

# Evaluating the Usage and Integration of ITs and ISs in Teacher Education Programs in a Sprouting Nation

Nwachukwu Prince Ololube

Faculty of Education, Ignatius Ajuru University of Education  
P. M. B. 5047 Port Harcourt, Rivers State, Nigeria

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## Abstract

*This article explores the impact of the changing context of information technologies (ITs) and information systems (ISs) on teacher education (TE). ITs and ISs have influenced educational philosophy and classroom practices all over the world. Significant technological innovations over the last three decades have altered the environment in which educators operate, and profoundly changed the experience of both formal and informal education. The impact and pervasiveness of ITs and ISs have forced traditional Colleges and of Education and University Faculties of Education into a period of transition and transformation. Colleges and Faculties of Education have, for example, become sites of branding and rebranding. The policy makers associated with these programs reflexively look to market-based solutions without first giving serious thought to the challenges preventing the effective integration and use of ITs and ISs in TE, particularly in developing economies. Using a theory-based method of analysis, this paper gathers and analyzes contemporary views and ideas on education and technology. This paper finds that the impact of ITs and ISs on TE programs in Nigeria has shortchanged these programs. As a result, education consumers and stakeholders are dissatisfied with the slow integration and use of ITs and ISs in government owned institutions of higher education in general and in TE programs in particular.*

**Keywords:** *ITs and ISs, ITs and ISs Use, ITs and ISs Integration, Colleges of Education, Faculties of Education, Teacher education programs, Student teachers, Nigeria.*

## 1. Introduction

The globalization of the education sector and impacts of globalization on the workforce require a different kind of education; one that enhances the ability of learners to access, assess, adopt, and apply knowledge, to think independently, to exercise appropriate judgment, and to collaborate with others to make sense of new circumstances. Much like globalization, emerging technologies have impacted all aspects of national economies and societies. Teacher education has been highly affected by global trends in technology, particularly its economics and business content (Singh & Papa, 2010). Among UNESCO's recent strategic objectives for improving the quality of higher education are the diversification of content and methods, the promotion of experimentation and innovation, and the diffusion and sharing of information, best practices and policy dialogues (UNESCO, 2002, 2003). Many of these objectives relate directly to information technologies (ITs) and information systems (ISs) which have become critical personal and social tools and have had a revolutionary impact on how we see and live in the world (Ololube, Kpolovie, Amaele, Amanchukwu, & Briggs, 2013). In the context of teacher education, ITs and ISs involve the gathering, processing, storing, distributing and use of information in a range of strategy, management and operational activities with the aim of improving the effectiveness and efficiency of teachers.

Information capitalism and globalization have likewise impacted the ways in which teaching and learning are carried out in education programs around the world (Singh & Papa, 2010). Innovations in

educational technologies are revolutionizing educational design and methodology (Miniaoui & Kaur, 2014). These trends, however, are not widespread and must be further strengthened if they are to reach a large percentage of the population, especially in the third world. In a complex society like Nigeria, many factors affect the use and integration of technologies in the teaching and learning process. As a result, a pro-active, interdisciplinary and integrated approach is required to ensure the successful development of teacher education and, in turn, the successful future development of the national economy (Ololube, 2014).

The global academic landscape includes research, teaching and learning. It includes educational programs and courses, the pedagogy or methodology of teaching, the research process (including dissemination and publication), library information systems and services, and administration and management. The integration of IT and ISs in teacher education programs has been the topic of a great deal of debate throughout this landscape. In Nigeria, the relationship between the development of ITs and ISs for teacher education programs and their diffusion into programs in Colleges of Education and university Faculties of Education is dependent upon governmental policies (Ololube, 2011).

Information technologies and systems are indispensable and have been accepted as part of the contemporary world especially in industrialized societies. In fact, many have already begun considerable adjustments to meet the challenges and opportunities of the knowledge age. The pervasiveness of ITs/ ISs has brought about rapid changes in technology and attendant social, political, and economic transformations (Ololube, 2006a). The field of education has not gone untouched. Without a doubt, ITs and ISs have impacted the quality and quantity of teaching, learning, and research in teacher education programs globally and to some extent in Nigeria. ITs and ISs provides opportunities for student teachers, and academic and non-academic staff to communicate with one another more effectively during formal and informal teaching and learning (Yusuf, 2005). Consequently, student teachers and academic and non-academic staff now require training not just in basic computer literacy, but also in the use of various communication and educational software packages and applications (Ololube, 2006b).

Teachers today must begin to learn at the outset of their teacher training programs about how to effectively integrate ITs/ISs into their classroom activities and school structure. Given that the quality of faculty is known to be a key predictor of student learning (Ololube, 2011), teacher education faculty training in ITs/ISs use is thus critical. Both ITs and ISs can facilitate student teacher training and help student teachers to take full advantage of the potential of technology to enhance quality and student learning in their own future classrooms. ITs/ISs have also introduced a new era in traditional face-to-face (f2f) methods of teaching and learning and in blended learning (BL). It is therefore pertinent that Nigerian education settings open themselves to the benefits that these new trends have offer in terms of building capacity and improving access to information.

The ability to effectively manage and plan for ITS/ISs enhances the proactivity of authorities with respect to information relevant to teaching services, in line with global best practices. When properly approached, ITs/ISs management can provide some of the essential information needed to manage education systems in an efficient and productive manner. This management effort must involve teachers and students as well as administrators and policymakers.

**Figure 1:** Image for Information Systems Management



**Source:** (<http://www.leadership-idn.com/definition-of-information-system-management/>)

## **2. Purpose of the Study**

In a complex society like Nigeria, we recognize that a number of prominent factors affect the successful development of teacher education programs. As such, it is quite impossible to consider all such factors at present. The purpose of this study is thus to address, exclusively, ITs and ISs in relation to teacher education and the sustainable development of education in Nigeria. This paper asserts that the effective use of ITs/ISs in teacher education addresses both the problem and solution to technology-based learning. ITs/ISs enable synergistic results that benefit pre-service teachers as they graduate and carry out their duties as teachers. Nonetheless there remains a need to better design teacher education curriculum and programs so that pre-service teachers can better plan for unanticipated and unintended results that confront them in the classroom in terms of ITs/ISs. At the societal level, ITs/ISs help us to better manage complex information flows and to integrate these flows in effective policy formulation and planning towards the maximization of human capital and potential.

It is more important now than ever that teacher education programs recognize these and other positive ramifications of ITs/ISs and ensure their graduates are equipped with effective and integrated tools and training modules to lead the next generation of students in the dynamic and innovative use and further development of these tools. Despite efforts by both the federal and state government, however, to establish effective teacher education programs in Nigeria, an ongoing lack of adequate ITs/ISs infrastructure on university and college campuses has reduced access to ITs/ISs instructional material for both faculty and students. Consequently, most teachers and student teachers rarely, if ever, come into contact with ITs/ISs aided instructional materials (Ololube, Umunadi & Kpolovie, 2014).

The desire to carry out this research arose from the need to examine the effectiveness of teacher education programs in Nigeria in relation to the role and usage of ITs/ISs. Theoretically, this paper aims to ascertain the degree to which ITs/ISs has impacted the development of teacher education. In general, the purpose of this study is to verify the research hypothesis as a basis for encouraging Nigerian institutions of higher education to maintain or improve the quality of their teacher education programs. This paper hopes to provide education administrators, planners and policymakers with the empirical models that will help them to better come to terms with the reality on ground in terms of the effective application of ITs/ISs in teacher education programs.

## **3. Teacher Education Programs in Nigeria**

Nigerian Colleges of Education and Faculties of Education in universities are openly committed to excellence in teacher education programs. Excellence in teacher education can be taken to mean effectively providing teaching and learning experiences that prepare student teachers for the challenges of today's multifaceted, ever varying, and varied workplace (Ololube, 2006). The guiding philosophy of teacher education is to produce student teachers with sharp intellectual minds capable of further critical intellectual inquiry (Ololube, 2011). Colleges and Faculties of Education are among several institutions in Nigeria that offer teacher education services to students who wish to specialize in subjects including agricultural science, arts, environmental sciences, health education, humanities, information and communication, management and social sciences, and the natural and applied sciences.

Colleges of Education offer post-secondary National Certificate in Education (NCE) training programs. The NCE is the qualification required to teach in junior secondary schools and technical colleges. In addition to training junior secondary school teachers, Colleges of Education now also train primary school teachers. The NCE has become the minimum qualification for primary school teaching as of 1998. Some of the Colleges also offer NCE pre-primary courses to produce qualified teaching personnel for the pre-primary

level (Moja, 2000). Universities in Nigeria offer Bachelor of Education degree programs to both senior secondary school graduates and senior secondary school teachers who already have NCE qualifications. They also offer Masters and Doctorate degree programs in education.

Introduction to Computer Science is a fundamental course for student teachers in Nigeria either as part of their program or as a part of a previously completed major. Computer science is ideally taught in a general and applied fashion and produces graduates who are scientifically and technically skilled in information processing, data collection and analyses, and communication. All of this should be set in a problem-solving context where students learn about the planning and management processes involved in using computers. Introduction to Computer Science should also involve teaching and learning about the information needs of computers, the design of information management systems, and the principles and practices of system usage.

The successful completion of an introductory course in computer science is a critical accomplishment for undergraduate students who may one day be at the helm of decision making in their workplace and looking to keep pace with the demands of a globalized economy. This course is equally important for students who are planning to further their studies in the future and who, as graduates, will need to make informed professional development decisions using ITs/ISs. Introduction to computer science courses are challenging classes to teach because the technical complexity of the course material is quite high while student interest in this material can, unfortunately, be quite low. In most cases, take home assignments are given to students with basic instructions and sources for materials on the Internet. In some cases, assignments are submitted to faculty members via e-mail and feedback is provided to students' days after the submission also via e-mail (Ololube, 2014).

In Nigeria, the need for well qualified teachers cannot be underemphasized. Teacher education is a means of providing teachers with the skills and knowledge needed to carry out their teaching responsibilities (Osunde & Omoruyi, 2004). Teacher education is concerned with the art of acquiring professional competencies and professional growth. It is designed to produce highly motivated, sensitive, conscientious and successful classroom teachers who will handle students effectively and professionally towards better educational achievement (Ololube, 2005a, b). According to Amedeker (2005), inadequate teacher preparation programs results in teachers' inability to demonstrate adequate knowledge and understanding of the structure, function and development of their disciplines. An effective teacher education program is thus a prerequisite for a reliable and resilient education which leads to confidence among both teachers and students as a result of effectively and professionally coordinated learning (Lawal, 2003; Umunadi and Ololube, 2014).

Teacher education programs in Nigeria are under the supervision and control of governmental organizations. The National Commission for Colleges of Education (NCCE) (2013) has responsibility for teacher education in Nigeria delivered by Colleges of Education. At present there are 74 Colleges of Education, of which 22 are controlled and funded by the Federal Government, 47 are controlled and funded by state governments, and 3 are owned by private agencies. The NCCE was established in 1990 to set minimum standards for all teacher education programs and accredit their certificates and other academic awards after obtaining the prior approval of the Minister. The Commission has also been given responsibility for approving guidelines and establishing criteria for accreditation for Colleges of Education in Nigeria. Nigeria's 129 universities, in contrast, are under the direct supervision of the National Universities Commission (NUC) (2013). Polytechnics, of which 9 run Nigeria Certificate in Education (NCE) programs, fall under the National Board for Vocational Colleges and Technical Education (NBTE) (2013).

**Table 1:** Status and List of Institutions that Offer Teacher Education Programs in Nigeria

| Institutions                            | Numbers |
|---|---------|
| Federal Colleges of Education (Regular) | 11      |

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|  |    |
|--|----|
| Federal Colleges of Education (Technical)    | 10 |
| Federal Colleges of Education (Special)      | 1  |
| State Collages of Education                  | 47 |
| Private Collages of Education                | 5  |
| Polytechnics with NCE Programs               | 9  |
| Universities with Teacher Education Programs | 89 |

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The National Teachers Institute (NTI) was established to provide refresher and upgrade courses to teaching personnel, to organize workshops, seminars and conferences, and to formulate policies and initiate programs that will lead to improvement in the quality and content of education in the country. In pursuit of this, the Institute has initiated training and retraining programs to help unqualified primary school teachers receive the qualifications now required. Recently, the Institute also embarked on an NCE program through a Distance Learning System (DLS). Lastly, the Institute provides training for the Pivotal Teachers Training Program (PTTP) also by means of a DLS. The PTTP was introduced in 2002 as a means of producing teachers to fill the gap in teacher supply for the Federal Government's newly introduced Universal Basic Education (UNBE) (Osunde & Omoruyi, 2004).

The requirements for admission to teacher training differ depending on the type of institution. Colleges of Education require prospective candidates to have at least three credits in senior school and two other passes. At the university level, prospective candidates must have five senior school credits that include the chosen major teaching subjects. Prospective College of Education and Polytechnic students are required to sit for and pass the Polytechnic/College of Education Matriculation Examination, while prospective university students are required to pass the Joint Admission and Matriculation Board Examination (Moja, 2000).

#### **4. ITs/ISs and Teacher Education**

Many Nigerian teachers have been unable to find effective ways to use technology in their classrooms or any other aspect of their teaching and learning life. In terms of an explanation, teachers often note that cite their use of technology in the classroom has not been encouraged and that they have not been well trained in the use of ITs/ISs as teaching tools and a means for educational sustainability (Ololube, 2006), notwithstanding the specifications in the National Policy of Education (FRN, 2004). Nigeria as a nation has come late and slow to the use of ITs/ISs in all sectors, particularly education. This is a result of chronic limitations brought about by both economic disadvantages and government policies. These factors have a direct impact on the nation's educational development.

In a 2005-2006 study by Global Information Technology (2005), the Networked Readiness Index (NRI) was used to measure the degree of preparation of 115 economies for participating in and benefitting from ITs/ISs development. Nigeria ranked 90<sup>th</sup> out of the 115 countries surveyed. The United States of America topped the list, followed by Singapore, Denmark, Iceland, Finland, Canada, Taiwan, Sweden, Switzerland and the United Kingdom. In a similar study of 104 countries in 2004 Nigeria ranked 86<sup>th</sup> (Global Information Technology, 2004). Thus rather than showing improvement, Nigeria's readiness is declining. Slow or limited access to basic ITs/ISs equipment, low Internet connectivity, inadequate computers, and poor use of audiovisual materials and equipment (films, slides, transparencies, projectors, globes, charts, maps, bulletin boards, programmed materials, information retrieval systems, and instructional television) in teacher education programs are very real barriers to the effective and professional development of teachers in Nigeria (Ololube, 2006). Administrators and instructors must thus make educational technology an integral part of teaching and learning so as to provide a clear demonstration of how the use of instructional technology tools can address the personal and general objectives of teaching and learning in Nigeria.

In recent years the integration of ITs/ISs in university teaching, and particularly in teacher training programs, has been the topic of much discussion (Larose et al., 1999) as ITs/ISs has impacted the quality

and quantity of teaching, learning, and research in traditional and distance education institutions around the world. In concrete terms, ITs/ISs literacy has enhanced teaching and learning through its dynamic, interactive, and engaging content, and has provided real opportunities for individualized instruction (Newhouse, 2002a). Information and communication technology has the potential to accelerate, enrich, and deepen skills, motivate and engage students in learning, help to relate school experiences to work practices, help to create economic viability for tomorrow's workers, contribute to radical changes in school, strengthen teaching, and provide opportunities for connection between institutions and the world. ITs/ISs can make education more *efficient and productive* by engendering a variety of tools to enhance and facilitate teachers' professional activities (Yusuf, 2005). To Newhouse (2002b), technology is further developed to solve problems, improve living standards and to increase productivity. It is reasonable to expect educational technology to be developed with similar objectives. That is, if a teacher selects the most appropriate educational technology, student learning can be optimized and an increase in the value of the outcome obtained (Ololube, 2014).

Newhouse (2002a) explains educational productivity as a concept most happily found in economics textbooks where the productivity of a worker or economic unit is defined by dividing the output (revenue) by the input (costs). This is generally more difficult to define for the education industry since the output is not easily measured, particularly in monetary terms, to enable its comparison with costs. Nonetheless, Newhouse offered a helpful definition of output as the quality and quantity of learning demonstrated by students, or learning outcomes.

The concept of teacher ITs/ISs literacy is theoretically unclear and changing in that the precision of the definition depends on whether it occurs at the level of operational abilities or at other levels. Most contemporary authors tend to center the definition of ITs/ISs literacy on a few core competencies or abilities, which might then determine whether teachers know or do not know how to use ITs/ISs instructional material. Ideal definitions go beyond this to include the ability to prepare and use a selection of appropriate and operational ITs/ISs materials, and the ability to identify and efficiently affect specific student purposes in order to build knowledge and develop critical and creative thinking. Teachers committed to improving their competence in ITs/ISs are likely to contribute, directly or indirectly to the growth of student's achievement (Ololube, 2014).

Teacher education and training is a means for professional updating, which deals with all developmental functions, directed at the maintenance and enhancement of one's professional competence and literacy. Teacher education and training must support the idea that ITs/ISs is an important factor in teachers' job effectiveness and professional development. Studies concerning staff training and education clearly demonstrate the need to offer teachers better opportunities to develop their ITs/ISs based knowledge in order to support this effectiveness (Kautto-Koivula, 1993, 1996). Teachers need techniques, tools and assistance that will help them to develop ITs/ISs based projects and activities designed to elevate the level of teaching in required subjects and in turn improve student learning and academic achievement (Aduwa-Ogiegbaen & Iyamu, 2005).

Newhouse (2002b) has classified the educational impacts of the use of ITs/ISs along five dimensions. These are:

- Students Attributes [ITs/ISs Capability, Engagement, Achievement of Learning Outcomes]
- Learning Environments Attributes [Learner-centered, Knowledge-centered, Assessment-centered, Community-centered]
- Teacher Professional ITs/ISs Attributes [Vision & Contribution, Integration & Use, Capabilities & Feelings]
- School ITs/ISs Capacity Attributes [Hardware, Connectivity, Software, Technical Support, Digital Resource Materials]
- School Environment Attributes [Leadership & Planning, Curriculum Organization, Curriculum Support, Community Connections, Accountability]



In contrast to many of the studies citing the benefits of ITs/ISs teacher training, Larose et al. (1999) argue that regardless of the quality of ITs/ISs equipment available to teachers and independent of the quantity of courses they have taken in their undergraduate studies, the transfer of acquired competencies and learning into practice is poor. The major impact of education on the educated, in fact, remains at the level of the "private" use of these technologies and not in their integration into daily teaching practices. In their findings, many of the educated, no matter the level of education, are computer literate but do not use technologies in their teaching because of their fear that the rate of obsolescence of the hardware and/or software will make their task more complex and interminable.

## **5. Discussion**

Theoretical and personal observation evidence suggests that teacher training programs provided by Nigerian institutions of higher education are hindered by their ineffective use and provision of ITs/ISs instructional materials. Although, based on observation, teacher preparation programs have slightly impacted the level of performance of Nigerian teachers this has not been to the extent needed to meet UNESCO's (2005) Millennium Development Goals (MDGs) for education. It might be deduced that there is a considerable relationship between ITs/ISs integration and usage and the poor standard of teacher education programs in general which invariably affect the student and in-service teachers' classroom performance. Yusuf's (2005) study, for example, found that most teachers in Nigeria do not have the needed experience and competence in the use of computers for educational or industrial purposes. Most, in fact, lack competence, skills and knowledge in basic computer and software operations. Yusuf found no significant difference between male and female teachers in their experience in using ITs/ISs materials, their levels of proficiency in computer operations, and their use of common software. Furthermore, the introduction of computer education into Nigerian secondary schools in 1988 has largely been unsuccessful as a result of teacher incompetence. Studies (e.g., Yusuf, 2005) have recognized that teachers' ability and willingness to use ITs/ISs materials and integrate these into their teaching is largely dependent on the quality of professional ITs/ISs development received.

Teachers trained in today's teacher education programs are not technologically equipped to meet the challenges of the 21<sup>st</sup> century and carry out their duties in line with global transformations in science and technologies. Existing curriculum designed for the training of student teachers in Nigeria does not include the practical usage of ITs/ISs materials such as computers, software, slides, and overhead projectors. In situations where computers are provided, training is based only on theoretical models. Student teachers rarely come into contact with ITs/ISs instructional materials, including those in the department of educational technology proper.

The institutions responsible for the provision of teacher education programs provide programs within the confines of the mandate given to them by federal and state governments through various bodies that coordinate their activities. Their ability to be effective is dependent, for the most part, on the policies set by these bodies and the availability of funds for the purchase and maintenance of much-needed ITs/ISs equipment. According to Osunde and Omoruyi (2004), the greatest problem faced by teacher education programs is inadequate funding coupled with a lack of library facilities and inadequate teaching/learning materials. This may account for much of the limited effectiveness of the teacher training programs. It is possible as well that some of the hardship faced by these institution, and their inability to develop an effective and proficient ITs/ISs literate teaching cadre, is as a result of corrupt practices by both federal and state government officials on the one hand, and the regulatory bodies and officials in teacher education institutions on the other.

## 6. Conclusion and Recommendations

Technological changes over the past three decades have rendered teacher education and training more important than ever. Teacher education programs around the world, however, are struggling to keep up with the new demands placed on them by the 21<sup>st</sup> century classroom. They are working, albeit slowly, towards providing their graduates with the knowledge and skills needed in evolving marketplaces and sophisticated learning environments, and to prepare teachers for lifelong learning. In order to meet these challenges, many countries have begun to focus concurrently on expanding access, improving internal efficiency, promoting the quality of teacher teaching and learning, and improving system management (Haddad & Jurich, [n.d]).

Quality education is seen as the main instrument for social, political and economic development of a nation. Thus the strength, security and well-being of Nigeria rest squarely on the quality of education provided for its citizens. Education has enabled a steady supply of human resources for national economies, especially in the west where education is seen and accepted as an effective instrument for success. It is thus essential that we recognize that teachers are indispensable for successful learning about ITs/ISs, and learning and teaching through ITs/ISs to improve the standard of education in Nigeria.

ITs/ISs is an important instrument in the development of quality teaching and learning in educational systems around the world, as well as a means for fundamentally transforming existing school principles and practices to better prepare students to meet innovations in the global arena. Achievements in ITs/ISs penetration and usage in Nigeria teacher education programs are dependent on the recognition, by federal and state governments and educational authorities, of the importance of ITs/ISs application to education for sustainable development. This recognition must manifest as useful policies and the provision of sufficient funds on the one hand and the implementation of policies by coordinating bodies and the institutions themselves on the other. It is clear that secondary school students in Nigeria are already far behind their peers in developed countries and that the digital divide continues to grow (Aduwa-Ogiegbaen & Iyamu 2005). Federal and state governments, through The National Universities Commission (NUC) and the National Commission for Colleges of Education (NCCE), must thus invest heavily in the institutions that offer teacher education programs. Such an effort will create an enabling environment in which teacher education programs can strive to produce highly qualified and ITs/ISs literate teachers that will help to make the integration and use of ITs/ISs in schools a success.

Teacher education institutions in Nigeria must assume leadership role in revolutionizing education or be left behind in the wake of rapid technological changes. Accordingly, for Nigerian education to reap the full benefits of ITs/ISs in learning, it is essential that student teachers and in-service teachers are able to effectively use ITs/ISs tools for learning. As noted by Newhouse (2002a, 2002b) and UNESCO's (2002) with emerging technologies, the teaching profession is evolving from emphasis on teacher-centered, lecture-centered instruction to student-centered interactive learning environments. Designing and implementing successful ITs/ISs enabled teacher education program is thus the key to fundamental, wide-ranging educational reforms.

Teacher education institutions and programs must provide leadership in new teacher education models, pedagogies and tools for learning through an effective strategic plan. That is, leadership in teacher education programs should be visionary about conceiving a desired future state, which includes the depiction of where and what the teacher education program should be in the future, without being constrained by such factors as funding and resources. It must then work backward to develop an action plan to bridge the gap between the current and desired state (Ololube, 2014).

This paper sought to provide an understanding of the impact of ITs/ISs on teacher preparation so as to support the nurturing of a new caliber of teachers whose professional abilities are key to the development of a struggling economy. This is so because the purpose of teacher education is no longer simply to convey a body of knowledge, but to teach how to learn, how to problem-solve and how to blend the old with the new. It is therefore imperative to establish innovative programs and curriculum that will address the challenges of



teacher education in a globalized world.

This study proposes that Colleges and Faculties of Education undertake a strategic planning analysis to determine their strengths, weaknesses, opportunities and threats (SWOT). As part of this analysis, they should first determine the intellectual capabilities needed to cope with current complexities in teacher education programs. Second, they will need to set priorities for teacher education programs according to the present and future needs and demands of Nigeria's citizenry. Third, they must be on the lookout for opportunities to improve and guarantee the quality of education. Finally, Colleges and Faculties of Education must be creative and prepare themselves for the challenges of the 21st century in line with the MDGs for both education and sustainable development.

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