

The adoption of mobile-learning to support physically challenged learners with special educational needs: Case of Zimbabwe

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Abstract— Education is a key investment in any nation as it plays a crucial role to sustainable human, economic, social and technological development of that nation. The right to education for all has been a long standing commitment for Zimbabwe and as such the Zimbabwe Education Act stipulates that all children have the right to the provision of education without discrimination in compliance with the Millennium Development Goals (MDG). On the contrast the situation in Zimbabwe shows that many children with physical disabilities are still segregated as regards education for very few neither have access to basic education nor reach the highest levels of education. This study investigated ways through which mobile technologies can be used as learner support services for learners with special educational needs due to physical disabilities. In this paper, disabled learners with special education needs refer to learners with physical and hearing impairments. This paper is timely since there is significant growth in the use of mobile technologies for a variety of purposes the world over. We find mobile technologies handy due to their affordances evident in existing literature such as the capability to afford learners with both cognitive and affective support to promote learning.

Keywords — mobile-learning, mobile technologies, mobile devices, special education needs learners, learning Management Systems, e-learning

I. INTRODUCTION

Education remains a fundamental and universal human right and a pre-requisite for economic growth, human development and poverty reduction [8]. It is a key investment in any nation as it plays a crucial role to sustainable human, economic, social and technological development of that nation [5]. Since her independence from colonial rule in 1980, Zimbabwe has been advocating for basic education for all and this policy has led to the country's attainment of the highest literacy rate in Africa that fluctuates between 88% and 99% [9], [4]. This is an achievement attributed to the country's efforts towards primary education for all without any discrimination [5].

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As such, [1] asserts that all humans have the right to access learning materials and information to improve their quality of life regardless of where they live, their status, and their culture. There is a common trend amongst most nations to cater for what has been viewed as the disadvantaged in society, chief amongst these is the girl child [12]. There is also a group of individuals within our society who are usually disadvantaged, the physically challenged. These are usually termed special needs learners [13]. The special educational needs learners need not be an exception on the education for all campaign.

II. PROBLEM STATEMENT

There is an increasing trend in schools towards segregation instead of inclusion of learners with disabilities [2]. Learners with physical challenges are therefore deprived of access to basic education, a situation that has widened the academic gap between them and their able bodied counterparts. [13] Contend that 28 per cent of children with disabilities never attended school. It has been revealed in literature that of the 1.4 million persons with disability in Zimbabwe most of them have cannot access education from schools either near them or schools of their choice without impediments being put in their way making it difficult for them to achieve their educational goals [5]. The same author concludes that the continued existence of specialized or segregated schools for people with disability precludes the education for all inclusivity. On the contrary, a sizeable number of the physically challenged learners with access to education fail to reach the highest levels of education due to challenges such as discrimination, stigmatization, high school fees, poverty, and long distance to school, lack of skilled teachers etc and these lead to dropping out of school. This research therefore seeks to establish the possibility of mobile technologies in affording the physically challenged learners similar educational opportunities as their able bodied counterparts.

III. PROPOSED SOLUTION

The research was aimed at exploring the feasibility of the adoption of mobile technologies to support the learning of learners with special educational needs. The study sought to explore the ability of the mobile devices in the fulfillment of the education for all policy in accordance with the MDGs. There is need to investigate if access to formal education by physically challenged special educational needs learners could

be enhanced through the use of mobile devices such as tablets and smart phones, which were once for the few privileged elite are now readily available even to learners with physically disabilities. This is in accordance with [10] suggesting that rather than see smart phones as disruptive devices, educators should seek to exploit the potential of the technologies children own and find ways to put them into good use for the benefit of learning practice.

The research sought to investigate the possibility of expanding access to education to the physically challenged learners through the use of portable and ubiquitous Information and Communication Technologies (ICT). This is on the premise that the use ICTs in education has resulted in the learning paradigms such as the electronic learning (e-learning), mobile learning (m-learning), cloud learning and Blended learning [11] as summarized in table 1

TABLE 1. ICT ENABLED LEARNING PARADIGMS.

ICT supported learning	Paradigm description and types	
Paradigm	Definition	Example
E-learning	learning that is dependent on the internet connectivity and is facilitated by LMS such as Sakai, MOODLE, Blackboard etc.	MOOC
Blended learning	It is learning that combines the traditional modes of learning with the electronic learning	face-to-face complemented with an LMS
Mobile learning (m-learning)	It is learning that utilizes mobile devices such as smart phones and their associated applications in the learning process	Mobile educational applications such as Chrome and Safari browsers for browsing information and Evernote etc
Cloud learning	is learning that occurs through cloud computing, clusters of distributed computers which provide on-demand resources and services over a networked medium such as the internet	Google Drive, Dropbox etc for data storage and information sharing

The research proposes the adoption of m-Learning, the ability to learn everywhere at anytime without permanent physical connection to cable networks [14]. M-learning requires the use of portable and ubiquitous ICT resources such as PDA, cellular phones, smart phones, portable computers and Tablet PC and software such as the search engines, social media, Learning Management Systems (LMS), mobile educational applications among others. Such hardware and software ICT resources should have the ability to connect to other computer devices, to present educational information and to realize bilateral information exchange between the learners and the educators.

The research has been motivated by the high prevalence of mobile technologies and devices the world over owing to the

size and cost of the mobile device batteries. [10] contend that mobile technologies are already widespread among children, it therefore make sense that education institutions with limited resources could take advantage and make the most of devices and technologies learners already have access to. Zimbabwe has experienced a phenomenal growth rate in mobile density as indicated in fig 1 thus accelerating opportunities for m-learning [7]. In acknowledgement [4] observed that there is a high proliferation of mobile phones among persons of the school going age inclusive of learners with special educational needs due to physical disabilities.

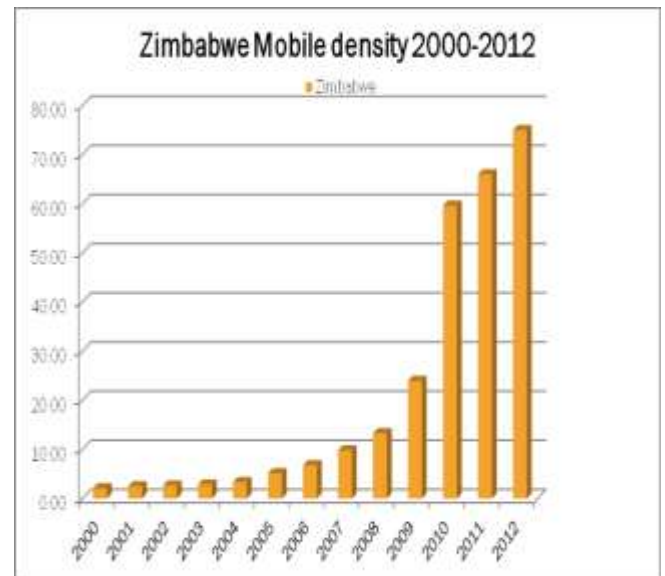


Figure 1 Mobile density for Zimbabwe adapted from [7]

Fig 1 depicts an increase of approximately 300% of mobile phone ownership by Zimbabweans and these figures are inclusive of learners with special educational needs.

Mobile technologies have been found to have opportunities that may benefit physically challenged learners whom [2] asserts that all learners have different priorities, preferences and approaches to learning and they have different needs for support. The evolving learner behaviours require learning institutions to continuously reevaluate their approaches to pedagogy both in the physical and virtual classroom spaces. The increasing availability of low-cost mobile and wireless devices and associated infrastructure heralds opportunities for and the application of mobile learning through mobile devices, which according to [12] mobile devices now represent a very significant element of the young people’s daily life. These technologies potentially bring the rewards of placing institutions at the forefront of pedagogical practice and addresses learner requirements for flexibility and ubiquity for learner engagement [3] independent of location and time. [2] argues that the prerequisites of children with disabilities are not the same as for children in general and m-learning can cater for these varieties that are often most exceptional and afford each child the right to be accepted and supported according to his/her needs In addition mobile phones have the potential to

dramatically change the mobility landscape in which young disabled learners operate [12].

IV. METHODOLOGY

The research adopted both quantitative and qualitative research methods. The National University of Science and Technology (NUST) is a higher learning institution which was used as the case study for investigating the potential of m-learning to afford the physically challenged learners an increased access to educational material. The institution lacks the conducive learning facilities for the physically challenged learners. The institution suited this exploration due to the availability of a LMS that is compatible with the mobile devices, which learners including the physically challenged already have and use daily. The classrooms are situated on first and second floors of a three storey faculty building while the ground floors are reserved for offices for lecturers and administrators. The elevators are still under construction and not yet functional, posing an accessibility challenge to learners on assistive technology such as wheel chairs. They have to rely on the assistance from classmates to reach the learning facilities. Paper based questionnaires were randomly administered to first year students enrolled in the faculty of applied sciences to determine the challenges faced by physically challenged learners. Follow up interviews were conducted with twenty physically challenged learners except those with sight impairments to ascertain their challenges faced from the learning facilities and the possibility of supplementing their learning through the use of mobile devices and technologies. Telephone interviews were also conducted with the principals from two special schools and school heads of selected ordinary high schools in the city of Bulawayo who confirmed the inappropriateness of the facilities to support the learning process of the physically challenged learners.

V. TECHNOLOGY DESCRIPTION

A variety of devices can be used for m-learning such as laptops, Tablet PC and Personal Digital Assistant (PDA) whose main limitation is the high price. [6]. Low cost mobile phones are limited by low memory capacity and low data transfer rates. The study thus proposes the use of smart phones as they can be used to access the Internet, send and receive the multimedia messages (MMS) and are less costly. There are several communication technologies which are used with mobile devices. These include, Bluetooth wireless technology, Infrared Data Association (IrDA), 3G, IEEE 802.11, WAP and GPRS. GPRS is the most common due to its high range capabilities in data exchange. WAP is also recommended as it is a free, unlicensed protocol for wireless communications that makes possible the creation of advanced communications services and access to Internet pages from a cellular phone [6].

The recommended m-learning implementation is based on a smart / cellular phone, learning management system, communication technologies and the Internet as depicted in fig 2.



Figure 2 Technological design of m-learning

Fig 2 depicts the communication between the learner and the learning management system residing in a centralized server. A learner uses a mobile device such as a 3G smart phone to retrieve course material or upload assessments to the LMS program such as SAKAI via the internet. The learners can also do the tests and quizzes online through the use of their mobile devices to access the set tests and quizzes created using the LMS tools and features. The instructor can choose to post learning material and assessments as well as retrieves assessments through the use of a personal computer, a mobile phone, and a laptop or tablet pc, whichever is more convenient at that particular time. Instant feedback is provided to the learners during or soon after the test or quizzes.

VI. RESULTS

The major findings were that mobile technologies are a major innovative way of supporting teaching and learning and could be utilized in the education of learners with special educational needs. Mobile Learning is intended for those people who were not able to undergo traditional education [13] just like the disabled who are restricted by their physical state. Mobile devices are capable of connecting them to a vast source of information and enables communication nearly everywhere they will be and facilitate for learning as if in the real classroom. Their mobility increases the learners' capabilities to adapt to new learning environments as learning takes place at any time and at any due to the rapid advancement in mobile technologies. Table 2 demonstrates the responses and satisfaction of the respondent learners with the engagement with m-learning as it is important for special needs learners to be mobile and flexible.

TABLE 2 RESEARCH ITEMS AND RESPONSES

Statistical Representation of the research responses			
	<i>Item</i>	<i>Mean</i>	<i>Standard Deviation</i>
1	I find the mobile learning environment enjoyable	4.93	0.25
2	I think the m-learning method can make me learn happily	4.62	0.52
3	The m-learning environment can provide me with the opportunity to discuss the course content with my classmates and lecturers.	4.70	0.59
4	The m-learning environment can provided opportunity to reach the content of a lesson any time and any place.	4.88	0.32
5	I would like a similar learning environment to be used in all of my lessons.	4.93	0.25
6	With the help of my mobile device I can learn course subjects easily.	4.63	0.52
7	My mobile device can provide an opportunity to do all my assessments.	4.62	0.52
8	Learning using my mobile device can motivate me.	4.88	0.32
9	Mobile technologies can afford me an opportunity to exchange the files with my friends.	4.68	0.54
10	Through m-learning method I can get prompt feedback immediately	4.68	0.54
11	Through the m-learning method collaborative learning is possible	4.93	0.25
12	I would like to see the m-learning being used throughout my learning experience.	4.70	0.53
13	M-learning can facilitate communication with my lecturers at all times.	4.62	0.52
14	Through my mobile device I can get automatic announcements and reminders on homework and tests.	4.63	0.52

The table indicates the feasibility and demand for ICT enabled learning by the physically challenged learners with special education needs. The school heads who participated in the study confirmed facing challenges in the provision of conducive learning facilities suitable for the special needs learners that has resulted in a high dropout rate by the special education needs learners. For instance one school had indicated having a single physically challenged learner in a population of over one thousand learners who apparently stigmatize and demoralizes the special education needs learner. The classroom setup and learning facilities are not supportive of the special needs of the physically challenged learners. More so, the majority of teachers are not qualified teachers to handle special needs of the physically challenged learners. Both the interviewed school heads and special school principals welcomed the idea of integrating the mobile technologies into the teaching and learning process. Nevertheless, both raised concerns that m-learning could be rather disruptive to the learning practice with learners prone to abusing the facility by engaging in other activities outside learning.

VII. CONCLUSIONS

The research evaluated the feasibility of m-learning for learners with special needs and the results confirm that this learning paradigm is very beneficial and a suitable method of teaching and learning for physically challenged special needs learners. This has been facilitated by the pervasiveness and proliferation of both mobile devices and technologies that has resulted in the world going mobile with physically challenged learners being a non exception. There was an enthusiasm from physically challenged learners apart from those with eye sight issues to bring and use their own mobile devices in the learning process as they indicated that this could alleviate challenges to accessing education material. If employed effectively mobile technologies can be used as flexible tools for expanding learning beyond the classroom what the learners with special educational needs require to attain either basic or higher education. The adoption of mobile technologies has the potential to increase the literacy rate among the physically challenged persons and prevent them from prematurely dropping out of school. In conclusion m-learning was found to afford not only the physically challenged special education needs learners with good educational opportunities but also the whole community of learners in different circumstances and with different educational needs.

VIII. LIMITATIONS AND FURTHER WORK

The study was limited to the physically challenged learners with walking, hearing and speech impairments. It would have been worthwhile to include learners with sight related challenges in the study for a more generalizable result of both the views and priorities of special education needs learners regarding ICT enabled learning. It was found that there is no regulation in place that supports bring your own device (BYOD) policy in schools. A recommendation is made to education policy makers to consider the BYOD policy for the benefit of both the physically challenged special needs education learners and the able bodied learners. The research further recommends to the government of Zimbabwe to support the integration of the mobile technologies in education by assisting the physically challenged learners with financial support towards the sustainability of mobile technologies in a similar manner with regards to the financial constrained learners benefitting from Basic Education Assistance Model (BEAM), a model covering the school fees and other education material to financially challenged learners.

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