ICT- Based Instructional Practices: An Assessment of in-Service Teachers in Ondo State

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Abstract
This study examined the availability and integration of ICT-based Instructional Practices among teachers in Ondo State Nigeria. This study adopted a descriptive survey research design. The population is made up of 32 public secondary and 26 registered private schools from which Simple random sampling technique was used to select 132 respondents for the study. Data was collected with the use of questionnaires and a checklist. The data were gathered with the aid of 5 research assistants.The study revealed that the teachers have limited opportunity to work with technology at their respective schools and they have little knowledge of ICT technologies with mean values of 2.64 and 2.70. In addition, the high standard deviation entails that, technological knowledge differed greatly among the teachers.The study recommended that ICT-based instructional should be compulsory for instructional practices among lecturers, should be motivated to use ICT-based tools for instructional practices through training and workshop on how to effectively use the available tools.

Key words: ICT-based Instructional Practices, Secondary education, Availability, and Usage.

Introduction

Technological change has become a most stable factor and ICT has intertwined with knowledge, making it dependent upon the technology. Through this alliance abstract knowledge has become the centre of the world's political economy replacing traditional concrete products. ICTs provide a means for overcoming historically intractable problems of isolation and lack of access to information and knowledge, crucial impediments to educational and socioeconomic development Ajoku (2014). Despite these awesome impact of ICT on education particularly, many teachers still adopt a 'teacher-centred' approach and do not know how to apply IT into their subjects. If this is the case; the question is how can these teachers impart knowledge of contemporary issues that can assist in the attainment of education for sustainable development? Albarrak & Al-Ghammas (2009), noted that in the process of building and developing curriculum through the use ICT there are bound to be

challenges. What are these challenges? Can these challenges hinder sustainable development? How can the challenges be dealt with in order to put in place education for sustainable development which the whole world is struggling to achieve. This study sought to provide answer to all these pertinent questions. It is expected that some of the ideas provided in the study will be contributing factors towards the attainment of education for sustainable development in Africa and beyond. Embedding the use of ICTs into the curriculum must be considered a key priority and part of national strategy for learning in an online world by every developing countries of the world. The reason for this is because we live in a technological world where information and communication technologies (ICT) are fundamental to most activities Asefeh, Mahnaz, Mina., John, Gardiner, & Peña, (2012). The importance of ICT in society is emphasized in Enabling Our Future (Framework for the Future Steering Committee (Australia, 2003) which identifies ICT literate citizens as being central to economic and social goals, to improving productivity and efficiency, and to building innovative capacity and competitiveness. The importance of ICT in schooling cannot be overemphasized. A Performance Measurement and Reporting Taskforce (2005) adopted a definition of ICT Literacy as: The ability of individuals to use ICT appropriately to access, manage and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society.

Using ICT as a tool for learning enables students to:

• "Efficiently and effectively access digital information to assist with investigating issues, solving problems and decision making
• Produce creative solutions to support learning and develop new understandings in areas of learning
• Communicate, share and work collaboratively in local and global environment understand the legal, ethical and health and safety implications of using ICT and their responsibilities as users and developers; and,
• Develop new thinking and learning skills to support learning"

Applying ICT as a tool for learning in curriculum areas enables all students to have the opportunity to become competent, discriminating, creative and productive users of ICT (Atsumbe, Raymond, Enoch, &Duhu, (2014). They are better able to achieve curriculum outcomes through effective use of ICT. They develop the knowledge, skills and capacity to select and use ICT to inquire, develop new understandings, create, and communicate with others in order to participate effectively in society. Students should have the opportunity to understand the impact of ICT on society, including potential risks to health and safety.

ICTs provide a means for overcoming historically intractable problems of isolation and lack of access to information and knowledge, crucial impediments to educational and socioeconomic development. Courville (2011). ICTs have reshaped the educational landscape by transforming the content and modes of delivery/acquisition of learning as well as how the educational institutions operate. No wonder, Gagne (2013) opined in this regard that the implementation of ICT is inseparable from the process of curriculum reform and development. This is because ICT is a means to help achieving future curriculum goals by providing a learner-centered environment, as studies have shown. However, ICT is not really

well integrated into the curriculum on daily teaching particularly in Africa. Joy, &Ishikaku (2012).

Many teachers still adopt a 'teacher-centered' approach and do not know how to apply IT into the teaching of their subjects. If this is the case; the question is how can these teachers impart knowledge of contemporary issues that can assist in the attainment of education for sustainable development? It is noted that in the process of building and developing curriculum through the use ICT there are bound to be challenges. What are these challenges? Can these challenges hinder sustainable development? How can these challenges be dealt with in order to achieve education for sustainable development which the whole world is struggling to put in place. This study sought to provide answer to all these pertinent questions. It is expected that some of the ideas that provided in this paper will be contributing factors towards the attainment of education for sustainable development in Africa and beyond. Curriculum Development

In any educational system, the level of available resources places a restriction on the degree to which any new subject can be introduced into the school curriculum, especially where only the most basic facilities have so far been provided (UNESCO/IFIP, 2000). ICT is of such importance to the future industrial and commercial health of a country that invest in the equipment, teacher training and support services necessary for the effective delivery of an ICT-curriculum which is expected to rank high in any set of government priorities. The curriculum proposed by any country in African need to take account of these resource issues and specifies minimum requirement for effective delivery in different circumstances.

A Model for ICT usage in Teacher Education
Welliver's Instructional Transformation Model (Welliver 1990) has teachers progressing through five hierarchical states in order to integrate ICT effectively. Figure 1 below shows these five states.

1. Familiarisation	Teachers become aware of technology and its potential uses.
2. Utilization	Teachers use technology, but minor problems will cause teachers to discontinue its use.
3. Integration	Technology becomes essential for the educational process and teachers are constantly thinking of ways to use technology in their classrooms
4. Reorientation	Teachers begin to re-think the educational goals of the classroom with the use of technology
5. Revolution	The evolving classroom becomes completely integrated with technology in all subject areas. Technology becomes an invisible tool that is seamlessly woven into the teaching and learning process.

Figure 1: Welliver's instructional transformation model

The Wellivermodel presumes that integration of ICT proceeds in a linear manner from the initial familiarization with the technology to the utilization of technology, then moves towards the beginnings of manipulation and eventually to more innovative ICT usage.

Shelley (2004, pp. 6.10-6.11) argues that with proper training in using technology teachers:

- Create relationships between active learning and active teaching
- Develop an appreciation and an understanding of the potential of technology
- Learn to be authors of multimedia software
- Develop leadership skills and become role models for successful integration
- Understand the power of technology integration
- Design integrated curriculum activities
- Learn the benefits of technology in the classroom
- Develop ownership of the technology through authentic experiences
- Learn to motivate students with technology
- Achieve success by becoming informed and reflective decision makers
- Become advocates for technology integration

These criteria for effective use of technology suggest that there are a number of complex interactions between the user and the technology and that these interactions are not explicitly linear, as suggested by Welliver. Every educator looks at integrating technology with the education process.

Integration of ICT-based Instructional Practices

The study of Atsumbe, Raymond, Enoch and Duhu (2014) depicts that lecturers and students in Federal University of Technology, Minna, had computers and laptops and can access the internet but, they do not use them for teaching and learning. This suggests that possession or availability of ICT resources is one thing while utilization of the resources is another.

The trend of integrating ICT-based tools towards online classes and educational opportunities has even become so prevalent that there are universities which consist of only online classes, allowing a teacher to complete an entire course of study through distance learning (Dempsey & Van Eck, 2007). Second, the use of distance learning is not limited to the university setting, but also found in school site, district, and state levels of professional development for teachers, with the emergence of web-based conferences and seminars. In addition, internet based technology allows for teachers to form their own learning communities that are not confined to the local school site (Courville, 2011). For example, science teachers may use a wiki or content delivery system to network and share information with teachers at other schools both within and beyond their local school district. Even more exciting, is the premise that teachers can not only receive information and training from a central authority, such as district or state personnel, but that teachers may develop content and share their information amongst their peers. This leads to situations of reciprocal teaching and mentorship that are part of a larger informal learning community. In terms of design, online learning communities allow for a multitude discussions and socialization that

adhere to a constructivist learning principle, in which people effectively learn information when experiencing and defining knowledge through social contexts (Dempsey

ICT-based Instructional Practices in Secondary schools

In order to integrate ICT into teacher education in a developing country such as Nigeria, the educational leadership needs more fundamental changes, i.e., moving the centralized decision making process to a more decentralized system where the schools are given the authority to implement changes with regards to their needs and possibilities (Makewa, Kuboja, Yango&Ngussa, 2014).

ICT usage in education is different between industrialized and developing countries. While developed countries have invested heavily in ICT integration in education and made it possible for educator to have access to the latest updates in the teaching fields, developing countries are lacking behind due to number of economic, social, and infrastructural limitations (Kommalage&Gunawardena, 2008).

Marshal and Taylor (2005) indicated that "Unless we get a greater level of access and adoption of ICT for education.We will miss the opportunity to turn the "digital divide into a digital opportunity particularly for those who risk being left behind and being further marginalized." The integration of ICT has brought about a paradigm shift in the process of teaching and learning from teacher centered to student centered whereby the teacher passes the information quicker and in a more understandable manner (Ajoku, 2014).

Yusufu, Kajuru and Musa (2014) support this when they say the potential powers of ICT-based tools usage in the teaching/learning process have contributed to a change from traditional instructional methods to modern ways of teaching which emphasize on learner's active participation.

The study of Sharma, Gandhar, and Sharma (2011) concludes that the integration of ICT-based instructional practices helps to keep students updated and enhances teacher's capacity, creating a live contact between the teacher and the learner through internet, emails and e-learning. Joy and Ishikaku (2012) argue that "teachers whose responsibility is to build the nation through their transfer of knowledge and skills acquired through education and training must be ICT competent.

Statement of the Problem

Teaching as a process is a sophisticated mix of knowledge, skills, behaviour and attitudes, and thereby requires sophisticated teaching and learning approach. Best global practices have been emphasized. As a result, teacher training colleges are supposed to be driven by best global practices which are based on research and innovations. One of such innovation is ICT-based instructional practices. Most Schools in Nigeria are still in the process of integrating these best global practices, which has not been completely successful, thereby preventing teachers of its use during teaching-learning process. However past studies have focused on effects of ICT on student's academic performance while there are few studies that investigates the availability and integration of ICT-based instructional practices in teaching and learning in Nigerian schools. Therefore, the study assessed the ICT-based instructional practices of in-service teachers in selected colleges in Ogun State, Nigeria.

Purpose of the Study

The main purpose of this study is to investigate the ICT-based Instructional Practices in line with the best practices globally being used in Secondary schools. The specific objectives of the study are to;

1. Examine the availability of relevant ICT-based tools used for teaching and learning in Ondo State secondary schools;
2. Determine the level of integration of ICT-based instructional in Ondo State Secondary Schools for teaching and learning in the study area.
3. Determine the pedagogical competence of teachers in the use of ICT in teaching and learning?
4. Assess the views of teachers on how ICT can enhance the learning of science subjects

Research Questions

The following research questions will be answered in this study;

1. What are the available ICT-based tools used for teaching and learning in Ondo State Secondary Schools
2. What is the level of Use of Technological Tools in Teaching of Science Courses
3. What is the pedagogical competence of teachers in the use of ICT in Ondo State secondary schools
4. What are teachers' perceptions of how ICT utilization can enhance the learning of science subjects in Ondo State Secondary schools?
5. What is the level of the use of web tools to support learning in Ondo schools?
6. What is the level of Science teachers' technological knowhow?
7. What are the Available of ICT Resources in Teaching and learning of core Science subjects in schools

Methodology

This chapter provides a framework of action for the study. It focuses on research design, population of the study, sample and sampling techniques, research instrument, validity and reliability of the instrument, data collection, and data analysis.The study employed both the descriptive and explorative research designs. The study is descriptive in nature because, the data interpretation is followed by explanation on responses. The study is also explorative; it explores more information on ICT and its benefit to students, teachers and administrators the choice of this design was dependent on the nature of the data to collect and the variables.

The population is made up of 32 public secondary and 26 registered privateschools' science teachers, ICT instructors and science students in Ondo west local Government State.The study population from which the sample was drawn for the study consists of 32 public secondary and 26 registered private schools in Ondo West local government area of Ondo state. Out of these public secondary schools, 6 schools were taken from urban areas and 2 schools from rural area while in the private schools, 3 schools were taken from the urban areas and a school from rural area, through judgmental sampling method and on which questionnaires were administered. The total number of staff in the public secondary schools is 294. However, 40 science teachers were selected from public

schools while 20 in private school which indicates that 5 respondents from each school, 5 students were also selected from each school and 12 ICT instructors were randomly selected making a total of 132 respondents.

A research instrument titled: The use of ICT in Teaching and Learning of Science Subjects in Secondary Schools (TITLSSSS) was constructed to provide relevant information the present state of ICT facilities in secondary schools, particularly how ICTs are utilized and their impact on teaching and learning of science subjects in schools. An observation inventory was also   used to generate quantitative data from the various sources, quantifying all the aspects of ICT usage in schools.
The items on the questionnaire were subjected to scrutiny using experts in educational measurement and evaluation/test items to ensure both face and content validity. Their expertise advice and suggestions were carefully incorporated in the final copy of the questionnaire that was later pilot tested.

The reliability of   the research instrument was determined using test re-test method for a pilot study in two secondary schools from the twelve sampled schools. The instrument was administered to 30 science teachers and 10 students twice an interval of two weeks. The coefficient of reliability of 0.85 was obtained which was considered high enough for reliability. The instrument was further subjected to a further critiquing at a training of experts on ICT held at NIEPA ICT department and necessary corrections were made before the field work.

The researcher personally visits the selected secondary schools in company of trained research assistants during data collection. This was done in order to make it possible to complete all aspects of ICT usage in schools' analysis format and Observation Inventories personally by the researcher and the research assistants as well as to ensure that the instruments get to the right persons at the right time. This method is preferred because the study involves first hand observation of ICT resources available in the selected schools. Apart from this, personal visitation by the researcher will make it possible to get more accurate data than collecting information by other means. In addition, this method will facilitate the high rates of return of questionnaires. In all, about 132 questionnaires were distributed while 132 were returned. The percentage returned is   100%

Data Analysis

The analysis of data collection for this study involves the use of both descriptive and inferential statistics. Descriptive analysis of data was carried out using simple percentages, while hypothesis formulated were tested using t-test analysis. All the hypotheses would be tested at 0.05 level of significance.

Table 1 Available ICT-based tools in School

Technological Tool	Mean	Std. Deviation
Personal Computers	1.62	0.83
Learning management system	1.23	0.47
Audio equipment	1.77	0.93
Digital photo camera	1.43	0.78
Mobile Phones	2.39	0.86
Projection systems	1.33	0.61
Television	1.73	0.89

Table 1 shows that, with exception of digital camera, projection system and learning management system, the rest of technological tools were either within or above the mean. Mobile phones were found to be more accessible than other technological tools; having the highest mean on a 3 points likert scale where 1 = *Not available*, 2 = *restricted access* and 3 = *free access*. The overall mean for the accessibility to technological tools lied between unavailability and restricted access ($M = 1.64$), meaning that most of technological tools were either unavailable or had restricted accessibility. The low access to various technological tools that support teaching and learning of science is considered to have affected the opportunity of the core science teachers to use technological tools to support their teaching and learning.

Table 2 Use of Technological Tools in Teaching of Science Courses

Technological Tool	Mean	Std. Deviation
Personal Computers	2.43	1.75
Learning management system	2.07	1.59
Audio equipment	2.54	1.65
Digital photo camera	2.11	1.67
Mobile Phones	3.83	2.23
Projection systems	1.82	1.32
Television	3.12	2.07

Table 2 shows the extent to which different technological tools were used by the teachers. The use of projection systems, learning management system, the use of digital photo camera, personal computer and audio equipment were all having the lowest usage rate with their mean values below 3.0 on a 6 Rating scale. Where 1 = "*Never*", 2 = "*rarely*", 3 = "*Less than half a time*" 4 = "*half the time*", 5 = "*more than half the time*" and 6 = "*Almost always*". Other technological tools such as the use of mobile phones and televisions were having values which were above the mean. The overall use of ICT by the core science teachers was low ($M = 2.56$). The above analysis implies a low level of technology use by teachers in Ondo West local government.

The table further revealed a high standard deviation for the use of all technological tools, with mobile phones and television having the highest standard deviations. This indicates that, the core science teachers had different opinions on the usability of these tools;

whereby some of them reports to be using while others report to have not used. The disparity in the use of ICT tools in teaching and learning process was thought to be caused by the differences in accessibility to those learning tools.

Table 3 Pedagogical Competency of the Teachers

Competency	(%)	Ranking
Technological Knowledge	70	1
Content Knowledge	58	7
Pedagogical knowledge	63	5
Technological Pedagogical knowledge	64	4
Technological Content Knowledge	66	3
Pedagogical Content Knowledge	60	6
Technological Pedagogical and Content Knowledge	68	2

Table 3 shows that technological knowledge, technological pedagogical and content knowledge and technological content knowledge had the highest IIR with values 70%, 68% and 66% compared to other components. Content knowledge had lowest IIR of 58%. These findings suggest that the teachers were missing the knowledge of bringing the three components of ICT together in an integrated manner. This made them incapable to integrate technology pedagogy and content and thus incompetency in the use of ICT in teaching and learning of science subjects in schools.

Table 4 Teachers views on how ICT enhances learning of Science

Competency	(%)	Ranking
ICT enhances learning of Science	62	1
ICT helps to meet various needs of the science students	60	3
ICT helps in lesson planning	58	4
ICT makes the lesson enjoyable	62	1

Table 4 shows that all the items had a IIR value above 50% on a 5 points scales, where 1 = *strongly disagree* and 5 = *strongly agree*, it was found from data that, the use of ICT in lesson planning had the lowest IIR of 58%. In general, most of the teachers agreed that use of ICTs makes them more effective in their teaching, i.e. ICT enhances effective teaching by making them more organized in their lesson planning and meeting various needs of students.

Teachers largely agreed that with the use of internet and technology, their lesson plans are better off and enjoyable, Therefore, it appears that teachers' perceptions toward ICTs in teaching science subjects are encouraging, where most of them showed positive perception on computer use in teaching and instruction. It is believed that, teachers can see the value of the ICTs in enhancing teaching and learning, and they are positive towards further integration of technologies into classroom instruction. The general feeling was that science teachers believe there are tools which motivate students and enhance their scientific

understanding by improving investigative practical work. Thus, the students and their teachers as well have the opportunity to evaluate and identify possible misconceptions or enhanced conceptual understanding.

Table 5: Use of Web Tools to Support Learning

Technological Tool	Mean	Std. Deviation
Google as search engine	2.79	1.71
Wikis	1.29	0.53
Weblogs	1.47	1.14
social learning communities e.g. Facebook	2.63	1.61
Email	2.23	1.46
Chat	2.64	1.66

Table 4 shows that only the use of Google search engine, Chat and social learning communities were above the mean on a 5 points Rating scale with Google search engine having the highest mean value of 2.79 closely followed by chat and social learning communities with mean values of 2.64 and 2.63 respectively. Other facilities, such as Wikis, Weblogs and Email including were below the mean. This analysis implies that the teachers' use of Web facilities was lying between occasionally and sometimes, which is not sufficient enough to enhance core science teachers' development of technology integration competencies.

Table 6 Science teachers' Technological Knowledge

Technological Knowledge	Mean	Std. Deviation
I can use technology without problems	3.41	1.19
I know how to solve my own technical problems	3.09	1.17
I can learn technology easily	3.86	1.18
I have the technical skills, I need to use technology	3.56	1.19
I have sufficient opportunity to work with different technologies at the school	2.64	1.25
I keep up with my important new technology	2.76	1.22
I know about a lot of different technology	2.70	1.25

Table 6 indicates theTechnological Knowledge of the core science teachers, it was discovered that the teachers have limited opportunity to work with technology at their respective schools and they have little knowledge of ICT technologies with mean values of 2.64 and 2.70. In addition, the high standard deviation entails that, technological knowledge differed greatly among the teachers.

Table 7: Availability of ICT Resources in Teaching and learning of core Science subjects in schools

ICT Resources	Not Available	Fairly Available	Available
Computers/PC in classroom	35(70)	1(2.2)	9(20)
Internet & E-mail	30(66.7)	6(13.3)	9(20)
Television Set	34(75.6)	4(8.9)	7(15.6)
Projector	38(84.4)	1(2.2)	6(13.3)
Software	34(75.6)	5(11.1)	6(13.3)
Computer laboratory	28(62.2)	6(13.3)	11(24.4)
Video Conferencing equipment	37(82.2)	7(15.6)	1(2.2)

One of the major factors affecting integration of ICT in education is the availability and adequacy of the ICT tools. If the available ICT resources are not adequate enough for both the students and teachers, full utilization of these tools may never be realized. The table above shows that all the ICT resources in the sampled schools were not available which in turn will affect the integration of ICT into teaching and learning of science.

Discussion of the Study
The findings of the study revealed that ICT-based tools are inadequately available in Ondo State Secondary schools for instructional practices. The overall use of ICT by the core science teachers was low ($M = 2.56$). The above analysis implies a low level of technology use by teachers in Ondo West local government. The study further revealed a high standard deviation for the use of all technological tools, with mobile phones and television having the highest standard deviations. This indicates that, the core science teachers had different opinions on the usability of these tools; whereby some of them reports to be using while others report to have not used. The disparity in the use of ICT tools in teaching and learning process was thought to be caused by the differences in accessibility to those learning tools.
The findings came out clear that the studied school was integrating ICT in instruction which benefited both teachers and learners. The greatest motivation for integration of ICT in education was found to be the teachers' desire to teach better. School supportive leadership played a second leading role.

Conclusion
This study has so far look at a very important, current and concern issue of curriculum development with the use of ICT for the achievement of education for sustainable development. The paper has also explored discussion on the challenges of integrating ICT into the curriculum to achieve sustainable development. In conclusion, the ultimate aim of ICT adoption now is to facilitate effective transformation of learning. Any plan of implementation which deviates from this aim is likely to result in futility. Integration of ICT with learning should be curriculum driven instead of technology driven in view of future curriculum reform. One thing that is observed nowadays is that many programs design at all education levels are for the purpose of contributing to the attainment of sustainable development. The implementation of these programs should entails building a culture among people. It must be a matter of inculcating values and shaping of attitudes and impartation of

knowledge and development of skills. Basically, therefore, emphasis should be placed on the effectiveness ICT in promoting sustainable education at all levels. To overcome challenges identified in this paper particularly in Africa, development of ICT experts who are able to tackle ICT projects successfully in both the private and public sector is highly necessary. The need has arisen for teachers of the new curriculum to be retrained in the use of ICTs to create and develop different activities to cater for different needs of individual learners.

Recommendations
Based on the findings of the study the following recommendation were made:
- It was recommended that schools need to integrate ICT in education which is the way so far viable to prepare learners to operate in the modern knowledge economy which is expected to further advance in future. Schools should play a leading role to implement ICT at the school.
- Teachers should show initiative and the school leadership should support and create an enabling teaching learning environment for teachers and students.
- The philosophy of pulling resources together and self-help could be applied and further source support from alumni and other well-wishers to facilitate ICT integration in education at school level.
- The government should support schools more by ensuring that they access electricity and internet connectivity.
- The parents and the community should also be supportive. There is a lot other schools could emulate from the studied secondary school.
- Future study should investigate specifically impact of ICT integration in students, performance of the subjects the teacher participants study, teach and means of incorporating parents and local community to support ICT integration in instruction.

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