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A Kenyan Cloud School. Massive Open Online & Ongoing Courses for Blended and Lifelong Learning

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Abstract

This research describes the predicted outcomes of a Kenyan Cloud School (KCS), which is a MOOC that contains all courses taught at the secondary school level in Kenya. This MOOC will consist of online, ongoing subjects in both English and Kiswahili. The KCS subjects offer self-testing and peer assessment to maximize scalability, and digital badges to show progress and completion to recognize and validate non-formal learning. The KCS uses the Moodle LMS with responsive web design to increase ubiquitous access from any device. Access is free and open, and the KCS intends to be a contextualized open educational resource for formal secondary institutions to support blended learning and a free source of non-formal education for lifelong learning. The expected outcomes are that this effort will reduce secondary school dropout rates, improve test scores, become a quality resource for blended learning, as well as validate and recognize lifelong learning in Kenya.

Keywords: Blended Learning; Digital Badges; ICT4E; Lifelong Learning; MOOC; OER

Introduction

Kenya, as many countries in sub-Saharan Africa, is extremely poor. 76 % of the population is rural, life expectancy is 56 years of age, and a remarkable 67 % live under the poverty line, which means that 2/3 of the population has an income of less than $2/day (World Bank, 2013). Primary school in Kenya is free since 2003, however, the reality is that formal schooling at the secondary and tertiary level is a pipe dream for many due to prohibitive fees. Kenya has a population of approximately 40 million habitants. The poorest quintile goes to school on average for 6 years, and the richest quintile goes to school on average for 8 years (World Bank, 2013).

However, access to the Internet and Internet connected devices is still rather limited but growing at an encouraging rate. Mobile devices are commonplace in developing countries and ubiquitous in Kenya. Kenya has around 29 million mobile subscribers, and mobile penetration is around 75% (Communications Commission of Kenya, 2012). Internet access in Kenya is around 27%, 15% access the Internet via smartphones, and the usage of mobile devices and the Internet is increasing (Kenya ICT Board, 2011).

Therefore, the combination of widespread poverty, school fees for secondary schooling, and fees for uniforms and learning materials contributes to high dropout rates. These issues create a need for some form of ICT solution to alleviate access to quality knowledge for anyone in Kenya. At the same time, a burgeoning infrastructure of desktop and mobile devices with Internet access is gradually increasing, so that the possibility to reach and utilize a web-based educational solution becomes feasible. This research intends to explore the feasibility and potential of using a Massive Open Online Course (MOOC) to reduce dropout rates and provide access to high quality knowledge in a Kenyan context for free.

Furthermore, existing research in the areas of Open Educational Resources (OER), MOOCs, and learning (blended learning, non-formal learning and MLearning) in developing countries typically

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focuses on higher education and/or teacher education. Examples of research efforts in higher education and teacher education for OERs in Africa can be found for example in Ngugi (2011), Sapire and Reed (2011), Murphy and Wolfenden (2013), Thakrar, Wolfenden and Zinn (2009), Wolfenden, Buckler and Keraro (2010), and studies regarding the OpenLearn Initiative such as McAndrew *et al*. (2009), Mwanza-Simwami, McAndrew and Madiba (2008), and Wolfenden (2008). Thus, there seems to exist a general lack of research that specifically addresses secondary schools in developing countries that use MOOCs or OERs. This research effort intends to even address this lack of research.

Related concepts and research

MOOCs and OERs

In 2008 Dave Cormier created the term MOOC (Massive Online Open Course) when analyzing a course offered through the University of Manitoba in Canada entitled Connectivism and Connective Knowledge (Mackness, Mak Sui Fai & Williams, 2010; Weller & Anderson, 2013). This course had 24 participants enrolled for credit and more than 2000 informal participants. Since this meager start, 2012 was recently crowned "The Year of the MOOC", and a MOOC is now more loosely defined as a free, non-credit, massive course (Pappano, 2012). Despite MOOCs being a direct open and free competitor to traditional online courses that charge a tuition and provide credit, many traditional institutions have created MOOC platforms such as edX from Harvard and MIT (Pappano, 2012). There are now even private portals that aggregate various MOOC offerings under one umbrella such as Coursera and Udacity, and Coursera is growing faster than Facebook (Pappano, 2012). The growth and popularity of MOOCs is enormous, and they are highly disruptive for higher education (Weller & Anderson, 2013). Shirky (2012) states that MOOCs will be equally disruptive to higher education as the MP3 music file format was to the music industry by asserting "Higher education is now being disrupted; our MP3 is the massive open online course (or MOOC), and our Napster is Udacity, the education startup." (p. 1). Shirky (2012) even elaborates regarding how this technology will be disruptive stating "MOOCs expand the audience for education to people ill-served or completely shut out from the current system" (p. 1).

However, everything is not perfect with MOOCs and key issues are assessment and recognition, validation, and accreditation (RVA). Regarding RVA, the use of certificates of accomplishment and digital badges are two of the most common ways for participants to show that they have completed a course or obtained a specific skill. Accreditation is a challenge for MOOCs, especially regarding how MOOC credit fits into the higher education landscape (Pappano, 2012). Weller and Anderson (2013) address this issue stating

> More difficult are the broader issues such as ensuring a good student experience when there is no tutor present and implementing methods of informal assessment (such as Mozilla badges) and how these relate to official accreditation raise issues for a large scale institution with a global brand. (p. 58)

xMOOCs, cMOOCs and quasi-MOOCs

MOOCs have evolved overtime into three different variations: xMOOCs, cMOOCs, and quasi-MOOCs. Traditional learning institutions typically use an xMOOC, where the teacher is the expert and the learner is the consumer. These MOOCs primarily consist of little external materials, and mirror traditional learning by using video lectures and quizzes (McGreal, Kinuthia, Marshall & McNamara, 2013). A cMOOC is based on a connectivist pedagogical model. These MOOCs are largely open and decentralized with limited structure, and learners are autonomous and view

knowledge as generative with a focus on sharing and connecting with other participants through blogs, forums, and an LMS (McGreal *et al*., 2013). A quasi-MOOC provides web-based materials as OER. This MOOC type intends to support specific learning tasks and provides little or no social interaction or grading, and a representative example is Khan Academy (McGreal *et al*., 2013).

Open educational resources

According to UNESCO, the term open educational resources (OER) was coined in 2002 at the UNESCO-hosted Forum on the Impact of Open Courseware for Higher Education in Developing Countries (Johnstone, 2005). OERs are simply defined as any educational resources that are "openly available for use by educators and students, without an accompanying need to pay royalties or license fees" (Butcher, 2011, p. 5). OERs and Open Course Ware (OCW) are very similar, but OCW typically refers to high quality digital publications for higher education materials. A representative example is the Open Course Ware initiative from MIT (Butcher, 2011). For this research, OER falls within these definitions in that the course contents will be entirely free as well as digitized educational resources.

Validation and recognition with digital badges

The key aspects to be addressed for formalizing non-formal learning are recognition, validation, and accreditation (RVA). As Singh (2012) defines

> Recognition, validation, and accreditation (RVA) of all forms of learning outcomes is a practice that makes visible and values the full range of competences (knowledge, skills and attitudes) that individuals have obtained in various contexts, and through various means in different phases of their lives. (2012, p. 8)

Furthermore, Singh (2012) states "the RVA of non-formal and informal learning is a key lever in making lifelong learning a reality" (p. 3). Singh (2012) defines these three concepts accordingly:

- Recognition is a process of granting official status to learning outcomes and/or competences, which can lead to the acknowledgement of their value in society.
- Validation is the confirmation by an approved body that learning outcomes or competences acquired by an individual have been assessed against reference points or standards through pre-defined assessment methodologies.
- Accreditation is a process by which an approved body, on the basis of assessment of learning outcomes and/or competences according to different purposes and methods, awards qualifications (certificates, diplomas or titles), or grants equivalences, credit units or exemptions, or issues documents such as portfolios of competences.

Validation of non-formal and informal learning is becoming a key aspect to lifelong learning, and the "purpose is to make visible the entire scope of knowledge and experience held by an individual, irrespective of the context where the learning originally took place" (Colardyn & Bjornavold, 2004, p. 69). Validation is a vital ingredient to ensure visibility and to indicate the appropriate value of the learning that took place (Colardyn & Bjornavold, 2004). Validation of non-formal and informal learning is often connected to formal education by providing a certificate or diploma, and it links the assessment of any form of learning to the validation proposed in formal education systems (Colardyn & Bjornavold, 2004). Furthermore, Werquin (2012) even defines the concept of recognition of non-formal and informal learning outcomes (RNFILO) as a promising approach and that "the growing focus on learning outcomes and on non-formal and informal learning is a strong incentive for non-education actors and stakeholders to become involved in the definition of standards."

(p. 270). Additionally, according to Mazoué (2012) "because of the wikification of knowledge, however, the notion that only certain forms of officially sanctioned learning count is no longer accepted as a given" (p. 83), and colleges and universities must accept competition from badge systems for accreditation. Moreover, Abramovich *et al*. (2013) found that participatory badges increase motivation and that different types of badges can affect learning performance.

A digital badge system is a nascent technology that intends to recognize, validate, and in some cases even accreditize non-formal learning and achieve the aforementioned concepts of RVA. One of the first and largest actors in this area is Mozilla with its Open Badges system (Surman, 2011). Digital badges allow badge owners to digitally show and publicize online an achieved knowledge or skill. As Carey (2012) mentions "the MacArthur foundation says it's a validated indicator of accomplishment, skill, quality or interest" (p. 1). A digital badge system is more than just a simple list of merits like a CV or transcript. It is a way for students to build and display their own education using digital badges as the building blocks. Once again Carey (2012) reinforces this idea by stating that "Students won't just earn badges—they'll build them, in an act of continuous learning" (p. 1). Open badge systems and digital badge systems are legitimate competitors to traditional accreditation systems such as secondary and tertiary educational institutions and quite possibly threats to their dominance. "The biggest push for badges is coming from industry and education reformers, rather than from traditional educational institutions" (Young, 2012, p. 49). However, Matkin (2012) states that "the real proof of the badge concept will come with employer recognition." (p. 10). Furthermore, large actors in the MOOC sphere such as Khan Academy and edX are using or intend to implement various implementations of digital badges (Young, 2012). Additionally, as of May 2013, Mozilla's Open Badge system will be integrated into the Moodle LMS system. Lastly, a potential drawback inherent in online learning environments is dishonesty, i.e. matters dealing with verifying the identity of a learner and ownership of work. However, Gikandi *et al*. (2011) state that dishonesty can be minimized by enhancing the validity and reliability of assessment methods.

Technical platform

Responsive web design is the concept of using CSS (Cascading Style Sheets), which is a style sheet language for describing the presentation of web pages, along with media queries, to determine the resolution of the device being used and adjust the delivery and presentation of the website content accordingly (Marcotte, 2010). What responsive web design basically implies is that the use of device specific apps or web applications becomes unnecessary because the content is simply manipulated according to the CSS3 directives provided in order to adapt the content for the screen size of each device. Furthermore, responsive web design even expands/shrinks the content to use available space when a web browser window is resized.

The technical platform to be used for the design, implementation, and delivery of the Kenya Cloud School is Moodle 2.5 in combination with the bootstrap theme. Moodle 2.5 is an open, free, and feature rich Learning Management System (LMS). The bootstrap theme (based on Twitter's bootstrap styling framework) is now standard in Moodle 2.5. This theme implements the aforementioned responsive web design to deliver content in a responsive manner, so that any type of device can optimally access, view, and use content. The Moodle 2.5 platform also provides all the necessary features to allow interaction, collaboration, and use of multimedia from any type of device. Finally, the Moodle 2.5 platform even has native support for Mozilla's Open Badge system so that the creation, implementation, and delivery of digital badges for participants' progress and achievement in the content can readily be realized.

MLearning

There are a variety of definitions for mLearning, but the definition used for the purposes of this research is "miniature but portable e-learning." This phrase implies that mobile, wireless, and handheld technologies are used as additional devices to access conventional e-learning, i.e. mobile technologies are adaptable substitutions for desktop technologies (John Traxler, 2007). Kukulska-Hulme (2007) also states that mobile learning activity continues to take place on devices not specifically intended for educational use, and this fact supports the need to allow and create seamless access to educational resources regardless of device. Using the definitions of mobile learning provided by Traxler (2007), this research effort is a mix of technology-driven mobile learning and remote/rural development mobile learning because this effort tests MOOCs and responsive web design in a developing country. Traxler and Leach (2006) found with the DEEP project regarding mobile learning in South Africa and Kenya that the potential for mobile devices was regarded as very high and portability was key. However, technical issues regarding mobile infrastructure, electricity, and device cost were noted, but these issues had diminished since this study was made.

Furthermore, Clough *et al*. (2009) concluded that mobile device users use their devices to support both intentional and unintentional informal learning, and that the portability and convenience of mobile devices means that they are always available to support spontaneous and planned learning activities. Unwin (2012) argues,

> However, with the rapid development of mobile broadband solutions, with the creation of even better handheld devices in the future, and with the realization that such technologies can indeed transform education, then learners will increasingly demand access to appropriate and sophisticated learning resources that they can access through their mobiles to use the Web in innovative ways, especially for those who remain outside traditional educational systems. (p. 130)

Finally, Park (2011) presents and explains the concept of the shift from m-learning to u-learning where the physical devices disappear, computation and communication are blurry, and learning is flexible and dynamic. Park (2011) even classifies educational applications with mobile technologies into four categories: (1) high transactional distance socialized m-learning, (2) high transactional distance individualized m-learning, (3) low transactional distance socialized m-learning, and (4) low transactional distance individualized m-learning. The Kenyan Cloud School effort falls into category four, as it most accurately supports blended or hybrid learning efforts.

Kenyan secondary school

Secondary education in Kenya consists of four years that are entitled Forms I, II, III and IV. In Forms I and II students are required to take 12 subjects, and the 10 obligatory core subjects are Mathematics, English, Kiswahili, Biology, Chemistry, Physics, Geography, History and Government, and Physical Education (Elimu Networks, 2013). The students then choose one subject from Christian Religious Education, Islamic Religious Education, and Hindu Religious Education, and two subjects from Business Studies, Agriculture, Home Science, Arabic, French, German, Music, Art and Design, and Computer Studies (Elimu Networks, 2013). In Forms III and IV students study a minimum of seven subjects and a maximum of nine subjects. Students must choose three core subjects (English, Kiswahili, and Mathematics) and at least two science subjects (Biology, Physics, and Chemistry) (Elimu Networks, 2013). The remaining two to four subjects can be chosen from the list of electives in Form I and II. Graduation from secondary school and the basis for entrance into higher education is the Kenya Certificate of Secondary Education (KCSE). An exam is taken for each core subject at the end of the final year (Form IV) and graded on a scale from A-E where C+ is a passing grade. Support materials, i.e. textbooks, for the curriculum in Kenya is developed by

approved publishers and evaluated and approved by the Kenyan Institute of Education. Each year a revised list of approved support materials is provided to all secondary schools.

Related research studies

Concerning similar research studies, a comparable study combining MOOCs and mobile access was made in 2011 entitled MobiMOOC, which was a six-week course about mLearning. It was a non-formal MOOC that provided a certificate of participation for memorably active participation (de Waard *et al*., 2012). De Waard et al. (2012) concluded that "mLearning and the MOOC format have a great potential for informal and lifelong learning. Both learning forms allow for knowledge creation to happen overtime without being tied to a particular space and contexts." (p. 44). Furthermore, de Waard (2012) called for further research in the two areas of mLearning and MOOCs, specifically calling for "more representation from developing nations" to "add depth to the dialogue" (p. 44). Additionally, de Waard *et al*. (2011) state that "more research should be undertaken into the realities, benefits, and challenges of MOOCs and mLearning in order to map all of their contributing dynamics" (p. 112).

Despite the fact that the majority of the research efforts regarding OERs in Africa focuses on teacher education and/or higher education, there exist some results and findings from various studies that provide guidelines and insights for MOOCs and secondary education that are the focus of this research project. The flexibility and literally unlimited possibilities of OER imply a potential to be an important part of the e-learning landscape (Kozinska *et al*., 2010). Additionally, "there is immense potential and promise in OER to operate in combination with the promotion of digital and online access in addressing major social problems" (Kozinska *et al*., 2010, p. 41). Liyanagunawardena (2013) analyzes and discusses the viability of MOOCs in developing countries and concludes that access to digital technologies and a general lack of literacy in computers and English along with cultural aspects are key hindrances for using MOOCs. However, this study focuses on existing general MOOCs available from developed countries and not on MOOCs from developing countries given in the local language. Sapire and Reed (2011) conclude in their study of using a collaboratively developed OER for mathematics teacher education that "expert led collaborative materials design, drawing on the subject and pedagogical knowledge and existing materials developed at institutional sites, has potential for achieving quality, cost-effective, and multiple-use resources" (p. 209). Ngimwa and Wilson (2012) also find that the benefits of OERs in Sub-Saharan Africa were better teaching and learning outcomes, improved learners' performance, and access to quality and cheap learning resources. They also find that the obstacles for OER adoption in Sub-Saharan Africa are socio-cultural and economic issues, academic pride, lack of awareness, negative attitudes towards OERs as a foreign initiative, lack of time/unwillingness to find time to participate, fear of loss of extra income, technology-related costs, and unsupportive institutional and national policies. Finally, "OER is of particular relevance for developing countries as OER combined with open, flexible and distance learning can contribute to easier and better access to education" (Mulder, 2008, p. 2).

Blended learning, non-formal learning, and lifelong learning are also frequent topics in related research. Olcott, Jr. (2013) summarizes and discusses the use of OERs for non-formal education, and presents emerging issues for research such as how OER can be expanded for non-formal education in developing countries. Wilson (2008) states that OER in developing countries fits in with the curriculum as a form of supplemental material. Further research that shows the potential and value of OER and education for blended and lifelong learning are examples in India of online school textbooks such as the National Council of Educational Research and Training (NCERT) and

eGyanKosh of IGNOU. These resources are widely used by curricula designers and used for various purposes by lifelong learner communities (Das, 2011). Finally, Mulder (2008) states that

> Lifelong Learning does not receive much attention. The natural bridging between informal, non-formal and formal learning by OER and the paramount opportunities this offers to widening and increasing participation in Higher Education, however, make OER probably a most powerful instrument in the area of Lifelong Learning (LLL). (p. 9)

Also, the need to explore validation and recognition of learning can be seen by the general trend in the developing world to use OER to meet the demand for qualifications at all levels, secondary and tertiary. OERs are seen as a route to earning credentials and adding value to existing educational efforts (Umar, Kodhandarama & Kanwar, 2013).

Other studies promote the importance of personalized and localized content. A comparable study by Petrides and Jimes (2008) reviewed the Free High School Science Texts (FHSST) project that was a South African-based OER project created by graduate students to address the lack of science and math secondary school textbooks. The FHSST project was a collaborative effort to create content from the ground up. Applicable results from this study to the Kenyan Cloud School effort are that measures must be taken to ensure that the content of textbooks adheres to existing national curriculum guidelines and that content is localized and fulfills local teaching and learner needs.

> In the LLL perspective, freely available content on the Internet should empower learners to really study on their own in an open and flexible learning environment, with no (avoidable) references to a teacher, a classroom or an educational institution. This requires structural and explicit learner-centered content design instead of the conventional teacher-centered content approach (Mulder, 2008, p. 9).

Methodology

Wang and Hannafin (2005) compare and describe a variety of terminology dealing with design research such as design-based research (Designed-based Research Collective, 2003), design experiments (Collins, 1992, 1999), design research (Edelson, 2002), and developmental research (J. van den Akker, 1999). Wang and Hannafin (2005) define design research as “a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories” (p. 6). This definition appropriately describes the intended approach to the Kenyan Cloud School research initiative because this effort takes place in a real-world setting and includes the three stages of design, development, and implementation. Furthermore the process is iterative and will be adjusted over time based on performance. Additionally, Akker, Gravemeijer, McKenney and Nieveen (2006) describe educational design research as the systematic study of designing, developing, and evaluating educational efforts as solutions to address complex problems in educational practice. Their definition further supports the use of design research because this effort takes place in the educational space.

The design and development segments of this design research effort consist of digitizing the curriculum material for Forms I-IV and making them available on the aforementioned course platform. Researchers from developed Western countries and Kenya will reproduce the content for each subject for Forms I-IV according to the most recently approved curriculum material. In addition to this reproduction of existing content, researchers will add video lectures, quizzes, and other supplementary material as deemed appropriate for each topic and subtopic to enhance the value of the existing content as well as take advantage of the capabilities of the learning management

platform. Finally, the design segment will include forums and/or blogs to promote and encourage interaction and collaboration among learners as well as the design and implementation of digital badges for each topic and subtopic to support recognition and validation.

Results

The Kenyan Cloud School is a current work in progress and the first iterations of subjects in Form I and II are scheduled for completion in the late fall of 2013. The Moodle platform is already deployed and a test course in Human Rights entitled Haki Zangu (hakizangu.org) that was part of a separate research project successfully used the platform in the spring of 2013 without encountering any significant technical issues regarding badges or mobile devices. The Kenyan Cloud School will have the following key characteristics based on the aforementioned related concepts and research:

1. Contextualization
    a. Provide each subject in English and Kiswahili
    b. Strictly adhere to the existing approved secondary curriculum in Kenya
2. Learning
    a. Combine learning aspects from the different MOOC types (xMOOCs, cMOOCs, quasi-MOOCs) such as structured lectures, interaction, and open resources
    b. Provide the ability to be used as a formal, blended, or non-formal (lifelong learning) learning resource
    c. Provide validation and recognition of learning with digital badges
    d. Provide a learning environment that supports collaboration, interaction, and socio-cultural learning
3. Recognition and validation
    a. Provide the ability for participants to show progress and achievement in each subject by earning digital badges
4. MLearning
    a. Ensure that the content is easily accessible and useful regardless of computing device type to promote ubiquitous access.
5. Usage
    a. Free, unlimited access for any Kenyan citizen
    b. Support use as a resource for formal secondary education institutions
    c. Support use as a resource for lifelong learning

The expected results are that the Kenyan Cloud School will be a mixture of the different MOOC types where the primary type is a quasi-MOOC, but traits from both xMOOCs and cMOOCs will be implemented in order to enhance the learning value. The Kenyan Cloud School will use: a) video lectures, self-tests, and quizzes from xMOOCs, b) interaction and collaboration such as forums and peer assessment from cMOOCs, and c) OER aspects from quasi-MOOCs. The goal is to not only duplicate the existing content in the official textbooks, but even enhance the content and hopefully create a community around the Kenyan Cloud School, so that both learners and instructors can use, update, and maintain the content to support formal learning, blended learning, as well as non-formal learning (lifelong learning). This MOOC version is envisioned as a Massive Open Online **Ongoing** Course (MOOOC) in that it is perpetual and has no planned termination date.

The key expected result is to show that the Kenyan Cloud School implemented as a MOOC with digital badges is a viable and cost effective means to address both the practical social issues of poor graduation rates and costly, printed textbooks, as well as the research issues of successfully utilizing OERs in developing countries to achieve lifelong learning.

Discussion

The possible benefits and drawbacks of a proposed solution such as the Kenyan Cloud School are numerous. For the past 10 years researchers have debated the success and failures of OER efforts in developing countries with a common theme that OERs, and nowadays versions of MOOCs, are the panacea to educational needs in developing countries. Nevertheless, the use and effects of OERs have not yet achieved their potential. One discussable aspect is the fact that a MOOC is intended only for courses, while this research intends to digitize textbooks. The word course is simply part of the acronym, but the intention of this research is to use aspects from formal courses in combination with the content from the Kenyan curriculum textbooks as outlined in the results. Hopefully, this merging of MOOC types and OER concepts can provide a sustainable and beneficial solution that can both supplement formal institutions and address graduation rates and social issues in Kenya, while at the same time successfully prosper as standalone courses to provide an avenue for lifelong learning. The importance of blended and lifelong learning has been presented in the aforementioned research. Using MLearning aspects to reach as many potential users as possible and access the growing smartphone/tablet segment of society, along with digital badges to provide learners with a means of showing the outside world that they have learned and achieved something is crucial to both the blended and lifelong learning aspects of this effort.

Key aspects that can increase the likelihood of success for this research effort is sustainability and scalability. Regarding sustainability, the creation of an active community of both learners and instructors is essential to long-term success (Petrides & Jimes, 2008). Also, the eventual involvement and policy support from the Kenyan government is desirable, and the importance of government support is deemed a necessity (Umar *et al.*, 2013). As Kanwar, Kodhandaraman and Umar (2010) point out "in order to promote the growth of the OER movement in education in developing countries, there is the need for greater support for the creation and use of OER by the national governments and the educational institutions themselves" (p. 77). Additionally, "Thinking of knowledge as a public good, indeed giving it for free, and the supposed responsibility of governments for access, quality and efficiency of HE (and education in general), would justify a 'good' debate on the funding role of governments" (Mulder, 2008, p. 9). Sustainability has two key aspects: 1) how to sustain the development and sharing of the OER; and 2) how to continue utilization by the target groups (Kanwar *et al.*, 2010). The inclusion of native experts and expert participants in the creation and maintenance of the course subjects addresses sustainability. It is vital that the Kenyan Cloud School creates a community of experts and users to address the first point as well as involve and gain official support of the Kenyan Institute of Education, which develops and approves the secondary curriculum. The second aspect of maintaining utilization by target groups can be obtained, if the effort becomes successful and shows positive results on graduation rates and test scores. Most likely, aspects of community and government support will eventually be crucial in determining the sustainability and long-term success of the Kenyan Cloud School. Scalability is hopefully less of an issue. From a technical standpoint the Moodle system can handle tens of thousands of users.

A final key aspect is localization and contextualization of OER content. Kremer (2003) indicates that Kenyan textbooks seem to improve test scores, but are in English, which is the official language of instruction. However, this is the third language for most Kenyans after their native vernacular and Kiswahili. Examples using flip charts had greater results on test scores (Kremer, 2003). Additionally, Rivard (2013) points out a variety of cultural and contextual issues with MOOCs, and implies that one course and content do not fit all. The Kenyan Cloud School attempts to preempt these shortcomings by offering the secondary curriculum in English and Kiswahili as well as using native and Western experts to translate and develop content. However, further research will be needed once the platform is operational to evaluate the actual results.

Concluding remarks

Hopefully, the creation of a Kenyan Cloud School using the MOOC concept to offer secondary curriculum for free with the reward of digital badges for achievement has the potential to reach the lofty goals for OER set by UNESCO, and improve secondary school graduation rates and test scores in Kenya, while also adding to the existing research in this area. Moreover, potential successes from this project can hopefully inspire and guide similar efforts in other developing countries and regions to further explore the potential of educational efforts that utilize MOOCs, digital badges, and MLearning.

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