

## The Use of Information Technology to Enhance Pedagogical Innovation in Vocational-Technical Education Delivery in Secondary Schools in Nigeria

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### Abstract

This paper examined the use of information technology as a tool for pedagogical innovation of vocational-technical education delivery in secondary schools in Nigeria. This approach if properly utilized can bring about effective teaching for the building up of the learners. It upholds that teacher education helps to promote teachers' competence and skills in information technology which in turn promotes effective teaching and learning. The relevance of vocational-technical education demands this better and innovative approach for effective teaching and learning. It could be practically difficult to develop vocational technical education programmes without an adequate application of information technology. This efficiently helps the capacity building in education as it trains both teachers and learners who are information technologically friendly. This study identifies some challenges in the application of information technology such as power failure, high cost of equipment, inadequate space/ personnel, etc., and ways forward should include teachers/learners' readiness, provision of equipment, funds, facilities and regular workshop and training. The paper concludes that vocational-technical education if well handled by competent and skilled teachers can result in national development and better the future of the new generation. The author has recommended that for information technology to serve as an efficient and effective pedagogical innovation for the training of vocational-technical students the challenges identified should be appropriately addressed.

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**Keywords:** Information Technology, Teacher Education, Vocational-Technical Education, Teaching And Learning,

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### INTRODUCTION

In Nigeria's National policy on Education (FRN, 2013), Technical and Vocational Education is used as a comprehensive term referring to those aspects of the educational process involving general education, technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life, [FRN, 2013: 22]. Technical and vocational education is also as enshrined in National Policy on Education, FRN (2013:22-3) understood to be:

- *An integral part of general education*
- *A means of preparing for occupation fields and for effective participation in the world of work;*
- *An aspect of lifelong learning and a preparation for responsible citizenship;*
- *An instrument for providing environmentally sound sustainable development;*
- *A method of alleviating poverty (as component of Technical and vocational education).*

The above reveals the relevance of vocational-technical education. It is therefore pertinent for it to

be studied. On the other hand, Information Technology [IT] is a new form of human knowledge. This new knowledge was made possible by the development of computer, through which the world experiences enormous change and advances in the recent times.

This is an information age. Information technology is the learning and processing of information that uses electronic devices. It provides opportunities to handle texts, messages, images, numbers, graphs, instructions, sound and music and, to process information by organizing and reorganizing, sorting, analyzing, processing, storing, remembering and communicating. It can therefore be used for teaching and learning effectively. It is obvious that teachers and students/learners therefore need the effective utilization of information technology but it must be learnt before it can be applied.

The use of Information Technology to enhance pedagogical Innovation in Vocational-Technical Education Delivery in Secondary schools is key in the theme "Embracing Capacity Building Opportunities in Education, Distance Learning, Teacher Preparation and languages". Information

technology enhances pedagogical innovation use in distance learning and teacher preparation programmes at various levels especially secondary and tertiary education levels. The capacity building opportunities in education would be addressed by teachers' preparation through the use of information technological-methodological innovations. This capacity building opportunity in education is required at both global and national levels. This paper therefore, focuses on capacity building opportunities in education in the nation Nigeria which can also be applicable to other Nations.

**Teacher Education and Information Technology**

For information technology to be used to enhance teaching and learning, teachers must be trained through teacher education. The Nigerian teacher education had passed through various stages such as teachers' training schools/ colleges for the issuance of TC11, Colleges of Education for issuance of NCE; Polytechnics for OND/HND and Universities (Departments and Faculties of Education) for B.Ed., B.A.Ed/B.Sc.Ed. These institutions at different stages and times are created for teachers Education. Afe

[1993] sees teachers' education as component of any educational system that is charged with the education and training of teachers to acquire the competence and skills in teaching for improvement of the quality of teachers for the school system

Teacher training in information technology is both teacher-centered, resource- centered learning and teaching-centered as well as computer and information-based learning. The application of information technology in teaching and learning is both teacher-centered and learning/learner-centered. This two-way approach in the use of information technology makes it advantageous in teaching and learning and hence it is a Tool for Pedagogical Innovation [TPI]. This can be used for broad based integrated approach/ method in education for the teaching and learning of any subject. The goals of teachers' education and that of technical and vocational education and training (TVET) according to National policy on Education (FRN, 2013: 36, 56) include to:

Table1: Showing Teachers' Education and Technical Vocational Education/Training Goals

Goals of Teachers' Education	Goals of Technical and Vocational Education & Training (TVET)
[a] Produce highly motivated, conscientious and efficient classroom teachers for all levels of our educational system. [b] Encourage further the Spirit of enquiry and creativity in teachers [c] Help teachers to fit into social life of the community and the society at large and enhance their commitment to national goals. [d] Provide teachers with the intellectual assignment and make them adaptable to teaching situations [e] Enhance teachers' commitment to the teaching profession.	(a) Provide trained manpower in the applied sciences, technologies and business particularly at craft, advance craft and technical level. (b) Provide technical knowledge and vocational skills necessary for agricultural, commercial and economic development; and (c) Give training and impart the necessary skills to individual for self-reliance economically.
The Information Technological Teachers with Innovative Pedagogical approach	The modern Learners/students with an entrepreneurial background.

Source: Compiled with Emphasis by the author (FRN,2013:36,56)

The goals of teachers training in information technology can be achieved by enhanced teaching and learning. These categories of teachers by their level of training are capable to produce technical and vocational graduates with a good entrepreneurial background. These teachers are innovative in their pedagogical approach because of the new teaching technique acquired by information technology. The excellent teachers referred to here are highly talented, motivated, efficient, conscientious, committed, creative and with the spirit of enquiry. They are capable of producing talented entrepreneurs, men and women with technical knowledge and vocational skills for agricultural, commercial and economic development. This category of trained manpower can apply knowledge of the sciences and technologies to business establishment and succeed.

**Information Technology Enhances Teaching and Learning**

Information and Communication Technology (ICT) can be seen as the application of computer technology to information process. In this vein, Greg in Gana (2017) defined Information and Communication Technology as the handling of information using computer technology for generating, processing, retrieving, storage and dissemination of all kinds of information while James (2011) pointed out that ICT skills have to be developed by educators and learners to enhance global understanding and dissemination of relevant information in technology/vocational Education and Training (TVET) for job creation. Very importantly, the definitions point at using ICT for the enhancement of teaching and learning.

Mark (2015) lauded the importance of ICT as a reduction in the cost of processing information, ICT skills increase rate of work such as retrieval, sharing and performance. It increases the accuracy of information processing and provides uniform application of method which can be reversed for replication when necessary. For Festa (2011) ICT helps the educator/teacher or learner upload and retrieve information, improves participation in technology/vocational education, relevance of skills acquired, global accessibility to practices, professionalism and job creation.

Fluck [1996] identified five modes of ICT applications in teaching to include; Link mode, Resource mode, Support mode, Tutorial mode and Exploration and Control mode.

**Link mode:** This technology is applied in communicating between individuals. This can be done through conferencing, voice mail, etc. Persons who are far apart can communicate and discuss on-line and provide useful discussions on various academic issues (Ayotola, 2003). In this mode effective link is established for teaching and learning without minding the distance. The challenges always pose by distance; venue and other human limitations are surmounted.

**Resource mode:** This mode is mostly used in the teaching and learning of science. This technology helps teachers and learners access current data, information and assist in scientific discoveries in various avenues (kerbyson, Packwood & Joy, 2001; Agwi, 2015). Resource mode is a very effective and current in its approach especially in updating data and making teaching and learning interesting. Here, the approach has been innovative and the content of lessons upgraded.

**Support mode:** This implies the use of devices such as email, desk-top publishing, computer aided design, word processing packages; it is the most applied in the teaching of science and other educational settings (Dienye & Gbamanja, 2012; Cohen & Miyake, 1996) and learning of technical-vocational subjects and English language. In this mode science teaching and learning can be effectively handled by the use of the electronic mail. The e-mail is also useful in various educational settings. In the support mode as the name implies all information technology devices are useful but e-mail is the most effective instructional materials for constructing on-line social learning environment providing teachers and students with required information and making information sharing especially among students most effective. This mode makes communication and science language development possible.

**Tutorial mode:** This is used to present lesson appropriately. It provides the opportunity to teach and receive feedback on the progress of the learners. Here information communication and technological devices are presented appropriately based on students' level and pace. There are software packages for the teaching of science subjects to enhance teaching and learning by the teacher and school children respectively. With this innovative pedagogical approach teaching and learning become effectively handled; and Knowledge and skills are easily acquired in the process.

**Exploration and Control mode:** This mode is used to examine, experiment and build up situations. The packages for this include computer based science and games. According to Cox and Burge (1978) and Agwi (2016) with the use of resources available science students effectively use laboratories for science subjects. It uses modeling techniques for science teaching and learning. Webb (1995) and White (1987) indicated data analysis software classification, organization and categorization of activities and skills as approaches implored by this mode. White (1987) and Agwi (2016) applauded the use of information technology, indicating three major areas of application as record keeping, computer literacy and computer assisted information through skills practice, tutorial simulation, dialogue, group discussion, etc. Information technology in this respect serves as a tool for a new method (pedagogical innovation) of teaching and learning.

### **Information Technology in Vocational Technical Education**

The relevance of vocational-technical education demands a better approach to effectively handle it in terms of teaching and learning. According to Oni (2003, 1998), it could be practically impossible to improve or develop vocational technical education programmes without an adequate application of information technology. It is clear that vocational-technical education is a relevant acquisition of practical and applied skills. It involves instructions and skills that are generally needed to be employed in commerce and industry. In a clear term the introduction of information technology in vocational technical education has enhanced the method of teaching and learning and therefore contributed generally to the training and development of students in various institutions of learning thereby making teaching and learning effective. Information technology has been a tool to improve Nigerian vocational-technical education. This has promoted Nigerian economy and hence social-political development of the nation. In support of this, is the expansion of global information processing industry which has been opened unto both the developed and developing countries like Nigeria. This has provided job opportunities for many Nigerians for the

economic and social development of the nation. It is obvious that global opportunities are opening for Nigerians due to the close relationship that has been created both on economic, socio-political and technological development as well as commerce and industry.

This training has been gradually reducing the fear of technology inherent in the students and teachers. So it has been a good preparatory ground for teachers and students. This is a positive direction for education and future generation of scholars, that is, gradually migrating from analog to digital. However, this is not to say that all is well, no, far from it. There are plethora of challenges and areas that need improvement or to be discovered for a better development of the nation in all ramifications.

### **Challenges for the Application of Information Technology**

In many ways information technology has been an effective tool for pedagogical innovation in teaching and learning. Within its application and implementation, there are teething problems associated with the use of information technology in teaching and learning in Nigeria. Cox (2000) in Ayotola (2003: 3) identifies the following challenges and remedies:

1. Identifying learning aims and objectives for the pupils/students which can enhance the use of IT
2. Selecting appropriate ICT resources to meet learning aims.
3. Ensuring that the pupils/students have enough ICT skills to be able to carry out the activity.
4. Planning the timing of the activity to include non-ICT tasks such as questioning and answers, group works, pupils/students discussions and so on.
5. Planning enough lessons to enable activity to be completed.
6. Deciding on the groupings of students they should always be assisted.
7. Introduce the lesson to all the pupils/students first before working on any ICT.
8. Interspersing the ICT activity with whole class guidance and direction.
9. Allowing enough time for the pupils/students to reflect and evaluate their achievements at the end of the lesson.

Salawu (2003: 135) also identifies the challenges confronting the teachers' education and the learners in the use of information technology as follows:

- 1) Threat to the would-be users
- 2) Power failure
- 3) High cost of equipment
- 4) Inadequate number of skilled manpower

- 5) Problem of maintenance
- 6) Problem of finance
- 7) Inadequate space
- 8) Logistics problems such as centralization vs decentralization
- 9) Problem of large student population

### **Information Technology as an Effective Delivery Tool in Nigerian Secondary Schools: Ways Forward**

For information technology to serve as an efficient and effective pedagogical innovation for the training of vocational-technical students these challenges should be appropriately addressed as follows:

**Teachers' Readiness:** The teachers' place in education cannot be overemphasized, it is therefore imperative for teachers to show readiness by accepting to adopt the innovation by being committed to learning information technological principles and skills. This readiness and acceptance removes fear, mistrust and uncertainty among the teachers. The teacher should shelve pride, shame and any negative tendencies that can hamper effective learning and development of the new skills, competence and knowledge. The readiness and eagerness to acquire new knowledge, skills and competence can enhance teachers' growth hence effective teaching and learning.

**Learners' Readiness:** The students' willingness and commitment to study the principles guiding the use of information technology in learning becomes highly imperative. The students' willingness makes the application of information technology easy to understand. Readiness is a booster on both the teachers and students. There is a very interesting reciprocal encouragement between the teachers and students which promotes the use of information technology for both parties.

**Government Policy:** Government should fully support information technology by issuing policy statements pointing at the aims and objectives of information technology as a way of encouraging teachers and learners/ students. Government support can come in form of making the aims and objectives public through the media. Deliberate national policy should be made to support the use of information technology.

**Funding:** The funding of information technology programmes is important because this will encourage the management of various government sectors to support and promote such programmes that relate to information technology. Budgetary allocation should be made for information technology and related programmes.

**Provision of Equipment, Materials and Facilities:** The common and most important trend is the encouragement of the application of information and communications technology in the teaching and learning of all courses in institutions of learning. For this to be possible the necessary equipment, materials

and facilities must be made available. The effective use and the integration of information technology into education will be meaningful if those equipment, materials and facilities are provided to teachers and students.

**Institutional Support:** For the use of information technology to be fully promoted in the nation, educational institutions should give full support. The support will be made available to teachers and students who are the direct users. The administrative staff should be provided with these necessary facilities. Institution must illustrate its commitment to applying information communication technology to improve the quality of education that the institution is meant to provide. The institution must readily provide maintenance services and organizational structure and coordination of programmes. It must create an enabling environment that promotes and encourages spirit of innovation and scholarship.

**Manpower Building Capacity:** Experts should be employed or trained to handle information technology either at institutional level or privately. This manpower building programme should be deliberately packaged to produce trainers who could use government institutions to train more information technology experts. Expert's advice is highly required because it creates users' friendly environment especially for inexperience computer users.

**Regular Workshop:** It becomes imperative to organize a series of workshops/seminars for teachers to acquire knowledge and new skills. The workshop/seminar will be used to update and upgrade various principles of information communication technology. The workshop serves as an additional intuitive and motivation to teachers and other categories of participants. This helps to promote academic and professional growth of the participants who are given many expertise guides.

**Training and In-service Training:** In addition to workshops there should be a well planned training programmes for first timers and in-service training programmes for the already existing teachers to update and upgrade their knowledge and skills in information technology. For information communication technology to be effectively utilized, training and in-training programmes should be regularly on-going among all the potential users, that is, teachers, learners/students, administrators and others.

### **Integration of Information Technology into Teacher Education and Effective Delivery in Secondary Schools**

Integration of information technology into teacher education aims at making the teacher effective and efficient in using it to teach and bring about quality education. If the teacher fully embraces the information communication technology, it is believed that he or she can effectively deliver his/her lesson.

The pedagogical approach right at this point should be innovative. Osaat and Ideri (2015) explained integration of ICT in teacher education for effective lesson delivery in three waves, namely:

- (i) Teacher internal Effectiveness
- (ii) Teacher Interface Effectiveness
- (iii) Teacher Future Effectiveness

### **Teacher Internal Effectiveness (TIE)**

The teacher after acquiring all the relevant knowledge and skills put in effort in his teaching to improve on internal performance particularly through the methods (Innovative pedagogical approaches) and processes of teaching and learning. This could be seen in the teacher's achievements of planned educational goals in terms of student's learning outcomes. This wave has three models such as the Goal and Task Model (GTM), Working Process Model (WPM) and Absence of Problems Model (APM).

### **Teacher Interface Effectiveness (TIFE)**

This wave focuses on the quality performance and accountability. The quality of work is ensured through quality outcome, competitiveness and performance in schools are measured to enhance effectiveness. In this process resources are fully utilized to ensure quality and accountability. It also tries to effect continuity in learning. This wave has four models namely: Resources Utilization Model (RUM), School Constituencies Satisfaction Model (SCSM), Accountability Model (AM) and Continuous Learning Model (CLM)(Heller, 2001, Cheng, 2004, osaat & Ideri, 2015).

### **Teacher Future Effectiveness (TFE)**

People demands an education that reforms which implies that teaching and learning should bring about aims, contents, practice at different levels to ensure relevance to future. The third wave emphasizes educational reforms (more ways of teaching and learning) that can promote future effectiveness in terms of relevance and achievements of teaching and learning. In the process lifelong learning has been expected. This gives rise to a new wave "Reflective Teaching- learning wave" which requires a strong networking that strengthens teaching and learning. Teachers and learners work together to achieve the set goals of education (Cheng, 2002, Osaat & Ideri, 2015).

## **CONCLUSION**

From the foregoing, the teaching of vocational technical education involves the use of information technology which is the actual pedagogical innovation for the teacher. So for the improvement of vocational technical education the teacher must be made ready and competent enough to handle both pedagogy and the content of the vocational technical education to be able to build up competent and

skilled students for national development and building of a better future generation. To overcome the challenges in the process the following tips should be embraced. They include:

1. Identification of aims and objectives
2. Making the aims and objectives known to the learners to enhance the use of information technology.
3. Selection of appropriate IT resources for the achievements of aims and objectives of learning.
4. The teacher must ensure that the learners acquire enough skills for independent practice.
5. Lessons and all activities must be planned.
6. Appropriate groupings of the learners must be made.
7. Enough time must be allowed for learners to reflect and evaluate their level of achievements at the end of the lesson.

### RECOMMENDATIONS

- The teachers must be well trained personnel to handle effectively, both learners, the materials, that is, the information technology resources and the content for skills development in the learner.
- Appropriate rules must be applied and compliance ensured to promote achievements, national development and hence future growth and hope for better tomorrow.

### APPRAISAL OF LITERATURE REVIEW AND LIMITATION OF THE STUDY

The reviewed literature showed that authors such as Afe (1993), Festa (2011) and Mark (2015) discussed teacher's education and importance of ICT skills and teaching while Fluck (1996) and others discussed modes of ICT applications in teaching. Puyate and Agwi (2017), in their empirical study examined "An appraisal of technical education students' participation in teaching practice programme in Rivers State" instead of the duo- vocational-technical education. Majority of others see information technology as a means of bridging the gap between the teachers and learners in distance learning as a great opportunity in education. This study among others identified the uncovered areas (Gap) that are very useful in the use of information technology as a content booster, pedagogical innovative, appropriateness of lessons presentations in terms of students' levels and pace in teaching and learning of vocational-technical education. It emphasizes the provision of opportunity to teach and receiving immediate feedback on the progress of the learners. Apart from IT being science based, the study finds out that information technology can serve as a new method (pedagogical innovative) for teaching and learning. This study, above all emphasizes the

relevance of vocational-technical education and effective training of students with a better approach using information technology. Challenges were identified in the works reviewed. They were discussed and ways forward proffered which would make an improvement in the method, content, pace and coverage considering large learners' population both in the present and future generations.

This study is limited by the quality and availability of empirical studies and findings that would have provided much more reliable facts for robust discussions. Empirical studies/findings are not common to be reviewed on the topic. However, there are other numerous materials for consultations which have helped to strengthen this study.

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