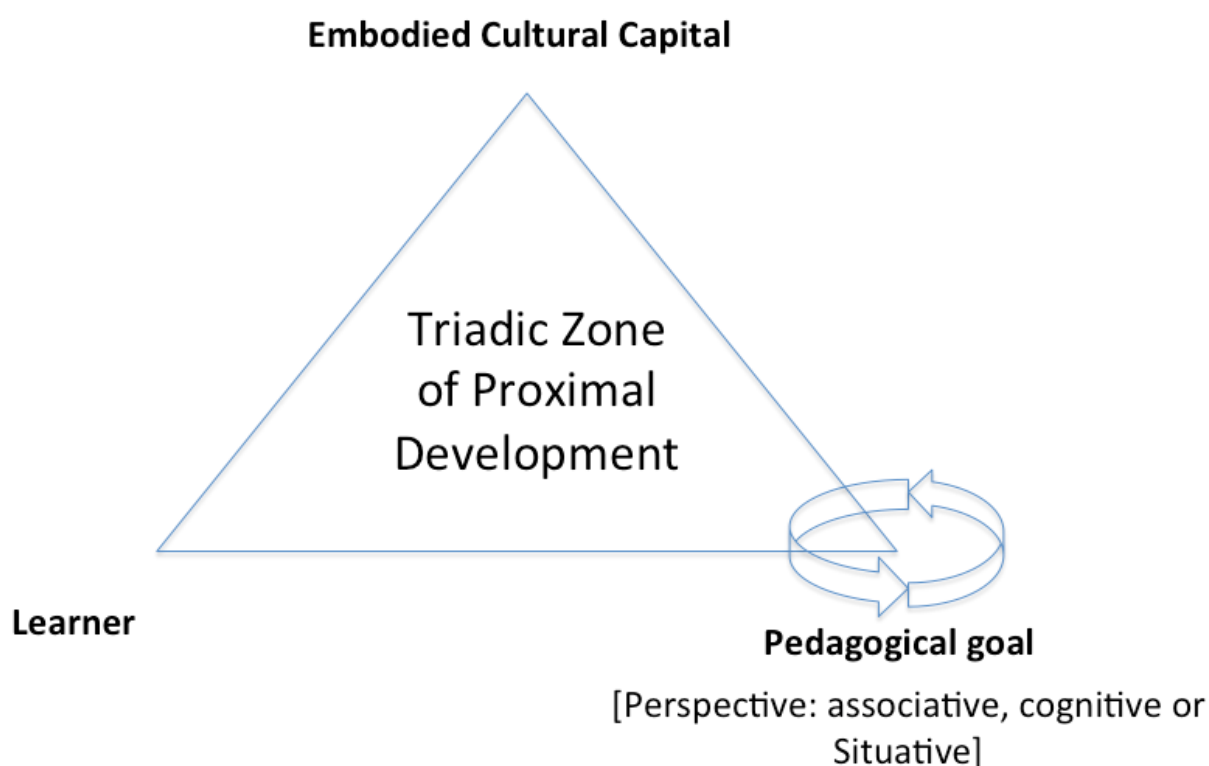


Figure 1: Triadic ZPD framework for learning technologies in resource-constrained environments

In proposing this framework, we seek to provide different and innovative ways of mediating formal education through the affordances of learning technologies so that education becomes meaningful and relevant for all learners. It is thus important to find ways in which formal education can be expanded to appropriate local subjugated knowledges. This calls for new ways of thinking about curriculum design and for more participatory forms of learning, where there can be a cross-pollination of ideas between learners themselves and between educators and learners. In Table 2 examples of how pedagogical choices inform the choice of tools within the Triadic ZPD framework.

Table 2: Examples of the implementation of a Triadic ZPD

Learner	Prior knowledge & competencies	Pedagogical goal	Tool
	Postgraduate students distributed in different countries in Africa. They have mobile phones and twitter	Distributed students undertaking an authentic field task share daily updates using an assigned hashtag with the classmates and the supervisors. The aggregation of the	Twitter hashtag https://twitter.com/

	accounts.	hashtag becomes a resource for students. The facilitator provides timely support to students. <i>{associative view}</i>	
	First year students in Engineering maths class are daily users of a social network site, Facebook (FB). The take photos of problems they need help with an share on FB. Peers respond with help.	Taking a photo, post with a narrative. Peer give feedback and 'like' it <i>{associative view}</i>	Facebook http://www.facebook.com/
	Final year business students, already users of Ning, engage in an authentic learning task	Facilitation of communication between students and the kinds of people they are likely to engage with when they enter the professional sector <i>{cognitive view}</i>	Ning http://www.ning.com/
	Second year students in Digital Media Economies participate in an authentic task	A practical assignment to enable students to examine online advertising as a tool to reflect on digital media economies <i>{cognitive view}</i>	Google's Online Marketing Challenge
	Students in a face-to-face class engage with the class using mobile phones	Students use a backchannel to give feedback on each other's 'live' presentation session <i>{cognitive view}</i>	Edmodo https://www.edmodo.com/
	Students use their creativity to create a voki to aid the presentation of a complex task	Students create a speaking avatar to present a response to an assignment <i>{cognitive view}</i>	Voki http://www.voki.com/
	Postgraduate Journalism students draw on prior knowledge to engage in authentic task	Leveraging access to international audiences to prepare students for the real world. <i>{situative view}</i>	Hosting online video conferences and feedback sessions using MyDimDim
	Students in an Adaptive management course use their mobile	Student are given a fish in a tank to care for and to keep a personal blog journal of how often they change its	Students use blogspot

	phones to make postings to a blog	water, feed the fish, what plants they introduce, what the quality of water (involving physical testing) is and where they keep the fish <i>{situative view}</i>	
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Some of the examples of pedagogical goals and associated learning technologies within a Triadic ZPD are presented to show how learning technologies can be theorized and applied in resource-constrained environments. Although educators who are using learning technologies in this theorized way are in the minority, much work still needs to be engaged in to ensure that technologies are used to transform teaching and learning practices.

12.16 Conclusion

Most schools and HEIs in resource-constrained contexts continue to operate within a culture of competitive individualistic learning, which tends focus largely on middle class interests. This unfortunately makes it difficult for them to accommodate emerging forms of engagement, such as socially constructed knowledge production, open-collaborative learning, MOOCs, which are seen as disruptive of the status quo. Furthermore, institutions of learning are generally hierarchical in nature and thus slow to change and to learn. Opportunities for transformation of practices tend therefore to lag behind, relying on traditional learning practices rather than ubiquitous or innovative ones which are used outside the classroom by scholars and students. With the rise of MOOCs from resource-rich institutions and new business models incorporating players outside the formal education sector, institutions in resource-constrained environments may not be aware that they have been usurped and could potentially become redundant or by-passed.

As we conclude this chapter, we review our research questions that this chapter sought to address:

How is learning with technology in resource-constrained environments theorized?

The use of the Triadic ZPD framework provides a way of understanding the need to take cognisance of learner's prior learning with technologies available to them and for which they are often competent users of. The underlying argument is that effective and meaningful learning requires that the affordances of the task match the affordances of tools which are readily available and accessible to learners (what we have referred to as 'effectivities'. Thus, the focus of the learning activity should be on realisation of learning outcomes and the barriers of technologies should not be a hinderance to the learning process. The cultural knowledge in the Triadic ZPD also suggests that examples and illustrations used in the learning activity need to align with what is familiar to learners as this reduces the transactional distance.

What are the challenges experienced in resource-constrained environments?

Ignoring the culture, skills and needs of resource-constrained environments and imposing western, white and middle class values and ideas can have disastrous consequences - such as

the transportation of MOOCs to African countries with no consultation about local needs for education. The general challenges of teaching with technologies in resource-constrained environments can be described as failure to take cognisance of cultural and social capital that learners bring with to formal learning environments. Thus, the problem is that of insensitivity to prior knowledge, familiar technologies and competencies of learners. It is important to take cognisance of the pitfalls of the cultural and social capital of the schooling system being imposed on learners at the expense of local knowledge, a concern which has been highlighted across this chapter.

How are educators in resource-constrained environments using emerging technologies to mitigate the constraints?

In this chapter we have outlined a number of technologies which have been used in resource-constrained environments both in beneficial and in problematic ways. We have discussed the DIY/Maker Movement, mobile learning, OER, MOOCs, cloud-based tools and learning with connected and unconnected devices. We have provided examples in the chapter of educators who are mitigating constraints through focusing on pedagogical goals rather than using emerging technologies without any pedagogical intent. The choice of pedagogical tools is an outcome of an affordance analysis that takes into account the embodied cultural capital and matches the affordances of a task with that of the tools.

Finally, as Baijnath (2013) reminds us, access to technologies in resource-constrained environments is a matter of social justice. Whether we will be able to include those who hitherto have been excluded from learning with technologies, and use their knowledges and voices, will determine how rich and socially just education will be in the future. Whether or not the affordances of these technologies can be harnessed to achieve valuable beings and doings is also a crucial factor in promoting socially just pedagogies in resource-constrained environments. Our final word to educators is that what is not recognised in learners is not appreciated, and what is not appreciated is not celebrated and what is not celebrated is soon or later lost in life.

References

- Aguaded-Gómez, Ignacio. 2013. "Editorial: The MOOC Revolution: A new form of education from the technological paradigm?" *Comunicar*, 21, 41: 7. DOI: <http://dx.doi.org/10.3916/C41-2013-a1>
- Aker, Jenny C. and Isaac M. Mbiti. 2010. "Mobile Phones and Economic Development in Africa" (June 1, 2010). Center for Global Development Working Paper No. 211. Accessed Nov 29 2013. <http://ssrn.com/abstract=1693963> or <http://dx.doi.org/10.2139/ssrn.1693963>
- Akoojee, S. and M. Nkomo. 2007. "Access and quality in South African higher education: The twin challenges of transformation." *South African Journal of Higher Education*, 21,3: 385-399.
- Ally, Mohamed and Avgoustos Tsinakos. 2014. *Increasing access through mobile learning*. Commonwealth of Learning and Athabasca University: Vancouver.
- Baggaley, Jon. 2013. REFLECTION MOOC rampant. *Distance Education*. Vol. 34, No. 3, 368–378, <http://dx.doi.org/10.1080/01587919.2013.835768>

- Baijnath, Narend. 2013. Opening address to *Higher Education Learning and Teaching Association of Southern Africa (HELTASA)* conference. Pretoria, UNISA 27 November 2013.
- Barlow, A. 2014. "Another colonialist tool?" In *Invasion of the MOOCs: The promises and perils of Massive Open Online Courses*. edited by Steven Krause and Charles Lowe 73-85. Parlor Press: Anderson.
- Bell, David. 2008. The university in your pocket. In *Podcasting for learning in Universities*. edited by Gilly Salmon and Palitha Edirisingha 32-145. Open University Press: Berkshire.
- BIS Research Paper No 130. 2013. "The maturing of the MOOC: Literature review of massive open online courses and other forms of online distance learning". London: Department for Business Innovation and Skills. www.gov.uk/bis
- Botha, Andele. and Laurie Butgereit. 2012. "Dr Math: a mobile scaffolding environment". *International Journal of Mobile and Blended Learning*, 4, 2:15-29.
- Bower, Matt. 2008. "Affordance analysis – matching learning tasks with learning technologies". *Educational Media International*, 45, 1:3 – 15.
- Bozalek, Vivienne and Chrissie Boughey. 2012. "(Mis)framing higher education in South Africa. *Social Policy and Administration*, 46,6: 688–703.
- Bozalek, Vivienne, Dick Ng'ambi and Daniela Gachago. 2013. "Transforming teaching with emerging technologies: Implications for Higher Education Institutions". *South African Journal of Higher Education*, 27,2:419-436.
- Bozalek, Vivienne, Poul Rohleder, Ronelle Carolissen, Brenda Leibowitz, Lindsey Nicholls and Leslie Swartz. 2007. "Students learning across differences in a multi-disciplinary virtual learning community". *South African Journal of Higher Education*, 21,7:810-823.
- Brown, Irvin. 2002. "Individual and technological factors affecting the perceived ease of use of Web-based learning technologies in developing countries". *The Electronic Journal of Information Systems in Developing Countries (EJISDC)*, 9,5:1-15. <https://www.ejisdc.org>
- Bryant, P., A. Coombs, M. Pazio and S. Walker. 2014. "Disruption, destruction, construction or transformation? The challenges of implementing a university wide strategic approach to connecting in an open world. In Proceedings of OpenCourseWare Consortium Global 2014: Open Education for a Multicultural World.
- Burgstahler S. E. 2010. "Universal design in higher education." Universal design in higher education: From principles to practice, edited by S.E. Burgstahler and R.C. Cory, 3 - 20. Cambridge, Massachusetts: Harvard Education Press.
- Castells, Manuel. 2012. *Networks of outrage and hope: Social movements in the internet age*. Polity Press: Cambridge.
- Corea, Stephen. 2007. "Promoting Development Through Information Technology Innovation: The IT Artifact, Artfulness, and Articulation". *Information Technology for Development*, 13,1:49–69.
- Diallo, B., W. C.Thuonand R.C. Wright. 2013. Approaches to the Production and Use of OERs: The African Virtual University Experience. *Open Educational Resources: Innovation, Research and Practice*. R. McGreal, W. Kinuthia and S. Marshall (Eds.). Commonwealth of Learning: Athabasca University.
- Fraser, Nancy. 2009. *Scales of justice. Reimagining political space in a globalizing world*. New York: Columbia University Press.
- Gee, James Paul. 2014. *Collected essays on learning and assessment in the digital world*.

Illinois: Common Ground.

Gibson, J. J. 1977. "The theory of affordances". In *Perceiving, acting, and knowing: Toward an ecological psychology*, edited by R. Shaw and J. Bransford, 67–82. Hillsdale, N.J.: Lawrence Erlbaum.

Greenhow, Christine and Benjamin Gleason. 2014. "Social scholarship: Reconsidering scholarly practices in the age of social media". *British Journal of Educational Technology*. 45,3:392-402.

Gulati, Shalni. 2008. "Technology-enhanced learning in developing nations: A review". *International Review of Research in Open and Distance Learning (IRRODL)*, 9,1, <http://www.irrodl.org/index.php/irrodl/article/viewArticle/477>

Jenkins Richard. 2002. *Pierre Bourdieu* (Rev. ed). New York: Routledge.

Johnson, L., S. Adams Becker, D, Gago, E. Garcia and S.Martín, S. 2013. *Technology Outlook – Latin American Higher Education 2013-2018: An NMC Horizon Project Regional Analysis*. Austin, Texas: The New Media Consortium.

Johnson, L., S. Adams Becker, V. Estrada and A.Freeman. 2014. NMC Horizon Report: 2014 Higher Education Edition. Austin, Texas: The New Media Consortium. Krauss, K. 2013. "Collisions between the Worldviews of International ICT Policy-Makers and a Deep Rural Community in South Africa: Assumptions, Interpretation, Implementation, and Reality". *Information Technology for Development*, 19, 4: 296–318, <http://dx.doi.org/10.1080/02681102.2013.79316>

Krishna, S. and Geoff Walsham. 2005. "Implementing public information systems in developing countries: Learning from a success story". *Information Technology for Development*, 11, 2: 123-140. DOI: 10.1002/itdj.20007

Leibowitz, Brenda and Vivienne Bozalek. in press. "Foundation Provision – A Social Justice Perspective". *South African Journal of Higher Education*

Lesko, Igor. 2013. "The use and production of OER & OCW in teaching in South African higher education institutions". *Open Praxis*, 5,2:103–121.

Mayes, Terry and Sara de Fretais, 2004. JISC e-Learning Models Desk Study - Stage 2: Review of elearning theories, frameworks and models. Retrieved on 27 April 2014 from http://www.jisc.ac.uk/uploaded_documents/Stage%20%20Learning%20Models%20%28Version%201%29.pdf

Minges, Michael. 2012. "Overview", In World Bank. 2012. *Information and Communications for Development 2012: Maximizing Mobile*. Washington, DC: World Bank. DOI: 10.1596/978-0-8213-8991-1; website: <http://www.worldbank.org/ict/IC4D2012>. License: Creative Commons Attribution CC BY 3.0

Mitra, S. 2003. "Minimally Invasive Education: A progress report on the 'hole-in-the-wall' experiments". *British Journal of Educational Technology*, 34, 3:367–371.

Global mobile statistics 2014 Part A: Mobile subscribers; handset market share; mobile operators. Retrieved on 18 May 2014 from: <http://mobithinking.com/mobile-marketing-tools/latest-mobile-stats/a>

Moensa, Nicolaas P., Jacqueline E.W. Broerse, Lisette Gastb and Joske F.G. Bundersa. 2010. "A Constructive Technology Assessment Approach to ICT Planning in Developing Countries: Evaluating the First Phase, the Roundtable Workshop". *Information Technology for Development*, 16,1:34–61

- Moore, G. Michael. 1993. Theory of transactional distance. In D. Keegan, ed. *Theoretical Principles of Distance Education*. London: Routledge, 22–38.
- Mtebe, Joel S. and Roope Raisamo. 2014. "Investigating perceived barriers to the use of Open Educational Resources in Higher Education in Tanzania". *IRRODL The International Review of Research in Open and Distance Learning*, 15, 2, <http://www.irrodl.org/index.php/irrodl/article/view/1803>
- Ng'ambi, Dick and Vivienne Bozalek. 2013. "Leveraging informal leadership in higher education institutions: a case of diffusion of emerging technologies in a southern context". *British Journal of Educational Technology*, 44,6:940-950.
- Ng'ambi, Dick and Airong Luo. 2013. "Towards a sustainable inter-institutional collaborative framework for Open Educational Resources (OER)". *Open Educational Resources: Innovation, Research and Practice*. R. McGreal, W. Kinuthia and S. Marshall (Eds.). Commonwealth of Learning: Athabasca University.
- Ng'ambi, Dick, Vivienne Bozalek and Daniela Gachago. 2013a. "Empowering educators to teach using emerging technologies in higher education: a case of facilitating a course across institutional boundaries". In *Proceedings of the 8th International Conference on e-Learning*, edited by Eunice Ivala, 292-300. Cape Town: Academic Conferences and Publishing International Limited.
- Ng'ambi, Dick, Vivienne Bozalek and Daniela Gachago. 2013b. "Converging institutional expertise to model teaching and learning with emerging technologies". *Progressio*, 35(2):19-36.
- Ng'ambi, Dick. 2005. "Mobile Dynamic Frequently Asked Questions (DFAQ) for student and learning support". Retrieved on 27 November, 2013 from <http://www.mlearn.org.za/papers/Ng'ambi.pdf>
- Ng'ambi, Dick. 2011. Short Message Services for supporting student learning. *Blended Learning across disciplines: models for implementation*. A. Kitchenham (ed.) 228-244.
- Njenga, James and Louis Fourie. 2010. "The myths about e-learning in higher education". *British journal of educational technology*, 41,2:199-212.
- Nussbaum, Martha. C. 2011. *Creating capabilities: The human development approach*. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.
- Ogembo, Javier, Ngugi, Benjamin and Matthew Pelowski. 2012. "Computerizing primary schools in rural Kenya: Outstanding challenges and possible solutions". *The Electronic Journal of Information Systems in Developing Countries (EJISDC)*, 52,6:1-17. <https://www.ejisdc.org>
- Pachler, N., J. Cook and B. Bachmair. 2010. "Appropriation of mobile cultural resources for learning". *International Journal of Mobile and Blended Learning*, 2, 1:1-21.
- Panofsky, Carolyn P. and Jennifer A. Vadeboncoeur. 2012. "Schooling the social classes: triadic zones of proximal development, communicative capital, and relational distance in the perpetuation of advantage". *Vygotsky and Sociology*, edited by Harry Daniels, 192-210, Routledge: London.
- Park, Yeonjeong. 2014. "A Pedagogical Framework for Mobile Learning: Categorising Educational Applications of Mobile Technologies into Four Types". *Increasing access through mobile learning*, edited by Mohamed Allyand Avgoustos Tsinakos, 27-48, Commonwealth of Learning and Athabasca University: Vancouver.
- Pauline, N. and T.Wilson. 2012. "An empirical investigation of the emergent issues around

- OER adoption in Sub-Saharan Africa". *Learning, Media and Technology*, 37:4, 398-413.
- Peluso, C. C. D. 2012. The fast-paced iPad revolution: Can educators stay up to date and relevant about these ubiquitous devices? *British Journal of Educational Technology*, 44(4), E125–E127.
- Rambe, Patient. 2012. "Social media-enhanced phones for productive learning of South African postgraduate students". *International Journal of Mobile and Blended Learning*, 4, 2: 49-66.
- Ratto, Matt and Megan Boler. (eds.)2014. *DIY Citizenship: Critical making and social media*. The MIT Press: Cambridge.
- Rohleder, Poul, Vivienne Bozalek, Ronelle Carolissen, Leslie Swartz and Brenda Leibowitz. 2008. "Students' evaluations of the use of e-learning in a collaborative project between two South African universities" *Higher Education* :95-107.
- Scott, Ian. 2012. Access, success and curriculum: Aspects of their organic relationship. In *Alternative access to higher education: Underprepared students or underprepared education?* ed. R. Dhunpath and R. Vithal, 25 - 49. Cape Town: Pearson.
- Sen, Amartya. K. 1999. *Development as freedom*, Oxford: Oxford University Press.
- Sharples, M., P. McAndrew, M. Weller, R. Ferguson, E. Fitzgerald, T. Hirst, and M. Gaved. 2013. *Innovating Pedagogy 2013: Open University Innovation Report 2*. Milton Keynes: The Open University.
- Siff, H. F. 2006. Mobility and Higher Education: Not Just the Next Big Thing. *EDUCAUSE Research Bulletin*. issue 22.
- Spivak, Gayatri C. 1988. "Can the subaltern speak?" In *Marxism and the interpretation of culture*", edited by Cary Nelson and Lawrence Grossberg, 24–28. London: Macmillan.
- Traxler, John and Dick Ng'ambi. 2012. "Special Issue on mobile learning in Africa: snapshot of Africa's mobile learning milestones". *International Journal of Mobile and Blended Learning*, 4, 2: i-iv.
- United Nations Children's Fund. 2013. *Children, ICT and Development: Capturing the potential, meeting the challenges*, Innocenti Insight, Florence: UNICEF Office of Research.
- UNESCO Institute for Statistics. 2012. *ICT in Education in Latin America and the Caribbean. A regional analysis of ICT integration and e-readiness*. Montreal: UNESCO. <http://www.uis.unesco.org>
- van der Berg, Servaas. 2007. "Apartheid's enduring legacy: Inequalities in education". *Journal of African Economies*, 16,5, 849-880.
- West, Mark and Han Ei Chew. 2014. *Reading in the mobile era: A study of mobile reading in developing countries*. Paris: UNESCO.
- Woo, Karen, Maree Gosper, Margot McNeill, Greg Preston, David Green, and Rob Phillips. 2008. "Web-based lecture technologies: blurring the boundaries between face-to-face and distance learning". *ALT-J, Research in Learning Technology*, 16,2, 81-93.