

Trends and Future Directions in Open and Distance Learning Practice in Africa

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Abstract

Open and Distance Learning (ODL), formerly known as Distance Education (DE) is one of the most rapidly growing fields of education in recent time. Distance education has experienced remarkable growth in national and international scenes since the early 1980s. In spite of recent phenomenal developments in the world of electronic networks, especially the recent global attention to the Internet, which has provided the primary technological thrust, several other emerging technologies have also promised to change the landscape of education in general, and distance education in particular drastically. The field of distance education is therefore, at the centre of dynamic growth and change. This paper focuses on current trends in ODL from African perspective. It examines some of the definitions that have been put forward by experts in the field, as well as some features that characterized ODL. The paper also reflects on some practices in Africa's ODL programmes. Furthermore, current trends in the practice of ODL in African countries like South Africa, Zimbabwe, Tanzania, Botswana and Nigeria are critically discussed. Some of the policy recommendations highlighted in the paper include the need to invest more in ODL through meaningful budgetary allocations and cost sharing at higher levels of education, creation of partnerships and networking among ODL institutional providers within the continent, private telecommunication sector, and Non Governmental Organizations (NGOs).

Keywords: Open-Distance Learning, Trends, Policy, Distance education, Africa

1. Introduction

Distance education has experienced remarkable growth both in national and international scenes since the early 1980s. It has transformed from early correspondence education status, using primarily print-based materials into a worldwide movement using various modern technologies. In spite of recent phenomenal developments in the world of electronic networks, especially the recent global attention to the Internet, which has provided the primary technological thrust, several other emerging technologies have also promised to change the landscape of education in general, and distance education in particular drastically. The field of distance education is therefore, at the centre of dynamic growth and change. McIsaac and Gunawardena (2001) further observed that the directions which distance education takes will depend on such factors as the development of new media and computing technologies, different methods of group learning and information gathering, and the development of government telecommunications policies.

Issues in prominent distance-learning journals and literature have established the need for stakeholders to be informed and prepared with strategic plans equal to foreseeable challenges in the future. There is therefore, the need for stakeholders in the field of distance education practice to keep abreast of the emerging trends in the field. This paper provides policy makers with some of the current trends that affect distance learning from African perspective. The importance of keeping abreast with the emerging trends in ODL has been stressed by scholars. For instance, Beaudoin (2003) opined that institutional leaders would be informed and enlightened to the point of asking fundamental questions that could influence institution's future viability. Some of such fundamental questions include "How many faculties do we need in ten years? Will the notion of classrooms survive? Is the present structure of the institution viable? Will teachers and students need to meet on campus anymore? and so on.

In view of these and other pressing questions, decision makers must clearly understand all influencing factors. This is because decision makers often rely on long-term demographic and economic projections, based on current trends and foreseeable influences in their strategic planning (Reeve & Perlich, 2002). The trends presented in this paper were products of integrative literature search and review, conducted to summarize the current status and future directions of distance education.

The Concept of Open and Distance Learning (ODL)

The terms 'open learning' and 'distance education' according to the United Nations Educational, Social and Cultural Organizations, UNESCO (2000) represent approaches that focus on opening access to education and training provision, freeing learners from the constraints of time and place, and offering flexible learning opportunities to individuals and group of learners. Some of the more commonly used terms related to open and distance learning include the following: correspondence education, home study, independent study, external studies, continuing education, distance teaching, self instruction, adult education, technology-based or mediated education, learner-centred education, open learning, open access, flexible learning, and distributed learning. Also, the Federal Government of Nigeria, in the National Policy on Education (2004), described ODL as life-long learning, life-wide education, adult education, media based education, self-learning .

Several founding fathers of distance education had earlier come up with different definitions. For instance, Peters (1973) defined distance education as a method of imparting knowledge, skills and attitudes, which are rationalized by the application of division of labour and organizational principles as well as by the extensive use of technical media, specially, for the purpose of reproducing high quality teaching material which makes it possible to, instruct great numbers of students in the same time wherever they live. It is simply an industrialised form of teaching and learning. Dohmen (1977) described distance education as a systematically organized form of self-study in which students' counselling, presentation of learning materials and securing and supervising of students' success are carried out by a team of teachers each of whom has responsibilities. In the opinion of Holmberg (1981), distance education refers to that kind of education which covers the various forms of study at all levels which are not under continuous and immediate supervision of tutors present with their students in lecture rooms on the same premises, but which nevertheless, benefits from the planning, guidance, and tuition of a tutorial organization

More recently, the UNESCO (2000) submitted that distance education is any educational process in which all or most of the teaching is conducted by someone removed in space and/or time from the learner, with the effect that all or most of the communication between teachers and learners is through an artificial medium, either electronic or print. By implication, in distance education the normal or principal means of communication is through technology. The Commonwealth of Learning, COL, (1999), however argued that there is no one definition of open and distance learning. Rather, there are many approaches to defining the term. Most definitions however, pay attention to the following characteristics (COL, 1999; Keegan, 1986):

- (i) separation of teacher and learner in time or place, or in both time and place;
- (ii) institutional accreditation; that is, learning is accredited or certified by some institution or agency. This type of learning is distinct from learning through your own effort without the official recognition of a learning institution;
- (iii) use of mixed-media courseware, including print, radio, and television broadcasts, video and audio cassettes, computer-based learning, and telecommunications. Courseware tends to be pre-tested and validated before use;
- (iv) two-way communication allows learners and tutors to interact as distinguished from the passive receipt of broadcast signals. Communication can be synchronous or asynchronous;
- (v) possibility of face-to-face meetings for tutorials, learner-learner interaction, library study, and laboratory or practice sessions; and
- (vi) use of industrialized processes; that is, in large-scale open and distance learning operations, labour is divided and tasks are assigned to various staff who work together in course development teams.

In its broad sense, Farrell (2003) contends that open distance education embraces open learning, distance education, flexible learning, online learning and e-learning, and virtual education. According to him open learning practices allow entry learning with no or minimum barriers in respect of gender, age, etc. Distance learning, on the other hand, deals with training or teaching people who are separated by time and space from their teachers utilizing certain mediating processes to transmit learning content. Flexible learning involves providing learning opportunities which can be accessed at anytime and place with much emphasis on scheduling of activities than to any specific mode of delivery. Online and e-learning are terms used to describe applications of ICTs to boost distance education, implement open learning policies among others while virtual learning combines both online and e-learning but it is web-centric and not limited to learners outside conventional learning setting.

Importance of ODL

Open and distance learning has become a very important mode of learning. This is due to the fact that problems such as distance and time, which are barriers to conventional learning, are overcome in open and

distance learning. According to the Commonwealth of Learning, COL (2003), ODL is important in the following ways:

(a) Overcoming physical distance: Open and distance learning can overcome problems of physical distance for learners in remote locations who are unable or unwilling to physically attend a campus; and learners and teachers geographically separated in that teachers in urban settings instruct learners in rural settings.

(b) Solving time or scheduling problems: Open and distance learning can solve time or scheduling for client groups unwilling or unable to assemble together frequently; learners engaged in full-time or part-time work, both waged and volunteer; and family and community commitments.

(c) Expanding the limited number of places available: Open and distance learning can expand the limited number of places available for campus-based institutions few in number; and stringent entrance requirements.

(d) Accommodating low or dispersed enrolments: Open and distance learning can accommodate low enrolments over a long period of time; and low enrolments in one geographic region but additional enrolments elsewhere.

(e) Making best use of the limited number of teachers available: Open and distance learning can make the best use of the few teachers available when there is a lack of trained teaching personnel relative to demand; teachers are geographically concentrated; and teachers with certain expertise are in short supply.

(f) Dealing with cultural, religious and political considerations: Open and distance learning can deal with differences, and consequently widens women's opportunities to learn; meets the needs of populations affected by violence, war or displacement; and makes learning possible even when group assemblies are proscribed

Reflections on Open Distance Learning in Africa

One of the major developments in the field of education in Africa has been the relative growth of distance education (Adekanmbi, n.d). In Africa, Open and Distance Learning (ODL) has become a policy option for most of the African States because it has very crucial roles towards the advancement of African development through the promotion of participation in, and access to higher education, at a time when demand far exceeds resources and opportunities available in the conventional educational system. Thus, African countries, like countries everywhere, are looking to the educational possibilities offered by distance education and Information and Communication Technologies (ICTs) as a way of expanding and improving the systems. In Sub-Saharan Africa (SSA), ODL/DE has been used primarily to widen access to basic education and to improve quality in the conventional school system through in-service training of teachers (Moore & Kearsley, 2005).

The reasons behind the acceptance of ODL system of instruction as an alternative approach to teaching and learning in conventional school system in Africa are not totally different from the global ones. For instance, geographical and socio-economic circumstances, problems of educational imbalance, the establishment of adult education units and departments in African universities, improved communication systems and the introduction of the postal system in Africa were some of the major reasons (Adekanmbi, 1993). According to Murphy, Anzalone, Bosch and Moulton (2002), Africa has had a long history in adopting distance education and technology in education, and today, there are over 140 public and private institutions offering distance education programmes in Africa. In spite of Murphy et al's remark however, Leary and Berge (2007) maintained that Sub-Saharan Africa (SSA) still currently trails the rest of the world in ODL development.

Aderinoye, Siaciwena, and Wright (2009) corroborated Leary & Berge's (2007) position, when they maintained that Africa lacks high-speed Internet infrastructure, access to computers, and human resources with the expertise to implement and support hi-tech delivery methods effectively. In Africa, most of the advanced form of technology is not a viable medium for most ODL learners as many of them still live in very remote areas. Thus, in Africa, distance education takes on a variety of forms including paper-based courses, radio instruction, and television broadcasts (Aderinoye, et al.).

ODL in Africa has no doubt, experienced a number of 'fundamental changes' in its practices. These fundamental changes, according to Adekanmbi (1993) reflected in the range of programmes and subjects offered and in the nature of collaborative ventures embarked upon do give some indications of some level of transformation. He asserted further that the introduction of new media of technology of delivery; the extent to which quality control is being considered; and indications of a merger of ways between distance education and conventional education also underscore this transformation. There is also a gradual adoption of new distance education models such that greater numbers of clients can be served.

A true development orientation of offerings still appears suspect while the research focus and the recognition of the field as a distinct discipline are becoming more evident. There is no doubt that ODL is currently revolutionising higher education in Africa. There are waves of distance educational revolutions across the African continent from Nigeria to Tanzania; South Africa to the Sudan; Rwanda to Ghana; Zimbabwe to Kenya, and so on. African nations are therefore, currently experimenting with different ODL models such as single to dual with a view to increasing access to higher education. However, these developments represent a

starting point in the nature of changes observed over a century of practice in the system.

Current Trends in Open and Distance Learning: An African Perspective

Having had a critical look at the some relevant issues in ODL, it becomes imperative to explore the current trends in ODL from African perspective, which is the core aspect of the paper. This is because African continent is not left out in the scheme of things as far as current trends in open-distance learning are concern. It is more than ever clear that open and distance learning will be an important element of future education and training systems. The emergence of new forms of distance learning based on new Information and Communication Technologies (ICTs), in particular those supported by the Internet and using the World Wide Web (WWW), has significant economic, pedagogical, and organizational implications. Furthermore, there is a significant trend towards intensifying globalization. Institutional and inter-governmental co-operation is increasing, and the 'global classroom' has been realized in quite a number of projects, particularly in connection with emerging global communications networks.

According to Bates (1995), most of the discernible current trends in ODL are linked to the ever increasing grow in information and communication technology. Considering the challenges of education and development, both in developing and developed countries, it is not surprising that open and distance learning is often seen as an important new approach and strategy which could make a significant contribution towards resolving problems of access, quality and equity.

In Sub-Saharan Africa, where the "knowledge gap" between the North and the South takes on its most dramatic character, the current trends indicates that ODL is being mainly used to widen access to basic education and to maintain and improve quality in the conventional education system, particularly through in-service training of teachers (UNESCO, 2001a). For example, UNESCO was involved in the in-service training of all of Botswana's unqualified teachers in the late 1960s and 1970s. ODL has also been used in non-formal education and community development by national and international organizations. However, there are strong indications that ODL is becoming more central to the education policy of many African countries. This assertion is attested to in a report submitted by Hanover Research (2011) on current trends in global distance learning. In the report which was subdivided into two sections (literature review of current global market for distance learning and programmes offerings, and selected case studies) it was found that Africa and India represent two of the growing markets for distance learning programmes. Similarly, the report indicated that subjects offered varied on the basis of region and organization but business and technology are frequently offered.

A remarkable phenomenon in South Africa in the early years of the new decade according to the UNESCO (2001b) is the shift on the part of learners from single mode to dual mode institutions. According to South Africa's Council on Higher Education, enrolment in the long-established single mode institutions (University of South Africa and Technikon SA) dropped by 41,000 students, or 21 percent, from 1995 to 1999 as a result of the growth of new dual mode institutions. These drew 31,000 new distance students, an increase of 111 percent, according to the Council. Besides this, there are universities in South Africa, such as University of South Africa (UNISA), that have shifted their traditions of admitting only adults to the policy of admitting young people. This has significantly increased the population of students for ODL programmes.

In Botswana, the foremost institutional ODL provider is the Botswana College of Distance and Open Learning (BOCODOL). BOCODOL currently offers distance education courses for the Junior Certificate that is the end of basic education, and which constitutes the first ten year of formal schooling. In addition, BOCODOL offers distance education courses for the General Certificate in Secondary Education (GCSE). Also, in 1993 the Zimbabwean Government established the Centre for Distance Education (CDE) by the University of Zimbabwe. The Zimbabwean's CDE however became the University College of Distance Education in 1996. The College received its University Charter in 1999, and this led to the transformation of the CDE into a fully-fledged University known as the Zimbabwe Open University.

Furthermore, in Tanzania, distance education is organized through the Distance Education Association of Tanzania (DEATA). DEATA, a national association was established in December 1992. It draws its membership form the Ministry of Education and Culture, the Open University of Tanzania, the University of Dares Salaam, the Vocational Education and Training Authority, the Muhimbili University College for Health Sciences, the Southern African Extension Unit, the Institute of Adult Education, and the Cooperative College Moshi. These organizations enrol over 18,000 students among them. Malawi also has its own share of distance education practice. For instance, there are two dedicated distance education providers in Malawi namely a private school and a Department of the Ministry of Education, Sports and Culture. The University of Malawi has been exploring possibilities of offering distance education programmes, and the Domasi College of Education has taken the initiative to adopt distance learning as an approach to the training of the Malawian teachers.

Current trends in ODL in Africa also exemplifies around regional collaboration policy. In Africa, there is much to be gained from enhanced regional collaboration on policy issues, development of delivery systems and sharing of materials. There are now many initiatives to establish networking through national and regional associations in order to strengthen and improve capacities for ODL in the region. Among projects that exemplify this collaborative approach in reference to the UNESCO (2001c) are:

- Training of Upper Primary and Junior Secondary Science, Technology and Mathematics Teachers in Africa by Distance. This programme is supported by the Commonwealth of Learning and countries included are Botswana, Malawi, Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe; and
- Training for primary school Principals, using print materials and Internet, coordinated by the International Francophone Consortium of Distance and Open Learning Institutions (CIFIAD). CIFIAD also has a project in Senegal, Guinea and the Côte d'Ivoire to improve the teaching of French at the secondary school level.

Nigeria is not left out of the current trends and waves in ODL. In Nigeria, the history of ODL system can be traced to the pre-independence era (i.e. Pre-1960) when some Universities and Colleges (mostly from the United Kingdom) established study centres and even conducted examinations in few of the Nigerian cities like Lagos and Ibadan. Few of the Nigerian elites earned their degrees through correspondence education. In fact, the premier University in Nigeria, that is, the University of Ibadan was a former extension of University College, London, until 1948 when it became autonomous. Oxford University, in 1947, established extra-moral studies at the then University College of Ibadan in Nigeria. In 1960, the first distance education course by Radio was inaugurated by the National Broadcasting Corporation (NBC). The then National Television of Nigeria (NTV) aired Educational Television Programmes in all their stations.

In 1972, the Ahmadu Bello University (ABU) launched her University of Air. In 1975, it established Teachers In-Service Education Programme (TISEP). Also in 1976, the Federal Government of Nigeria established the National Teachers' Institute (NTI). In 1987, the University of Lagos established the Correspondence and Open Studies Unit (COSU). It should be noted that the Federal Government of Nigeria muted the idea of establishing a National Open University in 1983, during the Second Republic, but the military intervention later that year crushed this hope. Successive governments only paid lip-service to this great idea. It was not until 1990 that the University of Abuja established the Centre for Distance Learning (CDL) and in the year 2001, the Federal Government of Nigeria re-established the National Open University of Nigeria (NOUN) to run some courses. In March, 2002, the National Open University invited experts from Universities, Polytechnics, Colleges and Industries for a one-month Structural Design and Course Materials Development in Lokoja, Nigeria. Today, NOUN admits over thirty thousand students annually (Adekanmbi, 1993)

The current trends in ODL in Africa finally led to the emergence of the African Council for Distance Education (ACDE). The ACDE is a continental educational organization comprising African Universities and other higher education institutions, which are committed to expanding access to quality education and training through Open and Distance Learning. It is registered under the laws of Kenya as an International NGO. As a unifying body of distance education providers and practitioners in Africa, the ACDE was formally launched in January 2004 at Egerton University, Kenya. In August 2005, the ACDE held its Inaugural Conference and General Assembly at the University of South Africa (UNISA) in Pretoria, during which it was resolved to establish a permanent ACDE Secretariat in Nairobi, Kenya. Its goals and objectives are to:

- promote open and distance learning, flexible and continuing education in Africa.
- promote research and training in open and distance learning in Africa.
- contribute to the development of policies essential to the advancement of open and distance learning.
- foster continental and global collaboration in open and distance learning.
- provide a forum where individuals, organizations and governments can deliberate on policy matters on open and distance learning.
- promote the development of appropriate methods and technologies in education and training relevant to open and distance learning.
- provide a forum for interaction, sharing and dissemination of ideas on open and distance learning.

Problems Facing ODL Practice in Africa

Singh & Paliwa (2012) posited that common problems identified in distance education include the need for face-to-face tutorial support (which is expensive) and course material development (which is often unreliable and

unsustainable). Professional development of educators is also often limited and sporadic. Administrative systems are often underdeveloped. Course fees are often beyond the reach of the learner. Unrealisable infrastructures make communication systems by way of roads, the postal service and telecommunication facilities and services difficult. There are funding constraints and no ready-made solutions that are applicable in every country. They further maintained that despite the rapid development and convergence in functionality of technologies, there is still a legacy of failed initiatives in attempting to implement educational technology. The four most common reasons for failure are: 1) inflexible technological choices were imposed on a system; 2) lack of investment in curricula and course design; 3) extremely high operating costs; and (4) underestimation of fully deployed systems for student support.

Conclusion and Recommendations

Without any iota of equivocation, Open and Distance Learning ODL is no longer regarded as a marginal educational activity, but rather seen globally as a viable and cost effective system of providing better individualized instruction. Thus, ODL programmes will continue to flourish and develop in Africa not only because a large number of African institutions have the potentials to support applications of technology required in any distance education system, but also more importantly due to ever growing global need for an educated workforce couple with poor financial constraints of establishing conventional educational institutions. McIsaac & Gunawardena (2001) opined that ODL offers life-long learning potential to working adults and will play a significant part in educating societies around the world. Thus, to the present authors, Africa will not be left out of the impacts the ODL will have towards the attainment of a well educated continent.

This paper has some considerations for policy makers and planners in order to ensure a better and higher return on investments in ODL in Africa. It is therefore recommended that African Governments, through seasoned educational policymakers and planners should:

- ✚ Invest more in ODL, through budgetary allocations and cost sharing at higher levels of education considering the invaluable roles it plays in the overall African development. They should analyze costs carefully and support long-term financing.
- ✚ Prepare national strategies and build capacity for using ODL and technology within the overall continental framework for educational reform and implement these strategies within sector-wide approaches where they exist.
- ✚ Create partnerships and networking among ODL institutional providers within the continent on one hand, and with the private telecommunication sector, and Non Governmental Organizations (NGOs) to share knowledge and reduce costs.
- ✚ Commence the procedure for establishing an African Open University that will be one of the organs of the African Union.

References

- Adekanmbi, G. (1993). Transformation in distance education: In search of a paradigm' In Scriven, B., Lunden, R. and Ryan, Y. (Eds.) *Distance Education in the Twenty-First Century*, pp.336-340. Oslo: ICDE.
- Adekanmbi, G. (n.d). The transformation of distance education in Africa. Retrieved from www.col.org/forum/PCFpapers/Adekanmbi.pdf
- Aderinoye, R., Siaciwena, R., and Wright, C.R. (2009). Regional focus issue editorial: A snapshot of distance education in Africa. *IRRODL* 10 (4)
- African Council for Distance Education (n. d). Newsletter http://www.acde-africa.org/html/about_ACDE.htm
- Bates A.W. (1995). *Technology, open learning and distance education*, London: Routledge.
- Beaudoin, M. F. (2003). Distance education leadership for the new century. *Online Journal of Distance Learning Administration* (6)2. Retrieved from <http://www.westga.edu/~distance/ojdla/summer62/beaudoin62.html> .
- Dede, C. J. (1991). Emerging technologies: Impacts on distance learning. *Annals of the American Academy of Political and Social Science*, 514, 146-158.
- Dohmen, G. (1977). *Foundations of distance education* (2nd ed.).London: Routledge Limited.
- Farrell, G (ed.). 2003. *A Virtual University for Small States of the Commonwealth*. Vancouver: The Commonwealth of Learning.
- Federal Government of Nigeria (2004). *Revised National Policy on Education* . Abuja: Federal Ministry of Education.
- Hanover Research (2011). Trends in global distance learning. Retrieved from

<http://www.hanoverresearch.com/wp-content/uploads/2011/12/Trends-in-Global-Distance-Learning-Membership.pdf>

- Holmberg, B. (1995). *Theory and practice of distance education*. London: Routledge.
- Keegan, D. (1986). *Foundations of distance education*. London, Croom Helm.
- Leary, J. & Berge, Z. (2007). Successful distance education programmes in sub-saharan Africa. *Turkish Online Journal of Distance Education*. 8(2).
- Mclsaac, M. S. & Gunawardena, C.N. (1996). Distance education. In D.H. Jonassen (Ed.). *Handbook of research for education communication and technology*, pp. 403-437.
- Moore, M. G. & Kearsley, G. (2005). *Distance education a systems view* (2nd Ed.). Thomson Wadsworth.
- Peters, O. (1973). Distance teaching and industrial production. A comparative interpretation in outline. In Sewart, D., Keegan, D., & Holmberg, B. (Eds). *Distance Education: International Perspectives*, London: Croom Helm.
- Reeve, R. T., & Perlich, P. S. (2002). Utah economic and business review. Bureau of Economic and Business Research (BERB), 62 (9-10), 1-15.
- Pityana, N B (2004). Open distance learning in Africa: access, quality, success. Retrieved from www.unisa.ac.za/contents/about/principle/odl_africa.pdf
- UNESCO (2001a): *Teacher education through distance learning, technology – curriculum – evaluation – cost*. Paris: UNESCO.
- UNESCO (2001b) *Distance Education in the E-9 Countries, The Development and Future of Distance Education Programmes in the Nine High-Population Countries*, Paris: UNESCO.
- UNESCO (2000). *World development report 2000*. Paris: UNESCO.
- Williams, P.E. (2003). Roles and competencies for distance education programs in higher education institutions. *The American Journal of Distance Education*. 17(1): 45-57.

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