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Availability and Use of ICT in South-Western Nigeria Colleges of Education *(Pp. 315 331)*

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Abstract

This paper investigated the level of availability and use of ICT in some South-western Nigeria Colleges of Education. The study revealed low level of usage of ICT gadgets and non-availability of some ICT equipments. The data for the study were gathered through a two page questionnaire administered to 200 respondents who were accessible in the School of Education in all the Colleges of Education in the South-Western part of Nigeria. In total, 180 questionnaires were retrieved which represents 90% return rate. At the same time, the data were analyzed quantitatively using SPSS. The results of the survey on College of Education staff on the level of availability, use of and perception of the impact of ICT on teacher education in Nigeria revealed and suggested a low level of usage of ICT gadgets; non-availability of ICT equipment and that the respondents were disgruntled with the sluggish use and integration of ICT.

Keywords: ICT; Teacher education programmes; Pre-service teachers; South-Western Parts of Nigeria.

Background to the problem

ICT is a generic term that refers to technologies which are being used for collecting, storing, editing and passing on information in various forms (SER, 1997). A personal computer is the best known example of the use of ICT in education, but the term multimedia is also frequently used. Multimedia can be interpreted as a combination of data carriers, for example video, CD-ROM, floppy disc and Internet and software in which the possibility for an interactive approach is offered (Smeets, 1996). Multimedia now includes a flash drive. information and communication technologies (ICTs) have become key tools and had a revolutionary impact of how we see the world and how we live in it. This phenomenon has given origin to the contemporary and advances in our ways of life. ICT is having a revolutionary impact on educational methodology globally

The following are the functions of the use of ICT in education as described in literature (SER, 1998, Moonen and Kommers, 1995, Pilot, 1998).

1. ICT as *object*. It refers to learning about ICT. Mostly organised in a specific course. What is being learned depends on the type of education and the level of the students. Education prepares students for the use of ICT in education, future occupation and social life.
2. ICT as an '*assisting tool*'. ICT is used as a tool, for example while making assignments, collecting data and documentation, communicating and conducting research. Typically, ICT is used independently from the subject matter.
3. ICT as a medium for teaching and learning. This refers to ICT as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. It appears in many different forms, such as drill and practice exercises, in simulations and educational networks.
4. ICT as a tool for organisation and management in schools.

Educators at the teaching profession (especially at the tertiary level) need to be able to exploit the potential of ICT to meet his or her teaching objectives. Educators at the College of Education level must not only equip themselves but equip trainees to evaluate examples of ICT, both during their training and in their future employment; to make sound judgements about when, when not and how to use it, and to become confident and competent users of it.

The pervasiveness of ICT has brought about rapid changes in technology, social, political, and global economic transformation. However, the field of education has not been unaffected by the penetrating influence of information and communication technology. The fact that ICT has impacted on the quality and quantity of teaching, learning, and research in teacher education the world over cannot be over-emphasised. ICT has, therefore, provided opportunities for student teachers, academic and non-academic staff to communicate with one another more effectively during formal and informal teaching and learning (Yusuf, 2005b, pp. 316-321).

Although it is recognised resources will differ from school to school, opportunities to create effective learning and teaching environments makes it necessary for tutors to not only talk about ICT in the classroom but also to model best practice by demonstrating different ways in which technology can enhance the delivery of ICT. ICT within the context of ICT teaching should be used to create stimulating and motivating leaning environments and provide a breadth of experiences to trainee teachers. Tutors should therefore provide experiences that clearly demonstrate to trainees how they too can use ICT in the delivery of ICT to the pupils they teach.

The role of the ICT tutor is therefore to enable trainee teachers to have access to the latest technologies and to give them experience of ICT in a variety of contexts during their ITT. The methods used to deliver ICT through ICT by tutors should enable trainee teachers to integrate ICT within their teaching and provide opportunities for them to use the technologies they will encounter in school.

Tutors, in order to provide for the need of their trainees, need to be aware of the current thinking about good practice. They should also have knowledge and understanding of relevant research so they can support the needs of the trainees. Ministries of education (both at Federal and States levels) and various educational organizations see the need for students to develop understandings and proficiencies in using ICT in appropriate ways to support learning and to develop appropriate technology knowledge, skills, and dispositions for the 21st century. For this to occur standards need to be determined and teachers need to have a framework to help guide them as they design learning that uses and integrates technology. The primary goal of ICT in education is to enable stakeholders in education to develop national standards for educational uses of technology that facilitate school improvement in all nations with particular reference to Nigeria. This is to

define standards for students, integrating curriculum technology, technology support, and standards for student assessment and evaluation of technology use.

The world has turned to be a global village now as a result of Information Communication Technology (ICT). Simply put, we are in the era of information age. These technologies have brought profound changes to all human endeavours. The ease of data collection, processing, transmission, and interpretation provided these technologies have engendered the flow of information across boards and between individuals, cultures, nationalities, corporate bodies and organization as never before, causing great technological, economic and social changes and binding the world ever more closely together. Murray (2003), posited that economic forecasts and business analysts predict that the 21st century jobs will require information processing skills. Development of information literacy, therefore, becomes inevitable for workers of the future.

The call for the 21st century literacy in ICT simply reflects the fact that the call for an educated citizenry and work force continues to rise to reflect changes in the society: Hardly could we not talk of involvement of ICT in all sectors of life; be in medicine, business, banking, politics, military, economics, insurance, and even education. That is the more reason we say this and that empowerment, also this and that reformation and development. If all sectors are reformed in terms of ICT, education too should not be left out. It is widely believed that education should now be ICT challenged and biased. The topic of such as availability and use of ICT in Colleges of Education has become imperative because of the fact that these institutions would produce teachers that need to teach/educate populace of values of ICT and its integration. Again by considering the teaming learners in this domain of education, in which a lecturer has to teach over five hundred (500) students at a go without use of ICT nothing or little can be achieved. Gone are those days that a teacher would stress himself/herself to the extent that he/she will no longer be useful to his/her family or society after teaching-learning process must have taken place. Education at this level should be ICT compliance as it is being found useful in other sectors such as in e-banking, e-commerce, e-mail, e-this or e-that, though we heard of e-learning of recent but its awareness and/or efficacy in Colleges of Education is seriously in doubt.

Statement of the problem

The use of Information and Communication Technology (ICT) in Nigeria education is lagging behind expectation and desire. Hence, the need to draw up and design learning process in the future and the role of ICT to support this process, with a focus on teacher training. There is the need for a powerful role of teacher training in the process of educational innovation and the implementation of ICT. The teacher training institutes such as the Colleges of Education and Faculties of Education in the University provide the teachers of the future with the assumption that teachers are the key figures in arranging learning processes.

These institutions, expectedly, anticipate new developments and prepare prospective teachers for their future role. The nature and extent to which ICT is being used in education is considered to be a result of synergy between 'top-down' and 'bottom up' processes. Institutes such as Colleges of Education where prospective secondary school teachers are being trained have to shift their focus from dealing with present education to that of 'future education'. This invariably will make teachers to be prepared and encouraged for the implementation of ICT in secondary education.

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ICT is being used as an integrated component of the learning environment, preservice teachers developed new understandings, skills, and dispositions with regard to technology integration into teaching and learning. A teacher educator is supposed to continue to develop this capacity in his work, to develop more opportunities for this type of learning within his courses, and to help the teachers in training (preservice teachers) continue to build upon what they have learned. A teacher educator, should normally ask himself how he intends to continue to be part of this capacity building?

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The role of the ICT oriented educator is, therefore, to enable trainee teachers to have access to the latest technologies and to give the preservice teachers experience of ICT in a variety of contexts. The methods that will be used to deliver ICT through ICT by tutors should enable trainee teachers to integrate ICT within their teaching and provide opportunities for them to use the technologies they will encounter in school.

Tutors, in order to provide for the need of their trainees, need to be aware of the current thinking about good practice. They should also have knowledge and understanding of relevant research so they can support the needs of the trainees. Do teachers in the Colleges of Education in the South-Western part of Nigeria possess the pre-requisites for carrying out these ICT-related tasks? How well are the teachers prepared for the task? Thus the level of availability and use of ICT in some South-western Nigeria Colleges of Education

Research questions

The main research questions are:

- 1 What is the level of availability and use of ICT in South-western Nigeria Colleges of Education?
- 2 What is the teachers' prospective role in a richly ICT-designed learning environment and what competences are required for this role?

Purpose of the study

The key assertion of this paper is that the effective use of ICTs for teacher education addresses both the problem and solution to technology based learning, seeking synergistic results that benefit pre-service teachers as they graduate and carry out their duties as teachers. Accordingly, there is the need to better design teacher education curricular and infrastructure as well as organization of programs so that pre-service teachers can better plan for unanticipated and unintended results that confront them in the classroom.

Because ICTs play a key role as enabler to help us better manage the complex information flow and to integrate such information towards effective policy formulation and planning towards the utmost maximization of human capital and potential in society. Thus, it involves the development of effective and integrated tools as well as training modules to enable their application through effective teacher education agenda (Mac-Ikemenjima, 2005).

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. The possible explanation for this lack of success by teachers is not only that the use of technology in the classroom has not been encouraging and teachers are not well trained in using ICTs in teaching as a means for educational sustainability (Ololube, 2006), but the level of the educators' exposure to the tool of ICT (the computer) has been very minimal notwithstanding the specifications in the National Policy of Education by the Federal Government of Nigeria (1998, 2004). Nigeria as a nation came late and slowly into the use of ICT in all sectors of the nation's existence more especially in teacher education. This is as a result of chronic limitations brought about by economic disadvantages and government policies. These factors have direct consequences on the nation's educational development.

In a recent study conducted by the Global Information Technology (2005), the report used the Networked Readiness Index (NRI), covering a total of 115 economies in 2005-2006, to measure the degree of preparation of a nation or community to participate in and benefit from ICT developments. Nigeria was ranked 90th out of the 115 countries surveyed. United States of America topped the list, followed by Singapore, Denmark, Iceland, Finland, Canada, Taiwan, Sweden, Switzerland and the United Kingdom and so on. Also, Nigeria was ranked 86th out of 104 countries surveyed in 2004 (Global Information Technology, 2004). This shows a decline in Nigeria's preparedness to participate in and from ICT development globally. Fundamentally, the slow access to basic ICT equipments, low internet connectivity and computers, and the inadequacies in the use of audiovisual materials and equipments including films, slides, transparencies, projectors, globes, charts, maps, bulletin boards, plus programmed materials, information retrieval systems, and instructional television in teacher education programs are barrier to the effective and professional development of teachers in Nigeria (Ololube, 2006). Therefore, administrators and trainers need to make educational technology an integral part of teaching and learning

to provide a clear demonstration of how the use of instructional technology tools can address the personal and general concerns of teaching and learning in Nigeria.

In recent times the integration of information and communication technologies (ICTs) in teacher training programs has been the topic of much debate (Larose et al., 1999), because educational systems around the world are under increased pressure to use the new information and communication technologies (ICTs) to teach students knowledge and skills they need in the 21st century. Teacher education institutions are faced with the challenges of preparing a new generation of teachers to effectively use the new learning tools in their teaching practices (UNESCO, 2002). Thus, teacher education programmes have been affected by the penetrating influence of information and communication technology (ICT). The fact that ICT has impacted on the quality and quantity of teaching, learning, and research in traditional and distance education institutions around the world cannot be over-emphasised. ICT literacy, in concrete terms, has enhanced teaching and learning through its dynamic, interactive, and engaging content; and has provided real opportunities for individualized instruction (Newhouse, 2002a)

It is practical that despite efforts by both the government to establish valuable and effective teacher education programs in Nigeria to help in the preparation of competent teachers, it has a fundamental problem which has incapacitated its development. This problem is the lack of adequate ICTs infrastructure available in the Colleges of Education and this has reduced access to ICT instructional material to faculty staff and students. Even at the school level, teachers hardly come in contact with ICT aided instructional materials. For example, Yusuf's (2005a) study which investigated teachers' self-efficacy in implementing of computer education in Nigerian secondary school found that:

- (i) Most teachers in Federal Government Colleges in Nigeria do not have the needed experience and competence in the use of computers either for educational or industrial purposes.
- (ii) A majority of male and female teachers in Federal Government Colleges do not have needed competence in basic computer operations.

- (iii) Most of the teachers in Federal Government Colleges do not have needed skills and knowledge in the use of common computer software.
- (iv) There is no significant difference between male and female teachers in their experience in using computers, their levels of proficiency in computer operations, and in their use of common software.

Today, computers with the development of the Internet facilities have become, along with the conventional information sources – teachers and book an important source of information. Its versatility and ease with which it applies itself as a teaching and learning helps make it an indispensable tools for improved reform and efficient teaching, because teaching and learning now should call for up to date information on facts and figures so that our students can compete with their counterparts at the global level. As a result of this some nations of the world have provided supports in terms of accessibility, usage, utilization and availability of ICT materials to their institutions (United States Education Support, 2001). This country, Nigeria, is matching towards technological break-through hence educational stakeholders should provide ICT materials in our institutions and these ICT should be properly integrated into school's curriculum in order to meet the need/target of the country especially that reform in education is taking place.

This paper reports empirical study on the level of availability and use of ICT materials in Colleges of Education and its implication on education.

Procedure and administration

Eight Colleges of Education were used in the zone under consideration. A survey on the availability and use of ICT materials was carried out using observation chat and interviews technique. Results from the observation are shown on Table 1.

Results

Table 1: Level of Availability and Use of ICT in Colleges of Education

	ICT Materials	%
1.	Colleges with computer	8 (100)
2.	Used for research/education purposes	2 (25)
3.	Used for administrative purposes	8 (100)
4.	Colleges connected to internet	1 (12.5)
5.	Colleges where lecturers can operate computers	2 (< 25)
6.	Accessibility of computer to lecturers	0 (0)
7.	Availability of software packages	2 (25)
8.	Colleges without computer center	6 (75)
9.	Colleges with generators for computers	8 (100)
10.	Colleges that allowed students to interact with computer	4 (50)

Remarks: Number in bracket indicates percentage.

Discussion of the findings

Less than 35% of the sampled Colleges use computers presently. Two Colleges use computers for research/educational purposes. All the Colleges use computers for administrative purposes and these computers are usually found in the Provost, Registrar, Deputy-Provost offices. Not a single one could be found in any of the H.O.D.'s offices except the offices of the Departmental heads of Mathematics/Computers. Only one College is connected to the internet and that lonely College is Oyo State College of Education, Oyo in Oyo state. Predominantly most lecturers in School of Science can operate computer and interview schedules shown that they could this through self-development. Lecturers have no access to Computers and the few computers that could be seen apart from offices mentioned above are in the Dean's office for administrative works only. Softwares such as C.D. were not available, let alone, being used at all. Six Colleges had no computer centre. Only Oyo State College of Education, Oyo and Osun State College of Education Ila-Orangun had Computer Centres the rest had only Computer Laboratory in their computer department with very obsolete personal computers. None of the Colleges, had standby generator and none was found to allow their students to interact personally with the computer. Other findings include that their General Studies in Education (GSE) on computer is taught without student appreciation of the computer.

Now that computer education and appreciation is important in order to acquaint students with this tool and also to prepare them for future jobs/assignments using computers, it is important that computers in terms of

Computer Assisted Instruction (CAI), for example, be used as teaching aids in Colleges of Education. Presently there is laxity in this area even though the National Commission for Colleges of Education recommends one computer per lecturer but the Government and the various College authorities do not provide ICT gadgets in our Colleges that should help toward this gesture notwithstanding the fact these various college authorities consider the provision as a laudable idea. High cost of ICT materials and lack of technical know-how might be another reason hence lecturers and students are continuously being denied access to a powerful and effective teaching and learning tool even for their research works (Nwosu, 1978, Okebukola, 1985; Onwuakpa, 1998). Research studies have shown that Colleges that integrate ICT into their curriculum package for teaching and learning yield positive results both for students and lecturers (US Department of Education, 2003; Fetherson, 2001). One advantage of ICT based learning is that they can be made interactive, and can provide activity based teaching methods in which students can fully involve in teaching/learning process whereby making learning residence permanently in students' memory than using texts or listening to verbal teaching. Internet, a global source of information is the most potent teaching tool of ICT gadgets. In country with few libraries poorly stocked and poor student reading/study habit – the internet provides the lecturers and students an easy access and up to date source of information that would make research and learning richer, easier and of world standard. Also, being user friendly, makes it more interesting than books and might encourage students to dig for more facts apart from what their teacher teaches them. It is therefore imperative that ICT which is not currently available and utilized in our Colleges of Education should be integrated into teacher education curriculum. Findings of this study indicate that the lecturers have not been sensitized enough to take advantages of ICT on teaching, learning and research or some of the lecturers are unwilling to be resourceful. Some of the lecturers are waiting for their College Management to train them through capacity building. This is in support of findings of Okwo (1998). Recent researches (Norman, 1999; Tirene D and Luft, 2002), has found that students whose teachers had professional acumen in ICT performed better than those whose teachers did not. Since most of the Colleges lack ICT materials and also many of the lecturers lack ICT competence, hence the National Commission on Colleges of Education (NCCE) should be commended for insisting that without a Certificate in ICT, lecturers in Colleges of education should not be denied promotion and that Government make lecturers ICT

professional training an important part of its educational policy and ensure that lecturers participate in these programs.

In conclusion, this study revealed that Government should provide Colleges of Education, apart with computers, Internet access, Lecturer ICT training programs should integrate ICT into Nigerian Teacher Education. NCCE should also help to see to the implementation through support from Education Trust Fund (ETF).

ICT-skills partly necessary for using ict in education

Looking at the afore-mentioned research results, it seems unnecessarily to argue for specific ICT-skills for teachers as a key for the problems experienced by the implementation of ICT in education. How to implement ICT in education mainly seems to be a design-problem (how does a teacher create a powerful learning environment?)

Required competences for solving this problem are defined within the concept of core problems. Core problems can be defined as the central problems and dilemmas in professional practice as regularly encountered by professionals and thus characteristic of the profession (Onstenk, 1997). Core problems are an interesting basis for education, because they define the professional core and structure and select the professional content. The professional, as an acting individual, is positioned in the centre.

To guide learning processes can be mentioned as one of the core problems of future education (compare paragraph 1.5.2). One of the dilemmas the teacher has to cope with is whether he should 'direct' students learning processes or 'leave students at their own devices'. A student has to work as independently as possible, but when should a teacher intervene? And in what way can a student accomplish the best (independent) learning activity? How should the teaching- learning process be formed to establish the best learning achievements? The teacher has to constantly consider which teaching aids or materials are most suitable to use. Other dilemmas will arise. For example, how much a teacher has to know about each ICT application (to be aware that the application is available or to know how to use it). Another dilemma concerns the question whether the teacher develops the teaching material himself or lets someone else do it for him.

A teacher requires many educational and didactical skills to deal with questions adequately (compare Ministerie OC&W, 1998). In concrete terms, it concerns matters like:

- A great pedagogical, didactical and educational psychological craftsmanship.
- To be a professional on the subject matter (vocational content)
- A large knowledge of (the application possibilities of) modern educational tools.
- Skilled to 'cut to size' of student guiding processes (e.g., formulating assignments, structuring the guiding process, assessment etc.)

The new learning environment differs from the one we are familiar with; the teacher has to cope with many more uncertainties. A curriculum in which lessons and content are fixed no longer exists. As a result, the teacher has to organise his work in another way (working in projects is mentioned explicitly). Moreover, the teacher cannot create new learning environments completely independently (anymore). He has to depend on all kinds of things like the technical infrastructure, timetables and the activities of other teachers. In doing so, the teacher loses a part of his autonomy (another core problem) and therefore, he is forced to collaborate with his colleagues in a way entirely different from that he was used to.

It requires skills like:

Teachers could learn from each other. The rapid developments of ICT require a communication network which actually can be established by the proposed approach. Teachers learn most from their own networks (learning from others, cf., Kwakman, 1999, Janssen Reinen, 1999). There is a great need especially for learning about ICT and its rapid developments. Teacher training institutes can fulfil an active role in (learning) networks, on the one hand by arranging and facilitating these networks and on the other hand by providing the knowledge from which people can learn. Additionally, the institute can develop its post-initial education in this way.

Schools and teacher training institutes experience a comparable process. Schools and teacher training institutes can learn from each other's experiences and expertise as well. They experience the same processes in designing new education. They have similar questions and face the same challenges. Co-operation based on shared responsibility for educating proper teachers requires a search for as many ways as possible to fulfil this ambition (Leenders, 1999).

ICT has many technical possibilities, but that the real innovative use of ICT is yet to be broadly adopted in Nigerian educational system. The dedication of the Nigeria government in providing technology-enhanced learning experiences for students and teachers in her schools is yet to be reflected in terms of legislation. There is no Ministerial Order that requires all teachers in Nigeria (especially at the tertiary level) who hold a first degree (at least) in addition to a Professional Certificate to demonstrate they understand the following: The functions of traditional and electronic teaching/learning technologies. They know how to use technologies and how to engage students in using these technologies to present and deliver content, communicate effectively with others, find and secure information, research, word process, manage information and keep records (as in civilized countries such as in the United States of America). (Alberta Education, 1997, p. 2)

Second, Alberta Education mandated the implementation of an ICT Program of Studies in September 2000 (Alberta Learning, 2000). It emphasized “(1) the seamless relationship between technology and subject disciplines, (2) the process nature of technology itself, and (3) the co-existence of KSAs (knowledge, skills, and attributes) for technology alongside those for the subject areas” (Jacobsen & Clark, 1999, p. 2). The program of studies further acknowledges, “Technology is best learned within the context of applications. Activities, projects and problems that replicate real-life situations are effective resources for learning technology” (Alberta Learning, 2000-2003, p. 1).

It is important that trainee teachers are well equipped to meet the challenges of ICT teaching in schools and that they are familiar with resources that impact on learning and teaching generally.

Tutors should make effective use of hardware such as computers, projectors, wireless and portable devices, e.g. PC tablets and other handheld devices including digital and video cameras, as well as the use of learning platforms for learning and teaching. Within the context of the school environment trainee teachers will be required to make effective use of a wide range of resources and preparation for these experiences must be systematically addressed.

Faculties of education have a critical role in preparing preservice teachers to work within innovative technological learning environments. Clifford et al. (2004) argued that one of the tasks of teacher education programs is to find “ways to bring educators’ attention to the implications of digital technologies

for learning, to leverage rather than to dampen their power and to bring those technologies into classrooms in increasingly meaningful, effective, innovative and just ways” (p. 11). Therefore, teacher educators within their assigned course loads must find ways to create opportunities for preservice teachers to experience and to learn how to design learning environments that integrate technology in a way that enhances and extends learning

References

- Apollonian, A, Nwosu, (2003). Integrating ICT in STM Classrooms: Status and Implications. *STAN Proceedings of the 44th Annual Conference*, 58 – 60.
- Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). "Using Information and Communication Technology in Secondary Schools in Nigeria: Problems and Prospects". *Educational Technology & Society*, 8 (1), pp. 104-112.
- Alberta Learning. (2000-2003). *Information and communication technology: Complete program of studies, kindergarten to grade 12*. Retrieved February 15, 2007, from <http://www.learning.gov.ab.ca/ict/pofs.pdf>
- Clifford, P., Friesen, S., & Lock, J. (2004). *Coming to teaching in the 21st century: A research study conducted by the Galileo Educational Network*. Report for Alberta Learning. February 15, 2007, from <http://www.galileo.org/research/publications/ctt.pdf>
- Clifford, P., & Friesen, S. (2007). Creating essential questions. Retrieved February 15, 2007, from http://www.galileo.org/tips/essential_questions.html
- Fetherson, T. (2001). Pedagogical Challenges of the World wide web. *Educational Technology Review* 8 (1).
- Global Information Technology Report (2004). "The Networked Readiness Index Rankings 2005". Retrieved 22/04/2006 from:
- Global Information Technology Report (2005). "The Networked Readiness Index Rankings 2005". Retrieved 22/04/2006 from http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/gitr_2006/rankings.pdf
http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2004_2005/

- Larose, F., David, R., Dirand, J., Karsenti, T., Vincent Grenon, V., Lafrance, S. & Judith Cantin, J. (1999). "Information and Communication Technologies in University Teaching and in Teacher Education: Journey in a Major Québec University's Reality". *Electronic Journal of Sociology* <<http://www.sociology.org/content/vol004.003/francois.html>>
- Leenders, C (1999). Samenwerken met het onderwijsveld een serieuze zaak. In *Velon: Tijdschrift voor lerarenopleiders*, nr. 20/2 maart/april, 1999.
- Mac-Ikemenjima, D. (2005). "e-Education in Nigeria: Challenges and Prospects". Paper presentation at the 8th UN ICT Task Force Meeting April 13-15, 2005 Dublin, Ireland.
- Moonen, J. & Kommers, P. (1995). *Implementatie van Communicatie- en Informatietechnologie in het onderwijs*. Enschede: OCTO, University of Twente.
- Murray, J. (2003). *Contemporary Literacy: Essential Skills for the 21st Century. The Online Educator*.
- Newhouse, C. P. (2002b). "A Framework to Articulate the Impact of ICT on Learning in Schools". Perth: Special Educational Service.
- Norman, M. (1999). Why your School Should Invest in Professional Development the Human side of School Technology. *American School Board Journal*.
- Okwo, F.A. (1998). Communicating STM with New Media: Status and Implications *STAN Proceedings*, 80 – 82.
- Ololube, N. P. (2005a). "Benchmarking the Motivational Competencies of Academically Qualified Teachers and Professionally Qualified Teachers in Nigerian Secondary Schools". *The African Symposium*, Vol. 5(3), pp. 17-37.
- (2005b). "School Effectiveness and Quality Improvement: Quality Teaching in Nigerian Secondary Schools". *The African Symposium*, Vol. 5(4), pp. 17-31.
- (2006). "Teachers Instructional Material Utilization Competencies in Secondary Schools in Sub-Saharan Africa: Professional and non-professional teachers' perspective". In *Conference Proceedings of the*

6th International Educational Technology Conference EMU, 19-21 April 2006 North Cyprus.

- Onstenk, J. (1997). *Kernproblemen, ICT en didactiek van het beroepsopleidingen*. Amsterdam: SCO-Kohnstamm Institute, University of Amsterdam.
- Pilot, A. (1998). *De student als junior medewerker*. Utrecht: IVLOS, University of Utrecht.
- SER (1997). *ICT en arbeid : advies informatie- en communicatietechnologie en arbeid*. Den Haag : SER Sociaal-Economische Raad.
- (1998). *ICT en onderwijs*. Den Haag: SER Sociaal-Economische Raad.
- Smeets, E.F.L. (1996). *Multimedia op school*. Nijmegen: Instituut voor Toegepaste Sociale Wetenschappen, Ubbergen: Tandem Felix.
- Tirene, D. and Luft, P. (2002). The Technology – Rich Classroom [American School Board Journal](#).
- UNESCO (2002). "Information and Communication Technologies in Teacher education: A Planning Guide". Paris. UNESCO.
- US Department of Education, Office of Educational Technology. (2001). E-Learning-putting a world class education at the finger tips of all children. National Educational Technology Development Plan.
- Yusuf, M. O. (2005a). "An Investigation into Teachers' Self-Efficacy in Implementing Computer Education in Nigerian Secondary Schools". Meridian: A Middle School Computer Technologies Journal Vol. 8, Issue 2.
- (2005b). "Information and Communication Technologies and Education: Analyzing the Nigerian National Policy for Information Technology". International Education Journal Vol 6, No 3, pp. 316-321.