

TECHNOLOGY AND OPEN LEARNING: THE POTENTIAL OF OPEN EDUCATION RESOURCES FOR K-12 EDUCATION

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Introduction

“Surely our aim must be to combine connectivity with learning resources so as to create a global intellectual commons accessible to the whole of humankind?”
(Daniel, West, D’Antoni, and Uvalic-Trumbic, 2006, p. 23)

The growth of distance education methods of delivery was a key feature of education in the twentieth century and continues still. Three primary reasons for this trend can be identified. First, the need has grown to provide access to students who would – either because of work commitments, geographical distance, or poor quality or inadequate prior learning experiences – be denied access to traditional, full-time contact education. Second, it has been necessary to expand access to education to significantly larger numbers of learners. Third, there has been a need to shift patterns of expenditure to achieve economies of scale by amortizing identified costs over time and large student numbers (SAIDE, 2002, 2004). In African contexts, these drivers are often underpinned by the need to transform education systems that have been ravaged by colonial histories and political instability.

In the K-12 sector, many countries around the world, when faced with problems of learner access to the conventional schooling systems, have implemented some or other form of Open School as a response to these problems. However, such approaches have tended to operate outside of the mainstream education system, thus leaving it unchanged rather than spearheading the transformation needed to create dynamic and responsive systems educating learners who are able to critically engage with a

continuously changing environment. Very often, establishment of Open Schools has also been motivated by intrinsic weaknesses in the mainstream, “contact” schooling system, which policy makers have seen requiring years of structural change before large-scale improvements will become noticeable. Thus, Open Schools provide a handy, reasonably quick institutional solution to problems of educational delivery, which can operate largely outside of the mainstream schooling system.

Against this backdrop, the key question when considering the potential of Information and Communication Technology (ICT) in K-12 education is how ICT can function as a catalyst to transform education systems. How can we use ICT to shift greater levels of control back to the level of the school and to learners? Experience working in various contexts has shown that schools, teachers and learners are becoming increasingly disempowered agents in the strengthening bureaucracies of centrally planned education systems, and the negative effects of this are seen starkly in African schools. In many instances, in Africa and other parts of the world, national curricula do not teach what learners need to know before they leave school (Levy and Murname, 2006; NEPAD, e-Africa Commission, 2006; see also Anderson, 2008; Voogt, 2008).

While ICT potentially presents opportunities to change many of these negative dynamics in education systems, the dominant approach is currently to layer ICT use as an additional problem on top of these inefficient and disempowering systems (NEPAD, e-Africa Commission, 2006). Thus, ICT projects often serve to further alienate and marginalize those at the bottom of the system, while they increase inefficiencies by creating new costs without increasing productivity across the system in any noticeable ways. It is common to talk about constructivist learning pedagogies and learner-centred education and to include these terms in education policies, but these philosophies are seldom reflected in the way the overall schooling system operates (NEPAD, e-Africa Commission, 2006).

This context raises questions about the role that distance education and technology can play in solving educational problems in developing countries. In this chapter we consider the concept of distance education in relation to open schooling, and then move on to define the concept of open learning. All too often, distance education and open learning are assumed to be the same thing, as evidenced in terms such as “open and distance learning”. We argue that the concept of distance education and open learning are not necessarily the same and conflating the two has negative consequences for education systems. Instead, we argue that increasing openness should be the criterion of success to which education systems and planners strive irrespective of the mode(s) of delivery employed. We consider how technology can be used to support open learning, with a particular focus on the role that open education resources (OERs) might play in improving quality and reach of education. The chapter ends with a brief example of an OER project supporting K-12 education in South Africa.

Distance Education and Open Schooling

Distance Education describes a set of teaching and learning strategies (or education methods) that can be used to overcome spatial and temporal separation between educators and learners. Further, since economies of scale can be achieved through

the enrolment of larger numbers of learners than is possible in a face-to-face context, distance education is often presented as a cost-effective solution to the challenges of increasing access to education (SAIDE, 2002, 2004).

An Open School is an educational institution operating in the spheres of primary and/or secondary education, providing courses and programmes predominantly through use of distance education methods. Most schools of this nature have been established for some time. The Correspondence School in New Zealand, for example, was established in 1922, while the Open School in India is over 20 years old. Reasons for establishing such schools have tended to revolve around accessibility to traditional schooling. In these two examples, part of the motivation to establish the school was to provide access to students in remote farming communities (New Zealand) and access to large numbers of students whom the mainstream schooling system could not absorb (India).

Over the last four decades, a growing number of countries within Southern Africa have experimented with a broad range of different kinds of open and distance learning models, in an effort to solve the twin problems of the low access and low efficiency of conventional secondary schooling. Some of the early efforts, such as in Malawi, actually pioneered national alternative secondary school systems which have since been adopted by government and integrated into the conventional secondary sector. The old Malawi College of Distance Education study centres have now been incorporated into the mainstream secondary sector and strengthened to form Day Community Secondary Schools. In other countries, such as Zambia and Zimbabwe, the models have either failed to work at scale and hence cost effectively, or they were inadequately supported and so were unable to deliver the required quality and have hence declined. The phenomenon of increasing number of out of school youth has prompted states like Botswana and Namibia to develop other models, which has given rise to “new Open Schools” like Botswana College of Distance and Open Learning (BOCODOL) (Tau, 2005; see also <http://www.moe.gov.bw/bocodol/index.html>) and the Namibian College for Open Learning (NAMCOL) (Mensah, 2005; see also <http://www.namcol.com.na/>). These organizations have effectively built on the lessons of the past to offer high quality education nationally and at scale (IRFOL, 2004). Both BOCODOL and NAMCOL now enrol well over 25,000 students at secondary school levels, and as a consequence enjoy increasing public support and legitimacy.

Thus, Open Schools have become increasingly common in African countries and serve important functions of expanding access to, and sometimes, improving quality of education. Yet, in most countries, mainstream education systems remain intact and educational outcomes for learners remain poor. Current understandings and categorizations of education as either “distance” or “face-to-face” perpetuate this situation. The concept of “modes of delivery”, often employed in educational planning and policy making, is based on an historical distinction in education systems between “distance” and “contact” education. This distinction has been very useful for many years, particularly as it allowed for the establishment of innovative responses to education problems – such as Open Universities and Open Schools – that could be set up and run without waiting for changes in mainstream education systems.

This flexibility was important to the success of many distance education institutions around the world, but has also had the unfortunate consequence of establishing two distinct education systems, which have historically operated in parallel and created long-term policy problems. This problem has been compounded recently, as there has been an explosion of education delivery options, around which it has become increasingly difficult to establish meaningful policy and regulatory frameworks.

Neat categorizations of “distance” and “contact” education are increasingly containing too divergent a range of educational practices to remain relevant. This has become particularly problematic in the area of distance education with the increasing use of ICTs (Butcher, 2003). For example, distributed lecturing systems using video-conferencing equipment and systems using instructionally designed study guides and decentralized tutorial support find themselves located within the same category, although they bear almost no resemblance in terms of pedagogical approach, technologies used, and their financial implications. This is not to suggest that one is intrinsically better than the other. It simply points to the inadequacy of planning approaches that assume that the planning requirements of both will be adequately met by a single framework called “distance education”.

Awareness is now growing that elements of distance education have almost always existed in face-to-face programmes, while educators involved in good quality distance education increasingly recognize the importance of different types of face-to-face education as structured elements of their programmes. This trend has rendered rigid distinctions between the two modes of delivery meaningless.

An appropriate solution to this problem is the conceptual introduction of a planning continuum of education provision (Butcher, 2007). This continuum has, as two imaginary poles, provision only at a distance and provision that is solely face-to-face. The reality is that all education provision exists somewhere on this continuum, but cannot be placed strictly at either pole. Educators often end up equating particular methods of education with good quality education, even when these methods are being poorly implemented. The notion of this continuum is free of such premature and unnecessary judgments about quality.

This conceptual shift is vital in changing the structure of education systems around the world. In particular, it allows for greater flexibility and opens possibilities of collaboration, both of which are vital to improvements in educational quality and cost-effectiveness of education provision, issues of particular relevance to policy-makers. It allows education providers to plan, implement and review each education intervention on its own merits, rather than being forced into simplistic, dichotomous categories (such as “distance education” or “contact education”), which set arbitrary and unhelpful constraints. This flexibility should form the cornerstone of all education planning processes. Education systems always serve a diversity of people with a wide range of educational needs. There is no single teaching and learning model that will equally meet these diverse needs equally well.

This stance fits well with the concept of *open learning* as an underlying philosophy to guide educational provision. Not only does a move to open learning as a defining feature of education systems overcome the problem of artificial distinctions

described above, it also creates opportunities for exploring how technology can be used to change how mainstream education systems function.

Open Learning

Open learning is based on the principle of flexibility in order to increase access to education and often forms part of broader equity efforts in society. This approach allows learners much more freedom to determine what, how and when they want to learn, than the traditional approaches to education. The aim is to provide learning opportunities to a diverse range of learners both originating from, and learning in, different contexts. Within open learning approaches, there is common reference to learner-centred approaches, as well as resource-based and autonomous learning. This means that the learner is central, “learning to learn” is in itself a goal, and the learner develops critical thinking skills and the ability to learn independently. This philosophy becomes increasingly important in the context of lifelong learning and the need for people to be equipped to function in the knowledge society.

Thus, open learning describes a concept that is complex and yet invigorating educationally. Herein, however, lies a great danger, namely that the term “open learning” can be used by educationists and politicians as an “inspirational” title, which allows for the perpetuation of outdated modes of educational practice under the guise of something new and exciting. If the term is not simply to be used as a smokescreen for such a phenomenon, it is vital to understand the full implications of making use of the concept. This problem is compounded by the growing use of the term internationally – as well as the emergence of hybrid terms such as open and distance learning – which is leading to further divergence in the definitions of the term.

Much of what has been written about open learning has led to the formation of certain misconceptions about it, which are reinforced by several uses of the term in practice. Clearing up these misconceptions is essential in attempting to define the concept. In particular, it is common to assume that open learning and distance education are synonymous (Butcher, 2003).

The term “distance education” describes a collection of methods for the provision of structured learning. Its object is to avoid the necessity for learners to discover the curriculum by attending classes frequently and for very long periods in order to listen to it being spoken about. This does not mean that there is no face-to-face contact, but that most communication between learners and educators is not face-to-face. Instead, it makes use of different media as necessary. Distance education, therefore, provides techniques of educational design and provision that – under certain circumstances – can bring better chances of educational success to vastly more people at greatly reduced costs (Butcher, 2003; SAIDE, 2004). Nevertheless, the provision of distance education does not automatically equate with openness in education. As Rumble (1989, p. 31) points out, for example:

“the technological basis of distance education may...lead to a closed system if undue emphasis is placed on ‘programmed’ media such as texts, broadcasts,

audio- and video-cassettes, computer-based instruction, etc, where the content is pre-determined and communication is one way (from the teacher to the student)".

Globally, a vast amount of distance education provision is closed in many respects. Consequently, although distance education is a collection of educational practices that has demonstrated great potential for increasing openness in learning, the terms should not be confused.

In addition to confusing the terms open learning and distance education, there has been a further tendency to regard open learning as something that can find final expression through individual projects, initiatives, institutions or other educational systems. This is expressed quite clearly in the names of several organizations, for example, the Open Learning Agency in Canada, the Open Learning Institute of Hong Kong (now also renamed as an Open University) or the Open University in the United Kingdom. The idea is also contained in opinions such as the following: "A sensible use of educational technology theories and technological devices can provide a truly open system" (Bosworth, 1991, p. 8). This notion is, however, misleading, as Rumble (1989, p. 33) makes clear:

"There is, I believe, an attempt to hijack [*sic*] the descriptive adjective 'open' and apply it to learning systems to form a compound noun 'open-learning-systems', which is then used in sentences such as 'the [institution's name] is an open learning system'. Such sentences are then used to define the particular system in a way which is attractive politically, given the political and financial advantages which may accrue from claiming status as an open learning-system. In practice the systems so described may be anything but open".

There is a great danger in labelling individual initiatives in this way, because it implies the creation of a separate "open learning" system alongside conventional education and training, running parallel to it through various "open learning projects". Such a tendency robs open learning of its strengths as a concept. This is because it suggests that open learning is a perceptible method of educational provision that is to be offered alongside conventional education.

Rather, then, open learning should be understood as an approach to education, the principles of which can continually inform all educational practices with the aim of improving them. This is most easily expressed in a simple grammatical switch, from understanding "open" not as an adjective – which then describes a particular kind of learning – but rather as a verb, creating an impetus for action. Thus, the strength of the concept lies in its capacity to lead to action focused on systematically opening learning. This it is able to do because open learning brings together key educational principles, all of which focus in one form or another on opening learning. These principles do not amount to a coherent doctrine or philosophy; indeed, often they exist in tension with one another. This tension is important, because it can help educational planners to understand where closure in their educational systems is required and where it is unhelpful. Thus, the principles of open learning provide a

set of benchmarks against which all aspects of any educational system (international, national, provincial or institutional) can be measured.

Open learning as an approach to education seeks to remove all unnecessary barriers to learning, while aiming to provide learners with a reasonable chance of success in an education and training system centred on their specific needs and located in multiple arenas of learning. To explain this further, it is necessary to outline those educational principles that can be clustered around the concept of open learning.

Learner-Centredness

This notion is a primary prerequisite of openness. The principle of learner-centredness, in essence, acknowledges that the learner should be the focus of the educational process and should be regarded as an active participant in an interactive process. Education should not be viewed as a transmission procedure, where there is a one-way flow of information from the source of knowledge (whether it be an educator or an educational course made up of one or more media) to a passive learner (Bransford, Brown, and Cocking, 2000). Rather, education should encourage independent and critical thinking and develop problem-solving capabilities (Levy and Murname, 2006). This is facilitated by regarding the learner as an active participant in the educational process, and can be further enhanced by offering learners choices, possibilities and contesting viewpoints within that process. Finally, learner-centred education should also build on learners' own experiences, using these as the starting point and basis for any learning process (Laurillard, 1993).

Lifelong Learning

The concept of lifelong learning is also central to openness. It argues that learning should continue throughout life, rather than being limited to childhood, and should be of direct relevance to the needs and life experience of learners. As Bosworth (1991, p. 76) points out, "educationalists, in particular, should always remember that a great deal is learned from material that is not specifically designated as 'learning' or 'training'". Thus, for example, watching, hearing or reading an advertisement is as much a learning experience (teaching the learner to buy a product) as is attending a lecture or working through a training course. It is vital, in attempting to open learning opportunities, to re-conceptualize what constitutes a "learning experience". The concept of lifelong learning is not, however, merely a philosophical concept about human rights, but a national necessity for economic survival. It is becoming clearly understood globally that commitment to lifelong learning is an economic necessity (Anderson, 2008; Laurillard, 1993).

Flexibility in Learning

The concept of open learning entails increasing the flexibility of learning provision to cater for the diverse needs and contexts of learners (Bransford, Brown,

and Cocking, 2000). This includes allowing learners flexibility in determining what, how and when they want to learn (SAIDE, 2002; Rumble, 1989). This implies that learners will increasingly take control of and responsibility for their own learning.

Removal of Unnecessary Barriers to Access

Central to the process of opening learning is the principle of removing all unnecessary barriers to access to educational opportunities. Barriers that learners might face would include geographical isolation, discrimination on the basis of race, gender, home language or language of learning, age or physical disability, the inability to take time off work for a course, lack of “appropriate” qualifications, and lack of funds required to enrol in particular courses and pay for the necessary resources (SAIDE, 2002; IRFOL, 2004).

Recognition of Prior Learning Experiences and Current Competencies

As mentioned above, one of the key barriers to access to courses in many educational institutions is the lack of “appropriate” qualifications. Hence, related to the principle of opening access to learning opportunities is the need for recognition of relevant prior learning experiences of learners and of the current competencies that they possess. Such experiences and competencies should also be accredited appropriately where applicable (SAIDE, 2002). In a schooling context, this principle implies that the pre-existing knowledge of learners is considered and integrated into the classroom environment (Bransford, Brown, and Cocking, 2000).

Learner Support

The process of opening educational opportunities cannot be effective unless educational providers ensure that it is accompanied by adequate support to learners (SAIDE, 2002). This involves the provision of a range of services such as advice, relevant information and counselling throughout the learning process. Several types of support should be made available to learners: support of all kinds offered by educators on a regular basis both through face-to-face contact and other forms of communication (including telephones, the post and computer links); the encouragement of interaction between learners in both group and one-to-one basis; the provision of any necessary learner support in educational courses; and by providing access to the necessary facilities, including a space in which learning activities and interaction between learners can take place, as well as access to computers, laboratories and other resources which might be a necessary requirement within the learning process (see also IRFOL, 2004, where quality of learner support is noted as a factor affecting educational effectiveness and sustainability).

Expectations of Success

Holt and Bonnici (quoted in Bosworth, 1991, p. 2) note that “open learning is not just about opening up access alone, it is also about providing people with a fair chance of success”. This necessitates offering learners the opportunity to complete learning programmes successfully, but also ensuring that the qualifications they earn will ultimately have value in the occupational marketplace. Linked to this, therefore, is the notion that, ultimately, it is essential that the education offered should be of the highest possible quality. This ensures that educational providers can meet expectations of success created by opening learning opportunities.

Cost-Effectiveness

Another critical principle of open learning, which draws together and expresses many of the tensions inherent in combining these principles, is the principle of cost-effectiveness. Cost-effectiveness is used here as a term distinct from cost-efficiency. The latter is about “cheapness” of educational provision – usually expressed in terms of per-student costs – while the former represents striking the optimal balance between cost, student numbers and educational quality, a balance that will be entirely different for different educational contexts (SAIDE, 2004). In many ways, the concept of cost-effectiveness represents the balancing act that constitutes open learning. There is no magical formula that leads to cost-effective education; rather, cost-effectiveness needs to be measured on an ongoing basis in relation to changing contextual requirements.

Open learning, in many instances supported by distance education methodologies and advances in technology, can potentially support many of the worlds’ poor to access educational opportunities from which they are currently excluded. In many instances, those educational opportunities that do exist are of poor quality, often due to lack of resources – human, financial and educational. Bringing education to this marginalized group will require drastic cost cuts as well as local adaptability. A focus on the role that technology might play in fostering more open education systems is thus of critical importance.

Technology and Open Learning

Technology has a role to play in the realization of many, if not all, of the principles of open learning. In particular, technology (when used correctly) supports increased flexibility in education provision and learner-centred approaches. For example, Momanyi, Norby, and Strand (2006, p. 159) note the following in a review of technology use in education:

“Norton and Gonzales (1998) noted that using technology could change the way teachers teach. They further observed that technology supported more student-centred approaches to instruction so that students conducted their own inquiries

and engaged in collaborative activities while the teacher assumed the role of facilitator. Peck and Dorricott (1994) have similar views about student learning. They suggested that since students learn and develop at different rates, technology could help individualise instruction and, through an integrated system, students could move at an appropriate pace in a nonthreatening environment”.

Key in learner-centred approaches is an emphasis on problem-solving and the development of critical thinking skills. When used to specifically further this ideal (ICTs can also be used to support traditional teacher-centred methodologies), ICTs become tools for supporting learners’ decision-making, creativity, higher order thinking and knowledge construction (Haddad and Draxler, 2002). Thus in the context of open learning,

“what is important about computer use is not being able to word process, or view a multimedia presentation, but the ability to interact with the computer in the manipulation and creation of knowledge through the rapid manipulation of various symbol systems. The value is not in more efficient representation but in improving the capability to generate thought” (Hokanson and Hooper 2000, p. 547).

Flexible learning is about providing learners with choices about when, where and how they learn. The wide range of technologies and applications available to support education provide a variety of means of delivering education. Examples of different ways in which education could be provided to learners would include human interaction (either at a distance or face-to-face), practical work, interactive television classes, drama in education, educational broadcasting, computer-based training and a range of media materials (including printed materials, videos and audio cassettes). Implicit in all of this is that learners will be given greater freedom to choose where they wish to learn, whether it be at home, in a classroom or learning centre, or at the workplace.

Further, technology also has the potential to increase access to educational opportunities. There are at least two different elements to consider in the context of technology removing barriers to access. The first is the use of technology to provide access to educational programmes, not available in their immediate environment often through the provision of online courses as is becoming common in Open Schools (Haddad and Draxler, 2002). The second is the use of technology to provide access to quality educational resources, the lack of which are a barrier to open learning.

Given these potential benefits of technology for education, much attention in the past ten years has been dedicated to improving access to technology – seen in the importance attributed to ICT penetration rates, learner: computer ratios, etc – while far less attention, until more recently, has been directed at the development of educational content or resources of high quality and contextual relevance. Macleod (2005) argues that:

“Currently there is discrepancy between the potential of educational multimedia and the reality of its content which its widespread use. For example the majority

of online content currently emanates from the US, is text based, and written in English. Not only does this exclude those in developing countries with low basic literacy levels but it is also of questionable cultural relevance”.

It is not denied that access to technology remains deserving of attention and investment, particularly in developing countries. However, technology access alone is likely to have minimal educational impact without appropriate learning materials and resources (e.g., see Hepp, Hinostroza, Laval, and Rehbein, 2004).

In 2002, Cushman (p. 1) noted that:

“With a virtual world closing in on 10 million web sites and some 500 million users, it may seem odd to speak of shortages or slowness. Despite such expansion, the WWW remains something of a disappointment to educators. Those hoping for transformation of the educational process have yet to see it. And a significant corpus of digital content – preferably available free or at least at low-cost – is still mostly a dream. More and better digital *content sharing* would be a means to serve these ends”.

Open Education Resources (OER)

Present debates in the distance education and educational technology arenas often centre on the issue of learning objects and more recently on open education resources (OERs) and the potential of these developments to support education (Johnstone, 2005). It is argued in this chapter that, when used appropriately, OERs also have much potential to advance open learning possibilities.

Learning Objects

Curriculum design and development is – in many ways – the most important investment in the quality of educational programmes, as it provides the basis for everything that takes place in a teaching and learning environment. Unfortunately, though, most curriculum design and development tends to be undertaken in an ad hoc and often individualistic way (Cushman, 2002; Butcher, 2007). Thus, it is plagued by three problems. First, lack of systematic investments in curriculum design and development prevent implementation of strategies for containing the ongoing costs of this work (or – worse – result in such investments being halted). Second, because curriculum design and development is not approached systematically, it becomes harder to understand and is often implemented very inefficiently. Third, because the process resides predominantly with individuals, large investments are often quickly lost when an individual leaves an institution or become unhealthily tied up with that individual, creating significant potential management problems.

In an attempt to overcome these problems, growing attention has focused recently on the concept of creating “learning objects” in an effort to attempt to systematize

the codification and storage of this critical intellectual property (see also McKenney, Nieveen, and Strijker, 2008). Much of this work began as a result of developments in e-learning, but the concept has grown rapidly to have relevance in much wider array of educational settings.

There has been much confusion about how to define a learning object, and Sosteric and Hesemeier (2002, p. 1) note that:

“For some, ‘learning objects’ are the ‘next big thing’ in distance education promising smart learning environments, fantastic economics of scale, and the power to tap into existing educational markets. While learning objects may be revolutionary in the long term, in the short term, definitional problems and conceptual confusion undermine our ability to understand and critically evaluate the emerging field”.

Many definitions, particularly the earlier definitions, of learning objects draw heavily on the object-oriented design of computer science theory. Object-oriented design focuses on the creation of components – objects – that can be reused in different contexts (Wiley, 2000). While one of the characteristics of learning objects is reusability, this property alone does not define a learning object and definitions focusing too strongly on reusability have received much criticism. (e.g., see Sosteric and Hesemeier, 2002; Wiley, 2000; Nurmi and Jaakkola, 2005). Cushman (2002, p. 7) states that:

“...object-oriented digital pedagogy can also imply both a positive and normative stance about learning. Not everyone agrees that all (or even most) forms of knowledge can be decomposed into independent, context-insensitive chunks; and not everyone who thinks it is possible sees it as desirable”.

Further, it has been argued that adopting an object-oriented design definition of learning objects implies reductionist views of teaching and learning. Nurmi and Jaakkola (2005, p. 3) note that:

“The typical LO approach stresses learning content and its effective delivery to the learner instead of supporting knowledge construction, and neglects the essential nature of learning processes and learner’s personal knowledge construction. Thus the prevailing LO approach takes a teaching perspective whereas according to the constructivist ideas the focus should be based on a learning perspective”.

These authors argue further that the content of learning objects should be seen only as information or raw material from which knowledge can be constructed when used within an educational context. Similarly, Sosteric and Hesemeier (2002) note that learning objects do not become useful as learning tools until they have a specific context attached to them with pedagogical intent. Wiley (2005) highlights the importance of instruction design theory informing learning object development if learning

is to be facilitated, rather than an overly technical approach, such as is common when object-oriented development is taken as the starting point. He notes:

“If learning objects ever live up to their press and provide the foundation for an adaptive, generative, scalable learning architecture, teaching and learning as we know them are certain to be revolutionized. However, this revolution will never occur unless more voices speak out regarding the explicitly instructional use of learning objects – the automated or by-hand spatial or temporal juxtaposition of learning objects intended to facilitate learning. These voices must penetrate the din of metadata, data interchange protocol, tool/agent communication and other technical standards conversations. While instructional design theory may not be as ‘sexy’ as bleeding-edge technology, there must be concentrated effort made to understand the instructional issues inherent in the learning objects notion. The potential of learning objects as an instructional technology is great, but will never be realized without a balanced effort in technology and instructional design”.

Several learning object definitions have also been criticized for being so wide and all encompassing so as not to be helpful. Calls are made for simplified, more focused and more practical definitions (Sosteric and Hesemeier, 2002; Nurmi and Jaakkola, 2005). For the purposes of this chapter, the following definition provides a useful and succinct starting point:

“A learning object...is an object or set of resources that can be used for facilitating intended learning outcomes, and can be extracted and reused in other learning environments” (Mills, 2002, p. 1).

From the discussion above, we see that initial conceptualizations of learning objects tended to be very weak, as they tended to assume that education was a process free of context, and thus that it would be a simple matter to re-deploy individual objects to new learning contexts and reuse them. They also contained an underlying assumption that all learning objects would be quite similar, thus assuming that standardization would be key to interoperability of learning objects. However, as the field has grown, it has become clear that learning objects come in many shapes and sizes, and that what will work well for one educational context may well be highly inappropriate for another. Thus, codifying curriculum information through learning objects has proven to be more complex than initially anticipated. Nevertheless, the process has focused attention on the importance of investing in high quality educational content development, as one key part of knowledge management in education.

Irrespective of the definition of learning objects ascribed to, one of the key reasons that interest has grown in learning objects is because of their promise of “reusability” and hence the promise of costs savings, efficiency and potential quality enhancement where learning objects are well designed. If a learning object is designed well, stored in an appropriate database, and catalogued accurately, then there is significant potential that this investment might find use beyond its original audience and educational context.

Open Educational Resources

Building on this early work, a more recent development taking place in the field of learning object development has been a move towards creating “open” educational resources. This move has been stimulated by a growing movement to make information more freely accessible as a reusable resource. The concept was recently defined as follows during an online discussion hosted by UNESCO:

“Open Educational Resources are defined as ‘technology-enabled, open provision of educational resources for consultation, use and adaptation by a community of users for non-commercial purposes.’ They are typically made freely available over the Web or the Internet. Their principle use is by teachers and educational institutions to support course development, but they can also be used directly by students. Open Educational Resources include learning objects such as lecture material, references and readings, simulations, experiments and demonstrations, as well as syllabuses, curricula, and teachers’ guides” (<http://opencontent.org/blog/archives/247>).

A similar definition has been provided by the Organization for Economic Cooperation and Development (OECD) Centre for Educational Research and Innovation (CERI) (Hylén, 2005).

Open educational content development is premised on the idea that the principles of the open source and free software movements can be productively applied to content (Downes, 2001; Daniel and West, 2006; Daniel, West, D’Antoni, and Uvalic-Trumbic, 2006). Most open educational content projects release the products of work completed using a Creative Commons license, which allows authors to retain certain rights while granting other rights to users (particularly the right to make copies of content produced). Additional information on Creative Commons licenses can be found at the following site: http://creativecommons.org/about/licenses/index_html. In this way, the open educational content movement poses a serious threat to many vested interests in educational content development, whose livelihood is based on protecting copyright. This was succinctly summed up by Downes (2001, p. 31) as follows:

“There is very much a tension, between those who create the knowledge, and who jealously guard their monopoly over its propagation and distribution, and those who must consume that knowledge to get a job, to build a life, to partake fully in society”.

The OER movement is still in its embryonic stages, but is starting to provide a compelling case for different economic models of educational content development. This is particularly relevant for developing countries where access to quality learning materials is often poor. For example, Beshears (2005) has provided a well-argued economic case for creative commons textbooks. Zalta (2005) presented “a new funding model for sustainable open access to scholarly and educational content”. However,

economic viability and sustainability of OERs has been and continues to be questioned (Unwin, 2006; Nurmi and Jaakkola, 2005). Unwin (2006, p. 1) asks:

“How can good quality OER be funded sustainably? Can we always rely on government funding, enlightened civil society donations, or the ‘spare time’ of well-intentioned developers who can earn sufficient income from other sources to subsidize their free and open resource development? High quality multimedia games and learning resources are expensive to produce. Will OER ever have sufficient funding to ensure continuing excellence of product?”

Downes (2006) reviews nine current funding models of OER and concludes that OERs can indeed be sustainable, but need to be seen as:

“part of a larger picture, one that includes volunteers and incentives, community and partnerships, co-production and sharing, distributed management and control” (Downes, 2006, p. 14).

This conclusion is based on an understanding of sustainability that is more than just financial. Downes (2006, citing Walker 2005) argues that:

“By sustainability we must mean “‘has long term viability for all concerned’ – meets provider objectives for scale, quality, production cost, margins and returns on investment”. This is significant: for after all, if the *consumer* of the resource obtains the resource for free, then the provision of the resource must be sustainable (whatever that means) from a *provider* perspective, no matter what the benefit to the consumer”.

Assuming, along with the various authors cited above, that sustainable models can be maintained, the concept of OERs holds particular value in resource-poor developing contexts, with African education systems poised to benefit significantly if it is applied appropriately. For example, well-developed and maintained portals have the potential to provide access to wealth of educational content. Key to successful implementation, however, are the following:

1. *Development of OERs needs to be closely aligned to institutional accreditation, recognition and reward processes from the outset.* A major problem with initial development of OERs is that institutional delivery partners had not been identified and their commitment to use the OERs secured during project design. This means that content is developed without any clear sense of who will use it and how. Much OER development has tended to be supply- rather than demand-driven (Cushman, 2002). For this reason, it is critical that institutional partners who are committed to using completed OERs in their programmes are part of all OER development projects. A related challenge is the need to ensure appropriate recognition and reward of researchers and educators who support the development of OERs (Geser, 2007).

(a) *OER investments need to be significant enough and sufficiently well planned to ensure high quality products.* A key challenge with OERs is to ensure that the resulting products are educationally effective and of a high standard (Atkins, Brown, and Hammond, 2007). Unfortunately, a high percentage of currently available OERs are of quite poor quality, particularly in terms of their underlying educational design. Part of the problem in this regard is also that materials are often not produced by people who understand the context in which their use is intended or that the involvement of institutional partners is expected to be funded by the institution.

(b) *Investment in OERs should be used as an opportunity to develop capacity to produce high quality programmes and materials.* Linked to the above set of issues is the reality that many OER projects intended to benefit Africa are driven from the developed world. Similarly, Geser (2007) notes that many current OER repositories regard teachers and learners as consumers rather than co-creators of educational resources. This has two obvious consequences. First, it means that materials are developed by people who do not have insight into the context and challenges of educational delivery. Second, it perpetuates the problem of Africans being conceived of as consumers of products created in the developed world (Johnstone, 2005). A key benefit of OER projects is not just the finished product, but also the opportunity that is created to develop capacity in educational materials development and the implications this process has for improving teaching and learning processes (Geser, 2007). Wiley (2005) stated:

“What is the future of open education? Where is it going? I think there is only one answer: localisation”.

If these critical issues are taken into account during development of OERs, then the concept has enormous potential to open and improve the quality of education in Africa and other developing regions, and to drive a process of establishing African educators as producers of high quality knowledge products rather than consumers of products produced elsewhere. In the context of K-12 education specifically, Hepburn (2004, p. 8) concludes:

“As educators learn about open source development models and re-consider some long held assumptions about how educational resources are produced, they can leverage open source processes to take control of meeting educational needs. In addition to producing substitutes for commercial resources, educators are likely to begin producing resources that are new and innovative. Education can quickly move towards the ideal of a commons and, perhaps more importantly, embrace the ideal of fostering a true innovative commons”.

OERs and Open Learning

We defined open learning as a principle-driven approach to education which seeks to remove all unnecessary barriers to learning, while aiming to provide learners with a reasonable chance of success in an education and training system centred on their

specific needs and located in multiple arenas of learning, distance and face-to-face. When used in contextually embedded education processes, OERs become a valuable tool in the achievement of open learning principles. This is not to say that OERs always support open learning, indeed the danger of such simplistic assumptions has been emphasized in the preceding sections. Rather, the OER movement is one pillar on which open learning can be built and becomes a useful means of conceptualizing the relationship between technology and open learning.

The sharing of investment costs and reusability of OERs have a great potential to support the open learning principles of flexibility and removal of barriers to access. The sharing of learning objects and their re-deployment, with relevant localization, across educational contexts can become a key element in the provision of more flexible education options. The concepts of learning objects and OERs can both support learner-centred education where learners have access to a wealth of relevant educational content from which to select and can contribute to the creation and development of resources. Finally, cost-effectiveness (as opposed to cost-efficiency) is a key driver of both the OER and open learning paradigms, hence OERs have much potential to support cost-effective open learning.

OERs in Action: A Practical Example from the K-12 Sector

While many OER efforts have targeted tertiary education, the following example has been selected to demonstrate the potential of OERs in the K-12 sector. The authors have been involved in the development of this resource in South Africa. As noted above, the development of OERs is still in its infancy and hence much further investment and development in this area is required for the many potential benefits to open learning to be realized. None the less, the example presented below demonstrates the value that technology can contribute to supporting and furthering the development of open learning.

South African National Educational Portal: Thutong (www.thutong.org.za)

A project of the South African Department of Education, Thutong is the national education portal and aims to be the starting point for South African schooling communities seeking educational information. Thutong was officially launched on 24th January 2005. The portal exists to provide access to a wide range of curriculum and support material. It provides access to a vast and ever-increasing range of quality curriculum and learner support materials, as well as educator professional development resources, administration and management resources and tools, education policy documents, and general news and information related to the latest developments in South African education. The content is highly relevant to the lives and learning contexts of South African learners, educators, education managers/administrators and parents, and has been strictly quality assured by experts in the education field. Over time – and with users' active participation and input – the

portal resources will continue to expand and become even more representative of users' interests and needs.

The Thutong portal represents a first sustained opportunity to pull together the online educational experience for South African educational communities. The portal is a not-for-profit project. Its extensive resources are made available free to its registered users, with particular priority given to the needs of those from previously disadvantaged schools and rural areas who often have limited access to learning resources. At the time of writing, a total of 27,791 registered users were benefiting from the resources provided. By requiring portal users to register, the Thutong portal is assured of delivering users a customized portal experience, tailored to suit user-defined needs and preferences. Of these users, 60% are teachers, 13% are learners and 13% are parents. The remaining users are community members, researchers, school administrators, school managers, and employees of the Department of Education. Registered users represent all nine provinces of South Africa. Teachers and learners represent all grades of the K-12 system, with the greatest proportion being in or teaching grades six to twelve.

At present, Thutong provides access to 21,183 education-related resources searchable by keyword, topic or by learning outcome. As far as possible, resources in all South African languages are made available. Users are able to contribute to the portal by adding resources and by taking part in various discussion lists. The development of Thutong is an ongoing process and includes expanding the resources available, enhancing functionality, and research to better understand issues of user requirements and portal usability.

Conclusion

While there have been many attempts to introduce distance education to schools, most notably the establishment of Open Schools, these approaches have been limited because they tend not to challenge the problematic mainstream systems which necessitated the introduction of these new models. In this chapter it was argued that the concept of open learning is central in understanding how mainstream education systems might be challenged and transformed. The role of technology in supporting open learning, rather than traditional distance education only, was considered, with particular attention paid to the emerging field of learning objects and open education resources, which hold much potential for supporting open learning in both developing and developed country education systems. This potential notwithstanding, many challenges remain and time will tell whether open education resources will live up to their promise. Future research and action needs to document and test out different sustainability models for OERs and most importantly should focus on understanding how OERs are used in practice, particularly in developing countries, with a view towards using this understanding as a basis for challenging mainstream education systems that do not currently deliver the type and quality of education demanded in the twenty-first century.

In conclusion, it is useful to remember the following:

“We must view the vast body of open educational resources as ‘content infrastructure’...instead of thinking about Open Educational Resources as being the educational opportunity we are trying to share with people (the end of our work), we should think about them as the basic resources necessary for doing our job (a means to the end of our work). A vast collection of Open Educational Resources is, of course, the first milestone in our work, not the end of our work” (Wiley, 2005, cited by Albright, 2005, p. 4).

and

“As reflective practitioners we never allow our work to become a matter of routine. We remain alive to new issues, new theories, new knowledge, new technologies, new controversies that touch upon our field. We expect to go on learning and developing new approaches of our own as long as we practice” (Rowntree, 1992, p. 2).

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