

Project Paper

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DEPM 625  
November 18, 2014

## INTRODUCTION

In 2013, a United Nations (UN) System Task Team established “A Renewed Global Partnership for Development” Agenda. It stated that improving education in all countries is a shared responsibility. This is necessary to significantly improve education in developing countries. The initiative contended that, “To do so effectively, it should build on the strengths of the current global partnerships for development while going beyond its present framework. Most importantly, it will have to be based on a strong commitment to engage in collective actions with a clear distribution of tasks between developed and developing countries.” (United Nations Task Team, 2013, p. v) In addition, the Agenda argues that it is important to consider present conditions to improve access to information and communication technologies (ICT) in order to improve education for all learners, including special needs populations. Specific planning must be established and then executed in order to advance the current state of education in African nations, which is critical to target the UN agenda goals. The research in this paper addresses the question: How are assistive technologies improving access in developing countries for students with disabilities? This is an important topic because boosting the status of education will help reduce poverty and enhance overall living conditions. Due to the lack of resources in these areas, open and distance learning (ODL) improves opportunities for students by opening doors to education that would otherwise not be available.

## METHODOLOGY OUTLINE

Access means to acquire something. Dictionary.com defines accessibility as the ability for an individual to attain, or access something. All students should have equal opportunities to learn. Assistive technologies (AT) are adaptive hardware and/or software that provide access for students with disabilities that would otherwise be unavailable. There are diverse learners all over the world, so it is critical for systems to be developed that enable equal access for all students, regardless of special needs. This pertains to cognitive, behavioral, and emotional disabilities, and physical disabilities. This paper analyzes ATs that are specific to learning. There are very few scholarly articles that provide evidence for use of assistive technologies in Africa. However, there have been a few examples of ODL systems existing throughout the continent in countries such as in Zambia, Zimbabwe, South Africa,

Tanzania, and Ghana (Kinyanjui, 1998). The contents in this paper are all specific to improving the opportunities for students with special needs through ODL. Data for this paper was gathered through a search and evaluate process of current scholarly articles and credible websites. All references are relevant and provide examples of how AT can improve accessibility for students with special needs in Africa.

## REVIEW OF LITERATURE

In 1990, UNESCO held a regional distance education seminar with representatives from all leading distance education institutions, major funding agencies, and other international organizations. A common concern was in the area of improving education and training at all levels. Kinyanjui (1998) stated, "It was evident during the seminar that distance education has an important role to play in providing greater access to education, and thus in helping to overcome problems of equity, particularly with regard to disadvantaged groups" (p. ...). Throughout his paper, he discussed what has and has not worked in distance education; then made suggestions on how Africa can follow the global trends in ODL systems. His strategies included: mobilizing resources, designing management procedures, improving administrative operations, establishing frameworks, applying research strategies, creating partnerships, and building political support.

Mishra and Bartram (2002) wrote a book about the need for citizens of struggling nations to gain skills through ODL in order to improve conditions. "The access to knowledge and skills to all people regardless of gender, age, race or location is enormously important" (p. xi.). Their focus was on the benefits and delivery options of technical and vocational education and training (VTET) systems. Past results showed successes through a variety of delivery means. These learning objectives must be repackaged for the transition to ODL from the past modes including: telephone, video conferencing, workplace learning, audio conferencing, print, video, audio tapes, fax, face-to-face, and online delivery.

In 1993 leaders of nine highly populated developing countries got together to create educational goals for their nations to improve education for all citizens. Creed and Perraton (2001) detailed these proceedings. First, the leaders provided an overview of the current conditions and detailed the purposes of ODL within their nations. Secondly, they reported on projects, achievements, and relevant

challenges. Finally, they concluded with the following recommendations about moving forward:

technologies must be updated to meet the educational demands, leaders must be persistent to develop political engagement, developments of large institutions must continue, teachers need continual and effective training to keep pace with changing methods of instruction.

In Samant, Matter and Harniss' (2013) article in the *Disability and Rehabilitation: Assistive Technology* journal, they focussed on raising awareness for policy makers, developers, and service providers about the expanding requirement of integrating accessible ICT in ODL systems in developing nations. They analyzed current findings from international reports and studies. Outlined in this paper are implications of the use of accessible ICT within these nations. They stated that providing many resources will improve access to AT and it's vital to improve coordination between governments, policy makers, and professional organizations. "Governments and policy makers can support the development of a strong and supportive ecosystem by working across ministries and departments to develop comprehensive accessible ICT policies and regulations, creating financial resources and schemes to aid the purchase and use of accessible ICTs, developing tax and other incentives to promote innovation and accessible design within industry providers, and developing and strengthening service delivery infrastructure, among other strategies" (p. 17). In addition, Samant et al. (2013) stated, "The effective diffusion and adoption of accessible ICTs will also depend on the appropriateness of the technology and how well it matches with the local culture and context. Providing accessible ICTs can become a development goal in itself and also support the realization of other development goals" (p. 17). Clearly, their findings reflect the necessity to promote collaboration between appropriate people and organizations to address the need to improve access for students with disabilities in developing countries.

Desideri et al. (2013) published a case study on essential components of an effective framework of matching AT to students with special needs. The main focus of this paper centers on assistive software that can be used within ODL environments to improve accessibility for students with special learning needs. The framework included these three elements: structure, process, and outcomes. The structure listed a collaboration between legislation, health systems, school systems, a financing

scheme, and concurrent interventions. Process included accessibility, competence, coordination, efficiency, flexibility, and considerations to user interface. Outcomes were broken down into 3 levels. Micro: effectiveness, individual factors, and quality of life. Meso: compliance and satisfaction. Macro: efficiency and satisfaction. Their model for assessment was in four phases. The first being pre-assessment, the second assessment, the third documentation, and the fourth post-assessment as they relate to aligning AT with students with disabilities. Desideri et al. concluded that their research was, “the first study reporting a model of AT assessment for children with multiple disabilities together with clear strategies and instruments for evaluating the effects of the AT intervention at any level of the service delivery process” (p. 165).

In his keynote presentation at the Symposium on Disability, Technology and Rehabilitation in Low and Middle-Income Countries, Khasnabis (2013) provided evidence supporting the use for assistive technologies needed by the one billion people with disabilities worldwide. Many of them can not get the appropriate and necessary assistive technologies. In his presentation, he declared, “Today, in low and middle-income countries only 5-15% of people in need can access assistive technologies.” Much of this presentation is focussed on rehabilitation technologies, but it’s extremely relevant because Khasnabis talked about necessary funding for assistive technologies and the lack of local resources.

Assistive technology in developing countries: a review from the perspective of the Convention on the Rights of Persons with Disabilities is a paper written by Borg, Lindström and Larsson (2011) that analyzed literature from 1995 or later and also carried out studies in low- and lower-middle-income countries. In their study about the current use of assistive technologies in schools in Bangladesh and Tanzania, they explained that effective uses of assistive technologies provide an improved education for children with disabilities in schools in developing countries. Most children with special needs worldwide don’t have access to a quality education. They noted, “Despite the importance and positive impact of assistive technologies, prior research on the use of assistive technologies in inclusive education especially in developing countries is limited.” (p. 5). Borg, Lindström, and Larsson found that the governments in both Bangladesh and Tanzania had regulations that support students with special

needs and concluded that there is some established legislation in place for the learning rights of students with disabilities, however, “national level coordination is lacking.” (p. 9).

Parraton and Creed (2000) conducted research projects together that support the need to make advancements in ODL. In their article on the application of cost-effective innovative technologies, they stated that although there is no equal alternative for face-to-face, technologies can meet needs for students who cannot access learning materials. Also, diverse technologies are needed to support various special needs. They studied and described their analysis of the effectiveness from a variety of appropriate and affordable technologies to learning systems. Data for their study was gathered in a variety of methods, which included information from: UN agencies, UNESCO Regional Technical Advisory Groups, scholarly literature and web-based publications, bilateral donor agencies, research and development think-tanks, professional educational experts and organizations, educational research project reports, and intergovernmental agencies. Studies like this help governments and institutions make practical choices.

In another article, Parraton and Creed (2001) assessed the condition of distance education achievements of goals set in 1993 by Education Ministers of nine highly populated developing countries. They stated that innovative programs can come from a variety of sources. A major initiative was to plan, initiate, and implement distance education utilizing information and communication technologies to improve the quality of education in their nations. The analysis resulted in the Education For All Students (EFA) program, which focussed on learners between the ages of 6 to 14. One of the target groups that was identified was students with disabilities. This report lists strategies that promote effective learning environments through specialized programs for student learning and teacher training.

Cawthera (2001) published research that focused on the finances associated with providing computers and access to secondary schools in developing countries. His analysis showed that it is best to plan for long-term use of the hardware to increase value and improve the likelihood of acquiring necessary components. The study was conducted through data collection from physical schools, satellite institutions, and training facilities. Statistics from several countries were evaluated. In another study, James (2002) reported on current state and potential options for integrating low-cost computers.

He analyzed publications from various studies. Two highlights stood out as possibilities for consideration. One was the MIT Media Lab development of \$100 laptops which took place over a decade ago and there have since been significant gains in affordable notebook computers. It was noted that individual devices are ideal when students are at great distances from one another. A second option is using virtualization devices through N-Computing. (p. 401) In this scenario, each user appears to be on their own machine, but in reality they are concurrently running an individual session. He concluded with the idea that sharing is not the most effective model and “things may change if the Indian \$35 laptop materializes.” (p.408)

In 2007, Sridhar and Sridhar conducted a study investigating the association between ICT and economic growth. They reviewed a variety of literature on this topic that showed that investments in infrastructure can favorably stimulate economic growth. This, in turn, creates jobs and there is a need for educational training to be initiated. They found that although the initial costs are high, the long-term effects outweigh these front-end investments.

## DISCUSSION

Having a disability is a life-long obstacle. People with special needs learn strategies to cope with and manage them. They utilize tools to help gain access that otherwise would be unavailable. There are questions about how can access be increased to boost achievement for students with special needs and what are proven strategies that can be implemented to improve access. One answer is through the use of AT which help students utilize their abilities to compensate for weaknesses in an effort to obtain access. ODL requires effective use of varieties of technologies and AT promote increased participation and engagement in learning. Adding specific assistive technologies can be the factor that determines a successful or failed outcome for students with special needs, but they are only as useful as the outcome they provide. Accessible ICTs open doors that might otherwise be closed for students with special needs. Samant, Matter and Harniss (2013) gave an example of this. “Accessible ICTs can be used to eliminate or mitigate barriers to socioeconomic participation for people with disabilities, thus reducing aforementioned disparities. Accessible ICTs become both a means of access to information and social participation, as well as tools to enhance functionality and active participation

in critical activities such as receiving an education“ (p. 13). The majority of examples of ODL in Africa are higher educational institutions and there is very little evidence of ODL at AT in place for elementary and secondary schools. Most are in urban areas in learning centers. Very little attention is given to students with disabilities and assistive technologies that would encourage effective learning for these populations.

The United Nations has set goals for global development, which includes improving access for all students. There is a serious need to address special needs in the least developed countries by improving access to ICT. The World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) has laid the groundwork for setting standards. Phipps and Kelly (2006) state, “The importance of accessibility to digital e-learning resources is widely acknowledged. The WAI has played a leading role in promoting the importance of accessibility and developing guidelines that can help when developing web and e-learning resources. While it is important to consider the technical aspects when designing and developing resources for students with disabilities, it is vital to consider pedagogic and contextual issues as well“ (p. 69). Technical, pedagogical, and contextual issues all have to be considered when designing and developing support for students with disabilities. Phipps and Kelly discuss a holistic framework for e-learning. The seven components to a holistic framework for e-learning are quality assurance, accessibility, usability, learner outcomes, infrastructure, local factors, and learner needs.

Regardless of abilities and special needs, all students have the right to equal opportunity to access learning information and materials. Many learners can obtain skills and knowledge through the mainstream approach, however some students struggle due to a myriad of disabilities. The UN’s goals to improve accessibility for students with special needs addresses this issue. Murray (2014) commented that every child deserves a quality education, but students with special needs are repeatedly left behind. She stated, “Often children drop out of school because they are not receiving the attention they deserve.” She also reported on a study conducted in 2010 by the Cambodian Ministry of Education, Youth and Sport that gathered data on students with disabilities who were absent from school. “If disabled kids do have access to education, often teachers lack the appropriate training necessary to accommodate the disability and this causes them to drop out of school more than any

other vulnerable group“ (Logan, 2014). If retention and program completion are goals for education in developing nations in Africa, then improving access must become a high priority. Careful considerations must be applied when developing ODL systems to ensure that all students have access to learning content. Regarding AT, adequate funding and relevant assessment are necessary to enable accessibility that match the goals of the learning experiences with the individual students. Desideri et al. (2013) describe this process as, “The achievement of appropriate outcomes for children and their families in the provision of assistive technology (AT) depends to a larger extent on the design of systems, models and practices which can serve both as a guide and as a means of evaluation” (p. 159).

AT are effective learning tools for students with disabilities that provide students of all ages learning opportunities. Peers reflected on the benefits of AT in their studies on how they can bridge the gap between gaining access and learning. Majette (2014) commented, “Often times, I access various audio/visual technologies and listen to various articles repeatedly when it becomes difficult for me to see. It most definitely makes realizing the potential of accessing the use of ICTs for distance learning purposes as real as it can get.”

There are many challenges for the integration of assistive technologies with ODL in Africa. Food, shelter, healthcare, and transportation are a few of the basic necessities not being met. They are in a state of desperation and do not have the resources to implement ODL and integrate AT, so there must be systems established. Additionally, securing the necessary finances for assistive technologies is a major challenge for developing countries in Africa. Furthermore, according to UNICEF, there are over 200 million children with disabilities in the world. (Borg, Lindström, & Larsson, 2011 p. 6) If 5-15% have access to the necessary assistive technologies, what is happening to the remaining 85-95% of children in need of a quality education? This is a serious concern.

In order to be effective, significant training is necessary for implementing assistive technologies. In their book, Mishra and Bartram (2002) discussed curriculum development and instructional design, identification of needs, student support, program delivery and evaluation, and quality assurance. The content used in their analysis is technical vocational education and training (TVET). The authors

explain why ODL is an effective process for skill development for all students and outline acquired skills. Learning goals are the same for all populations of learners. Therefore, it's best to understand what the expectations are in order to make modifications to address special needs through careful planning by professionals who have proper education, training, and support. Murray (2014) commented about the need for other relevant people to get adequate instruction and support also. She stated, "Parents, teachers, and school leaders would need adequate training. The training should include how the technology works to benefit the student, how to tell if the student is learning skills because of the technology and learning to how use the technology to assist the student."

Politics and leadership plays an integral role in promoting advancement of learning for all students, but there is a disconnect between policy and coordination. A positive thing is that many leaders understand the state of education in developing countries, acknowledge the need for improvement, and recognize the lack of AT currently in place. Similar to the UN, other organizations have set goals to improve these conditions, develop initiatives, and are striving to improve education in developing countries world-wide. For many years, the International Research Foundation for Open Learning studied ODL for the purpose of making changes. They identified many needs and made relevant recommendations, although they are no longer able to conduct research projects. Documented research initiates movement of change. There are studies that attest to the necessity of improving learning systems in developing nations. This is a positive element as we move forward to advance accessibility for all students in developing nations.

Hardware is costly and resources are limited in developing countries. Fortunately, there are a few reasonably priced options that can serve as integral pieces in forming effective ODL systems. First of all, any existing hardware can help launch projects to develop learning schemes. This includes computers and devices which are much easier to obtain, and adaptive equipment, which can be very expensive. N-Computing is definitely a viable option as a low-cost solution for telecenters, however, it is not an option in rural areas. Up to 100 users can simultaneously run these virtual desktops off of one PC running server software.

Software is less complicated to address. Open Educational Resources (OER) are a combination of low or no-cost curriculum, open source software, and virtual tools. There are so many free resources. Once network access is available, there are endless possibilities of free OER that can help with accessibility needs. Visual, auditory, motor, and cognitive options are easily attainable. For example, text-to-speech, magnification software, speech recognition, translators, interactive dictionaries, online study guides, mind mapping programs are examples. Also, there are a plethora of high quality free curricula and tutorials. Open source software has been available for quite a while, has world-wide support, and is not a strain on budgets. There is also open-source operating systems.

Administration, management, and funding of ODL systems have to be considered. Curricula must be developed based on learning objectives. Assistive technologies must be accessed, configured, implemented, and overseen. Hardware needs to be installed, configured, and managed to keep systems running. In addition, considerations must be made in areas such as storage, instruction, maintenance, connectivity, support, and other extraneous costs. (Cawthera, 2001). Partnerships are available to help finance improving ODL in developing countries and should be researched and encouraged.

Infrastructure, is most likely the biggest hurdle to face when planning on improving accessibility in developing nations. It is limited and requires a significant amount of funding, political support, and resources to implement. "According to the World Bank, the private sector invested \$230 billion in telecommunications infrastructure in the developing world between 1993 and 2003" (Sridhar & Sridhar, 2007, p. 38). This is an unsettling figure when considering the current conditions of ODL in developing countries. However, there are options for increasing network communications. Some of these technologies are possible systems. One approach is radio network access. This is lower cost than some other options, but limited in bandwidth and reliability. Open broadband access and satellite communication are more functional options, yet the design and development can take significant time and cost. Some countries in Africa, such as South Africa, already have ODL systems in working order. Most of these institutions are within the higher education sector.

A positive point is that justification for international support is growing due to research and documentation in the area of improving access in developing countries. Sridhar and Sridhar (2007, p. 37) point out, "The literature on general ICT infrastructure and its impact on growth are steadily growing. A number of researchers have hypothesized that ICT (including telecommunication) infrastructure lowers both the fixed costs of acquiring information and the variable costs of participating in markets." Beyond the need to build a framework for educational purposes, it is also beneficial for financial purposes, which is a driving force for corporations. They add, "As the ICT infrastructure improves, transaction costs reduce, and output increases for firms in various sectors of the economy" (p. 38). The international community is aware of financial benefits to getting involved in projects. The current state in developing countries must improve. There are some existing institutions and organizations in Africa that can be used at a launchpad for getting some of the most needy nations getting up-to-date with ODL. In addition, these resources can help provide ODL and assistive technologies to the vast remote areas throughout the continent.

## SUMMARY AND CONCLUSIONS

Developing countries are lacking food, healthcare, shelter, clothing, among other basic needs. It is no surprise that the students of these nations are also lacking quality education. Furthermore, students with disabilities do not have access to learning with assistive technologies. It is really a difficult decision about funding. Without basic needs, people don't survive. Without quality education, societies cannot advance and solve the problems previously stated. I am not surprised about the lack of accessibility in African countries, but I am surely much more aware. Seeing statistics of the amount of children who do not have access to a quality education is worrisome. When I established my research question, I was optimistic that I would find some examples of assistive technologies helping improve access for students with disabilities.

My research started with a specificity on assistive technologies used to improve accessibility for students with special needs in Africa. During my research, I found very few examples, and located much more information on the basic need of installing ODL systems within the continent. However, there are currently some positive initiatives that can help improve the situation of lack of accessibility.

The UN's Renewed Global Partnership for Development goals provides optimism to boost education through international collaboration. Surely, this will raise awareness and hopefully continue to gather the necessary resources to make this initiative a reality. The first step in making progress is designing and building the necessary infrastructure to provide access to the millions of potential learners in developing nations who are lacking access. The next is providing devices to be used for learning purposes. There is evidence that there has been some productive conferencing between leaders in several African nations about strategizing solutions to this problem. Governments and organizations must get on board to identify the specific needs, set realistic goals and timelines, and then begin the implementation process. History has shown that these nations do not have the capability to individually make their conditions better. Students with special needs are not getting the required support through ODL with assistive technologies. Awareness and collaboration are the first steps towards the solution.

OERs are a means of making ODL a real possibility. Once access is achieved, there are so many free and available courses, trainings, learning materials, communication tools, and also assistive technologies that provide opportunities to engage students with disabilities. The great thing about these are they all globally attainable through the internet. Also, collaboration between many diverse areas enables students in remote areas to experience quality education and provides opportunities to gain knowledge of the outside world.

In closing, there are goals and initiatives in place that shows promise for solving very important issues. However, there is only very little progress being made to provide students with disabilities in developing countries the assistive technologies they need for effective learning through ODL. On the bright side, there is significant research being done on the current state of education in these areas which raises awareness. Recommendations are being made for strategizing plans for innovative solutions. Advancement is essential and it is understood that this is a shared global responsibility. There are not many systems in place in developing countries that enable students with disabilities access to learning. The question remains: How can the challenges for improving access to ODL for students with disabilities through assistive technologies be met?



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