Innovative Applications of Educational Technology Tools in Teaching and Learning

Blessing Foluso Adeoye, Ph.D.

Edited by:

Blessing F. Adeoye, PhD
Department of Science and Technology Education
Faculty of Education, University of Lagos, Lagos, Nigeria
docadeoye@gmail.com

Prof. Joel B. Babalola
Department of Educational Management,
University of Ibadan, Ibadan, Nigeria

&

Prof. Michele T. Cole
School of Business
Robert Morris University, Pittsburgh, USA
## Contents

List of Reviewers ........................................................................................................ ix
Foreword ......................................................................................................................... xi
Preface ............................................................................................................................... xiii
Acknowledgements ......................................................................................................... xvii
Introduction ...................................................................................................................... xix

### SECTION 1

**The Concept of Educational Technology, Need, and Significance**

- Chapter 1  The Impact of Educational Technology: Students’ Experiences and Perceptions of Educational Technology in Higher Education ........................................ 1  
  *by Nebra Nfonsang and Gary Schnellert*

- Chapter 2  Education, Technology, and Universalizing Quality Outcomes ...................... 20  
  *by Augustine Obeleagu Agu*

- Chapter 3  Integration of Technologies in Education: A Study on University of Benin Mass Communication Undergraduates .................................................. 59  
  *by Ofonmeghe Daniel, Ekhareafio, B. O. J. Omatseye & Blessed Friedrich, Ngonso*

### SECTION 2

**Utilisation of Educational Technology Tools for Teaching and Learning**

- Chapter 4  Availability and Utilisation of Information and Communication Technology Resources in Secondary Schools in Central Senatorial District of Edo State, Nigeria ................................................................................................. 93
by Eimuhi, Justina Onojerena and Ikhioya, Grace Olohiomereu

Chapter 5 Utilisation of Educational Technology as Correlates of students’ Academic Performance in Ekiti State Technical Colleges ............................................ 109
   by Ogunlade, B. O. and Babalola, J. O.

Chapter 6 Design and Utilisation of Educational Technology Resources for Improving Teaching and Learning of Technical Vocational Education and Training Programmes in Nigerian Schools ............................................ 121
   by Olabiyi, Oladiran Stephen

SECTION 3
Adoption and Integration of Educational Technology Tools in the Classroom

Chapter 7 Teen Perceptions of Cellular Phones as a Communication Tool ............................................ 145
   by Denise Jonas, Gary L. Schnellert, and Attia Noor

Chapter 8 Strategies for Effective Integration and Adoption of Educational Technology Tools into Teaching and Learning Process in Nigerian Schools ............................................ 170
   by Jennifer N. L. Ughelu & Sylvester Akpan

Chapter 9 Gender Differences in Achievement of Students Exposed to Concepts in Motor Vehicle Mechanics Work through Computer Simulation and Tutorial in Oyo State, Nigeria ............................................ 191
   by J. A. Jimoh S. A. Adebayo & I. O. Oguche

Chapter 10 Restructuring Igbo Language Classroom for Modern Pedagogy: The Use of Information and Communication Technology ............................................ 216
   by Okudo, Afoma Rosefelicia
by S. A. Oladipo & A. A. Adekunle

SECTION 4
The Cultural Factors Affecting Integration of Educational Technology Tools in Education

Chapter 12 Cultural Factors Affecting Integration of Educational Technology Tools in Education in Private Learning Institutions of Malawi.......................... 253
by Joseph Boniface Mwaimwai Maere

Chapter 13 Science Communication for Effective Teaching and Learning for Societal Impact............................. 273
by Caleb Ademola Omuwa Gbiri

SECTION 5
Emerging Trends in Educational Technology Tools in Education

Chapter 14 Using Social Media Tools to Enhance E-Learning ......291
by Michele T. Cole Blessing F. Adeoye
Louis B. Swartz & Daniel J. Shelley

Chapter 15 A Survey on Augmented Reality-Based Education .....316
by Javid Iqbal and Manjit Singh Sidhu

Chapter 16 Web 2.0 as an Innovation: Perception, Attitude, and Adoption in Tertiary Institutions in Lagos State, Nigeria ................................................................. 350
by Nathan Emanuel N. and Blessing F. Adeoye

SECTION 6
Integration of Educational Technology in Health Education

Chapter 17 Integrating Electronic Learning Technology and Tools into Medical Education and Training .............. 379
Chapter 18  Applications of Innovative Educational Technology Tools in Teaching and Learning of Health Education ... 396
  by Georgy O. Obiechina

Chapter 19  Innovative Applications of Educational Technology Tools in Nonformal and Informal Health Education ....412
  by Ekenedo, Golda O.

Chapter 20  Evidence-Based Strategies to Reduce Barriers to Web-Based Education of a Low-Income Prenatal Clinic Population in the Midwestern Hospital in Illinois, USA ................................................................. 436
  by Florence F. Folami

SECTION 7
Blended Learning

Chapter 21  Impact of Blended Learning Approach on Critical Thinking Ability and Academic Performance of Educationally Backward Students ..................453
  by Kshama Pandey and Ms Ncestu Singh

Contributors ............................................................................................................ 473
List of Reviewers

Dr. Blessing F. Adeoye, University of Lagos, Lagos, Nigeria

Pai Obanya, Emeritus Professor, University of Ibadan, Nigeria

Prof. Joel B. Babalola, University of Ibadan, Nigeria

Prof. Michele T. Cole, Robert Morris University, USA

Dr. Georgy O. Obiechina, University of Port Harcourt, Nigeria

Dr. Golda Ekenedo, University of Port Harcourt, Nigeria

Dr. Gbenga Peter Sanusi, University of Ibadan, Nigeria

Dr. Bamidele Ogunlade, Ekiti State University Ado-Ekiti, Nigeria

Dr. Florence Folami-Adeoye, Millikin University, Decatur, Illinois, USA

Dr. Abubakar, Abubakar Sadiq, Abubakar Tafawa Balewa University, Nigeria

Matthew David Fazio, Robert Morris University, Pittsburg, Pennsylvania, USA

Robert Loyal Siedenburg, University of Illinois, Urbana-Champaign, Illinois, USA

Adeneye O. A. Awofala, PhD, University of Lagos, Lagos, Nigeria

Michelle Adebukola Adeoye, University of San Francisco, California, USA
Innovative Applications of Educational Technology Tools in Teaching and Learning

Blessing Foluso Adeoye, Ph.D.

Edited by:

Blessing F. Adeoye, PhD
Department of Science and Technology Education
Faculty of Education, University of Lagos, Lagos, Nigeria
docadeoye@gmail.com

Prof. Joel B. Babalola
Department of Educational Management,
University of Ibadan, Ibadan, Nigeria

Prof. Michele T. Cole
School of Business
Robert Morris University, Pittsburgh, USA
Chapter 6

Design and Utilisation of Educational Technology Resources for Improving Teaching and Learning of Technical Vocational Education and Training Programmes in Nigerian Schools

Olabiyi, Oladiran Stephen

Introduction

In Nigeria, a lot of opportunities are available to ambitious and progressive technical vocational education and training (TVET) teachers to learn various techniques that will make their outputs more effective, while at the same time make their jobs more interesting and pleasurable. One such avenue exists to train, procure, and produce teachers that will be able to impart the required knowledge and skills to the technical vocational education students. Therefore, efforts should be made to equip the schools with technology tools, human, materials, and financial resources so as to achieve the objectives of TVET programs.

Educational technology has been variously defined by different authors; however, three major areas of perception of the concept include hardware, software, and system approach. The hardware approach, which is the oldest concept, sees it as mechanizing or automating the process of teaching with devices. On the other hand the software approach looks at it from the point of view of learning theories and reinforcement principles in the design and presentation of stimulus materials. The systems approach sees it as systematic way
Blessing Foluso Adeoye, Ph.D.

of designing, presenting, and evaluating instruction. The Association for Educational Communication and Technology (AECT, 1982) gave a comprehensive definition as a systematic way of designing, carrying out, and evaluating the total process of teaching and learning in terms of specific objectives based upon research in human learning and communication and employing a combination of both human and nonhuman resources to bring about a more effective instruction. An important aspect of educational technology is instructional design, which according to Siemens (2002) is the systematic process of translating general principles of learning and instruction into plans for instructional materials and learning. This should involve real application of educational technology resources competencies in the teaching process. The Educational Resource and Information Centre (ERIC, 2008) defined educational technology as the study and ethical practice of facilitating human learning and improving teachers performance by creating, using, and managing appropriate technological resources and process.

Educational technology is aimed at the interaction process among the teacher, media, and learner, upon which all other systems are dependent. All technical education programmes planning, management, and curriculum development have in the end to justify themselves by the effectiveness of learning outcomes. The effectiveness of teaching and learning of technical vocational education programs has to meet the needs of both the individual and the society through the use of multimedia. One of the most current and crucial moves towards better educating students is the application of technology tools in all areas of studies (Albion, 2001). Multimedia has been considered as an effective media for enhancing teaching and learning process. These tools are commonly found in many schools, from elementary schools to universities. However, the world of multimedia is relatively new in some places and can be defined as the combination of different media (Howard, 1994), such as text, sound, image, and video, to convey information. To be more precise, Marshall (1999) states that multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still, and moving images (video), animation, audio, and any other media where every type of information can be represented, stored, transmitted, and processed digitally.
The common use of a technology tool is due to its functionality that brought the fundamental change for people in sending and receiving and interpreting information. Pea (1991) states that multimedia help students in many ways. It provides the context for the abstract word or explanation such as a different emotion on a human face, and to fulfill individual needs and preferences so that students can learn the material accordingly. Therefore, Teoh and Neo (2007) state that multimedia offers an alternative way of instruction to the current or traditional learning process. The new function of multimedia has led programmers to develop new software for teaching and learning process in technical vocational education and training (TVET).

Technical Vocational Education and Training (TVET)

Technical vocational education and training according to Thomson (2012) is defined as an instructional program which includes general studies, practical training for the development of skills required by the chosen occupation and related theory, in which the proportion of these components vary considerably depending on the program (vocational agriculture, vocational business, vocational home economies, and vocational technical), but emphasis is usually on practical training. By implication, vocational education helps in developing an individual’s psychomotor, cognitive, and affective skills, so that they can take their rightful place in society. Vocational education is more all-embracing than technical education. The latter is seen as a postsecondary vocational training whose primary purpose is to produce self-reliant technicians who are technical driven with affective skills in different occupations. Technical vocational education and training (TVET) is one of the recognized and effective processes by which quality, up-to-date, information, literate, and knowledgeable workers are prepared and trained for sustainable society. Both of them required educational technology tools.

The Federal Republic of Nigeria (2004) describes TVET as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, the acquisition of practical skills, attitudes, understanding, and knowledge relating to occupations
in various sectors of economic and social life. In a nutshell, TVET prepares human resources for the ever-changing world of work. The reason for this is that, for effective participation in the world of work, the study of technologies and related sciences as reflected in the description of TVET is of paramount significance that can be realized with adequate educational technology resources arrangement in TVET institutions. Practical skills can be delivered virtually via a well-organized technology tools setup; gone are the days when practical skills are taught using only hands-on learning. Programmed instruction in the form of software and interactive video made it easy for practical skills to be taught using technology tools. TVET incorporates the total learning experiences offered in educational ideas and abilities to make mature judgments and be in a position to create goods and services in the area of business education, industrial technical education, computer education, home economics education, agricultural education, and fine and applied arts education.

In a nutshell, TVET prepares human resources for the ever-changing world of work. For effective participation in the world of work, the study of technologies and related sciences is of paramount significance, and this can be achieved through educational technology resources. TVET in the views of Okorie (2001) has a good potential of creating jobs for the unemployed graduates, and reducing poverty level of the people since those who have undergone training in this area can establish their own business thereby getting income to take care of their families, and making people stand on their own economically without depending on others (self-reliance). Productive, competent, and flexible personnel are a prerequisite for further economic development. TVET though effective utilisation of education technology resources will increase expertise and capacity of technical institutions to provide effective work skills to the populace.

A quality TVET programme plays an essential role in promoting a country's economic growth and contributing to poverty reduction as well as ensuring the social and economic inclusion of marginalized communities. UNESCO views TVET as the master key to poverty alleviation and social cohesion and as central to promotion of sustainable development. An educational technology resource has
the potentials to simplify and facilitate the quality of instructional processes in our schools. Cavas, Cavas, Karaoglan, and Kisla (2009) explained that ICT supports teaching and learning processes by providing new opportunities for interaction between students and knowledge; provides students easy access to information; offers the potential to meet the learning needs of individual students to promote equal opportunity, and also promote interdependence of learning among students. Additionally, educational technology tools support holistic learning, collaborative grouping, problem-oriented activities and integrated thematic units. Teachers wishing to teach in this way will be both more efficient and effective if they employ tools to reach their goals (Dellit, 2002).

Training Resources Required for Teaching Technical Vocational Education and Training

The acquisition of practical and applied skills as well as the basic scientific knowledge that would facilitate efficient occupational efficiency requires good manipulation of skill-oriented training resources in a favorable environment. Such a learning situation can be created through effective utilisation of training resources. Furthermore, an important component in teaching TVET is training facilities. It enables an instructor or teacher to promote multiple senses of skill acquisition in TVET students, as we have seen from learning theories, the more sense stimulated in the teaching and learning process, the easier it is for students to (recall) remember what they have learned. TVET teachers and instructors have to continually bear in mind that learners learn through their senses. Some learn better by one sense or some other senses; to some, seeing is believing. To others, the sense of learning by touch, smell, and taste dominate in technical vocational education. Technology tools provide many new opportunities to address issues such as learning styles and student-centred instruction and promote higher-level thinking. One of the possible means of acclimatizing TVET to develop human resources for the ever-dynamic world of work is to focus its investment in design and utilisation of educational technology resources in the curriculum implementation process (teaching and learning). The aim of TVET is to prepare people for self-employment and to be a medium of evolution
for people to the world of work, by helping individual to have a sense of belonging in their communities. Consequently, TVET is seen as an instrument for reducing extreme poverty (Hollander and Mar, 2009). These distinctive features of TVET make technology tool application a mandatory component that can aid in achieving a sustainable and globally recognized workforce.

Within TVET learning, software such as computer-assisted instruction, Energy Performance Design System (EDPS), many programs for improving drawing, spatial ability, creativity, and writing skills are easily found within the Internet. A lot of resources can be accessed to get these materials; the most common one is CAD, while TVET teachers can adapt these tools or design his own to use in teaching.

Also, the concept of training facilities is perceived by various authors. Nwachukwu (2001) posited that skill acquisition that would facilitate occupational efficiency requires performance and a skill oriented situation. He explained that training facilities are all practical and skill acquisition resources that would facilitate the process of teaching and learning and evaluation of technical vocational education skills. He also described it as the electronic system, tools, equipment, and other resource materials that could be utilised in directing and controlling technical vocational education operations and for reinforcing the teaching and learning. He further explained that training facilities are devices developed and acquired to assist technical vocational teachers in transmitting organized knowledge, skills, and attitudes to learners within an instructional situation directed towards learning and acquisition for work. Ogwo and Oranu (2006) described training facilities as any device employed by the instructor or teacher to transmit facts, facilitate skill/knowledge acquisition, and improve an attitude, understanding of learners. The authors emphasised that training facilities include models, objects, drawings, graphs, and charts, pictures, films and specimens. And all these are found in the domain of educational technology.

Awotu-Efebo (2002) explained that training facilities comprises all available and accessible theoretical, practical, and skill-oriented resources which facilitate the learning, acquisition, and evaluation
Innovative Applications of Educational Technology Tools in Teaching and Learning

of technical vocational education teachers in transmitting the facts, skills, attitudes, and knowledge to the learners within the instructional system and as may be applied to the world of work. Awotu-Efebo asserted that they are resources or equipment which are essential in the teaching process to achieve the objective of teaching. This is in line with Olaitan (1996), who cautioned that without the use of some materials, tools, or equipment in teaching skill-acquisition programmes, certain skills that might be required for entry into some vocational occupational areas might not be imparted. It therefore means that educational technology tools are necessary for some vocational skills to be learned by TVET students.

Olowu (2002) classified training resources into human and nonhuman resources. Human resources, according to Olowu, include people who have various educational backgrounds, experiences, skills, position, and status and are engaged in the teaching and learning relevant skills. These include people who are subject specialists, such as woodworkers, home economists, auto mechanics, professionals such as doctors, engineers, nurses, and teachers or instructors among others. Nonprofessionals according to Olowu are classified as administrative support staff, cleaners, clerical officers, and semiprofessionals. Semiskilled workers include auxiliary teachers and nurse ward maids, copy typists, and laboratory attendants, among others. These categories of human instructional resources are invited as resource persons in any teaching and learning situations. Gerlac and Ely (2000) regarded instructional resources as including a wide range of materials and equipment such as motion pictures, television programmed instruction models, demonstrations, books, audiotapes, and computer-assisted stimulatory printed materials, equipment, and combination of them.

Principal tools, equipment, facilities, machines, and materials used for instructional purposes in TVET programs include the following functional library, which comprises basic reference materials, such as encyclopedias, dictionaries, modern textbooks on various subjects, a library built with facilities such as recording studies where books are recorded on cassettes, Internet facilities, and audiovisual equipment. Olaitan, Nwachukwu, Igbo, Onyemachi, and Ekong (1999) explained
that in vocational technical education, acquisition of diverse technical skills calls for utilisation of diverse training resources. This forms the basis for categorizing training materials in vocational technical education into three groups, namely: tools and equipment, fixed facilities, and consumable materials.

Tools and equipment describe all the portable and heavy instruments or mechanical devices useful for performing special operations in TVET teaching and learning situations. They are the instruments that can be handled easily while carrying out special operations as well as instructional or learning activities. Tools are usually used in transmitting knowledge in the workshop to the learners. They are used for demonstrations, for practices in the process of learning skills, and for testing skills in specified vocational areas. Equipment, on the other hand, refers to portable or heavy mechanical devices usually used for TVET operations in workshops. Equipment is more sophisticated than tools. The use of equipment is mainly on technical specialized skills, practices in the instructional and learning environment. Tools and equipment used for technical education are classified in specialized areas: automobile, building, electrical and electronics, metalwork, and woodwork.

Fixed facilities are the facilities positioned at a particular place for the performance of specified and specialized operations for providing required services. An example of a fixed facility is a building needed for numerous purposes. A workshop is meant for woodwork, metalwork, automobile, electrical and electronics operations with fixed equipment, schools, farmlands, orchards, plantations, fishponds, different livestock structures and buildings, and processing storage facilities. Consumables are materials that are utilised for machines as components of the production of observable job outcomes. Consumables are the basic materials requirement for facilitating skill development activities and practices. The special areas of TVET have a need for different consumables; for instance in woodwork, the consumables are: wood, nails, glues, wood products, paints, fittings, and fixtures among others, metalwork requires steel, electrodes, and sheet metal. Electrical operation requires consumables such as cables, nails, wire, sockets, masking tape among others (Olaitan, et al., 1999).
Application of educational technology tools in teaching both science and technology subjects according to Odumosu and Keshinro (2000) is the integration of learning aids, simulation, modeling, Internet services, lesson presentation, AutoCAD, ArchiCAD, drill and practice and computer-assisted instruction (CAI). In addition, Adewoyin (2006) indicated that ICT can be applied in producing smart drawing, semantic, GIF construction, videotape, relay chart, tool book, graphic design, and animation.

**Design of Educational Technology Teaching Resources in TVET**

Design is the human beginning of every manmade product in existence, there has to be practical or scientific reasons for this involving exercise. Design, therefore, is an intentional planning or inventing and making of an article for a particular use. According to Walton (1974) the term *design* refers to the article itself as well as the planning of its construction, operation and appearance. To Olabiyi (2005) design is viewed as a creative process of using available resources to provide what people need or want, which can be made by either hand or machine to meet people's specific need. From this definition, design must satisfy the felt need. It is purposeful creation activity resulting from creative thinking. The end result is usually a new product, either as an original creation or modification of an already existing product. If products are designed from the standpoint of function, materials, appearance, and construction technique, it is believed that those products will ever be anything but contemporary. Design as applied to educational technology in the production of teaching materials, resources, and devices, is purposeful creation or modification of existing teaching resources or materials consequent upon which new products are produced to satisfy felt instruction needs. Design is generally concerned with how things work (technology), how things look (aesthetic), and how things feel (emotions) (Olumba, 1996).

**Stages in Designing and Selecting Educational Technology Resources in TVET Programs**

Educational technology resources are being designed from the moment they come to mind. When thinking about the product, ask some
questions such as How would the product serve the purpose? How will it look like? Are there materials and tools or equipment to produce the product? How much will it cost to make the product? Because of these questions, it is essential to develop and record the mental picture and identify the stages involved in designing educational technology resources in technical vocational education and training resources. Specifically the following need to be considered:

- Determine your students’ needs and the purpose of the resources.
- Generate a design or develop ideas, develop several sketches of the product, develop a model and do some experiments, develop the sketch and model into final drawing.
- Select the materials and construct the resources using good workmanship.
- Judge the product to see it fits your students’ needs.

Educational technology resources either commercially produced or teacher-made are designed, produced and utilised for executing different types and levels of instructional objectives. It could be for a specific lesson, unit, and modules or for an entire course of study. For whatever purpose, the responsibility of selecting the most appropriate resources rests on the teacher. Superficially, making the choice could be adjudged a very simple task. In fact, it transcends ordinary selection from the abundance of competing educational resources. To succeed in this important instructional decision, the technical teacher requires good judgment, intelligence, and unique competency. These qualities are desirable because selection and utilisation of an unsuitable educational resource exert far-reaching adverse effects on the learners. On one hand, it could constitute a great distraction to learning rather than attracting the users. In the same vein, hearing may be blocked instead of being facilitated. Apart from the above effect, there are other factors that are important and worthy of consideration in selecting educational resources for instructional purposes. These, among others factors, include attributes of the instructional resources, individual differences among the learners, instructional objectives, class size, availability of infrastructural amenities, teachers’ capability in handling the teaching resources, learner’s cultural background.
nature of the learning task, and the enabling task. Other factors include durability, portability, currency, availability, maintenance and service, cost, ease of operation, safety, aesthetic, and availability of support personnel. In addition to the above variables, a requisite knowledge of the psychology of human learning is an essential criterion for selecting instructional resources.

The Learner. The conventional classroom or workshop comprises learners with distinct and diverse biological, social, cultural, religious, and economic background. As a result, these learners possess different abilities, interests, attitudes, motivations, and rates of learning. Despite these observable differences, learners are grouped in a class or workshop under the guidance of the teacher. For teaching to be considered effective, teachers must work for the benefit of all. The teacher provides a conducive learning environment, a relevant and interesting classroom or workshop experience motivating enough for each of the learner. Thus, the consideration of the learner in instructional resources selection behooves the teacher to identify inherent differences among the learners and select the most suitable educational technology resources that will beneficial to all. Thus, the educational resources selected should be tailored to suit the nature, interest, need, and aspiration of the learners.

Instructional Objectives. Instructional objectives are the expected end results of an activity which directs the behaviour and activities involved in teaching technical education programs. Instructional objectives emphasised what teacher should prepare to achieve. Instructional objectives indicate the changes expected in the learners after completing a learning experience. Effective teaching is based upon well-defined and specific objectives stated in behavioural forms. Because learning requires active efforts of learners, the objectives must be stated in terms of activities that will best facilitate students' learning and what they should be able to do at the end of the teaching experience. Instructional objectives guide in the selection of instructional resources. As a matter of importance, the instructional objectives should be decided on the basis of available instructional resources and the teaching method to be adopted.
Furthermore, the instructional objectives suggest the activities expected of the learners and the materials to be used. Therefore, instructional objectives (affective, cognitive, and psychomotor) should guide teachers in the selection of instructional materials for instruction. In a situation where instructional materials bear no relationship on stated instructional objectives, the attainment of the objectives may prove difficult. Marrying instructional objectives with instructional materials demands thorough analysis of the lesson content to identify the important, concepts, principles, and tasks. Selection of learning contents involves listing the knowing.

Types of Learning and Tasks. A teacher’s knowledge of the types of learning and the relevant activities to facilitate them equips him better in his choice of instructional materials. This is important because a teacher in a single lesson may have to promote different types of learning from simple to complex types as concepts, principle, and problem solving. For instance, in a wood workshop, the teacher wants to teach the students how to construct mortise and tenon joints; hand tools required for making mortise and tenon joint, steps in wood preparation to the required sizes, methods of marking mortise and tenon, cutting of tenon and chiseling of mortise, trial fitting of joints. Content analysis of the lesson shows that three types of learning are involved. In hierarchical order they are: chaining, concept learning, and principle learning and problem solving. These types of learning are facilitated through discussion, demonstration, observation, and the questioning method. Therefore, instructional resources capable of enhancing the methods will also promote the various hierarchies of learning identified

Teacher Capability in Handling Instructional Resources. The ultimate goal of utilizing instructional resources in technical education is to promote or facilitate teaching and learning. This presuppose that the teacher possess the requisite competencies for effective utilisation of the instructional resources and management of instruction, oftentimes, instructional resources, especially the hardware constitute nuisance in the class resulting from the teacher’s lack of skill or inexperience in their operation. Instead of facilitating learning, such resources tend to block it and the teacher thrown into state of dilemma, confusion.
and even ridicule. The panacea is for the teacher to always strive to select instructional materials and devices which they possess enough skill and knowledge to operate. For sophisticated hardware, last-minute rehearsal prior to actual demonstration in class is important. The teacher thus evaluates his competency and certifies the device functionality. Where necessary the services of a knowledgeable technician should be employed.

**Class Size.** The Federal Republic of Nigeria (FRN, 2004) recommended that the class size should be 1:40; in reality a laboratory should enroll an average of twenty students. The FRN (2004) emphasised that for effective participation of students in practical work, the teacher-students ratio shall be kept at 1:20. This consideration relates to the number of learners in the class and the physical dimensions of the classroom. Some instructional materials have the potency for large and small group instruction while others are best used for small groups. For instance, in a large lecture theatre that accommodates about five hundred to one thousand students, projected aid such as film, film strip, transparencies, and slides are suitable. In such a large class, multiple screen can be used. Others like chalkboards and other types of boards, flip charts, specimens, among others are ideal for small groups. For visual materials, visibility and clarity should predicate their use.

**Cost.** Before deciding on the use of any instructional material or device for classroom or workshop instruction, the financial involvements should be ascertained. Instructional resources should be the type that can be procured or accommodated within the limits of the funds available whether commercially produced or improvised. Where there are several alternatives, their cost effectiveness relative to performance needs to be determined. There is nothing wrong in using a cheaper instructional resource, provided it is capable of achieving the objectives of the lesson.

**Learner’s Cultural Background.** Learners in the classroom come from different cultures. Diverse as the culture may be, they exert distinct and enormous influences on the learners which subtly or overtly manifest in the class. The influences shape learners’ perceptions,
thinking, values, and interests, methods of learning, outlook in life, motivation, and belief systems. As in the consideration for individual differences, instructional resources selected to enhance learning should consider the learner’s cultural background and belief systems especially. Instructional resources that constitute a taboo in a given geographical area should be avoided. Attempt at using such materials may conceive as deliberate effort at ridiculing the people and their culture.

**Currency of the Educational Resources.** Newness of the educational instructional resources is another important pragmatic criterion that should guide the instructor or teacher in making his choice. This brings to focus the teacher currency on the substantial number of new educational resources available in the market. Knowledge of this nature is acquired through reading professional journals, attending conferences and workshops. The benefits of using current educational technology resources are innumerable. More powerful, efficient, and result-oriented methods of storing, retrieval, and dissemination of educational information in the classroom may be acquired on one hand. On the other hand, learners may acquire skills on improved methods of learning for better results. It is important that teachers and instructors should use sound judgment and intelligence devoid of prejudice in selecting the instructional resources according to need and peculiar nature of the learning content, learners and local environment.

**Qualities Required of Competent TVET Teachers in Utilising Instructional Resources**

Skillful instructors and teachers are vital to every dynamic, successful technical vocational education program. Facilities, instructional materials, equipment, and personnel with specialized technical knowledge are also needed, but without instructors and teachers competent in the art of teaching, no educational program can be completely successful.

**Competent in the Subject Contents and Instructional Materials.** There is no substitute for experience and detailed knowledge and skill in the subject being taught. The competent instructor and teacher will do a
better job of studying one lesson ahead of the class and will be more at ease with students than an inexperienced instructor or teacher. The instructor or teacher should be thoroughly competent in the skills to be taught as well as in the use of the suitable learning resources that will facilitate the skills and knowledge, and related information. This is particularly true where students are being prepared for positions involving specific and specialized tasks. Students are usually alert, capable, and are quick to appraise their instructors. The competent instructor earns their respect.

Mastery of the Techniques of Instructor and use of Instructional Materials. The competent instructor or teacher prepares each lesson with the best use of student’s time, in accordance with the instructional objectives of the lesson, ensuring that planning of the lesson is flexible enough to meet the needs of individuals in the class. The techniques of presentation of content and resources include being able to speak clearly without shouting; organize instruction and resources according to students learning capability; repeat and emphasise key materials in such a way that it stands the best chance of being remembered; conduct a demonstration skillfully using suitable instructional materials, and provide practice sessions and performance tests in such a way as to promote and develop desirable skills and attitudes.

Resourcefulness and Creativity. Only the incompetent instructor or teacher uses the same instructional resources and method all the time. The resources and methods that work well for one individual or for one class or for one lesson may not be satisfactory in another learning situation. The good instructor is alert to even the slightest evidence that confusion, misunderstanding, or lack of interest is present among the students, and is able to adjust his or her approach instantly to correct the situation. One of the reasons for varying instructional resources and procedures with different classes or individuals is that individual differ to a marked degree in native capacity, in background of experience, and in learning pattern. The rapidity with which a particular individual learns a particular subject depends to a large extent on how well he adopts his learning pattern to the method by which the instructor or teacher presents materials. Resourcefulness is demonstrated when the instructor or teacher designs a new
Blessing Foluso Adeoye, Ph.D.

Instructional resource to help illustrate a principle, uses a current event to emphasise a concept, builds an advanced project to develop his own competence in the subject he teaches, or discovers a more effective way of measuring the progress of each student.

Knowledge and Application of Evaluation Procedure. The good instructor or teacher is like the good cook who keeps testing the food to see if the flavor is right, or like the craftsman who uses the senses of sight, smell, and touch to indicate when the power tool is cutting properly and safely. The instructor or teacher must be sensitive to the way the students are responding. There must be a constant desire to find out the extent to which students are learning. This can be done periodically by examinations if the questions are designed to find out whether or not the students have achieved the objectives specified for instruction. The good instructor or teacher makes every effort to tell by the expression on the faces of the students, by the questions asked, and by other indications of the extent to which a particular idea, process, or skill is being assimilated by the learner.

Desire to Teach with Instructional Resources. The attitude of the instructor or teacher towards use of instructional resources is very important. Few occupations make such demands on the emotional and mental composition of the individual as teaching. The instructor or teacher must always be projected into the thinking of others, and must do this not in the sense of command—of ordering students to do things—but as a sympathetic and understanding guide. The instructor or teacher must show, tell, and guide patiently until the beginner has acquired the necessary competency. He must learn to transfer his interest from the subject to the students. He must make central in his thinking not what he is teaching, but what students are learning.

Ability to Develop Good Personal Relations. The instructor or teacher must learn to get along with students, supervisors, and administrators. Emotional factors influence learning. Favorable attitudes such as a feeling of confidence tend to increase the level of student achievement, while unfavorable attitudes or strong emotions such as the fear of failures may block learning entirely. It must be remembered that the instructor who has good interpersonal relations with his students can
require, and get, much more achievement from them in the long run than one who is disliked, resented, or not respected for his ability. The instructor or teacher must work in harmony with his fellow instructors and with his supervisors. Demonstrating willingness to do more than is required is a great help in earning the respect of one's associates and supervisors. In summary, the instructor or teacher needs to be friendly, cooperate with other staff, take part in social activities, complement the achievements of others, use tact and consideration, maintain good personal appearance, and be a professional—taking pride in the role and demonstrating a high degree of ethical behaviour.

Principles of Utilising of Training Resources in TVET

The utilisation of training resources involves the teacher manipulating tools, equipment, fixed facilities, and consumable materials to facilitate the teaching and learning process. Vocational and technical education skill development in students is facilitated by the use of training resources which, when properly used, serve the following: demonstrating specific skills, carrying out manually operated functions, providing supportive functions of used tools and equipment, performing mechanically operated activities, aiding students' skill-development activities; promoting students' memory development and recall, aiding the construction and production purposes and evaluating the success of skill acquisition (Olaitan et al., 1999, and Nwachukwu, 2002).

Availability of good quality educational education resources is not a sure guarantee of successful and efficient utilisation in the classroom or workshop. The instructor or teacher's personality and background in instructional resources utilisation are vital determinants to successful presentation. A poorly presented instructional resource may constitute a great hindrance in the teaching and learning process. Inadvertently, the instructor or teacher's diligent plans for an interesting and successful instruction would have been shattered. Therefore, the instructor or teacher needs to be guided by some fundamental principles in utilising educational technology resources.

Adequate Preparation. Effective utilisation of educational technology resources in TVET brings to scrutiny (and often times ridicule) the
professional competencies of teachers/instructors. The reason is simple. Good presentation indicates teacher’s/instructor’s level of preparedness, knowledge of the subject matter, classroom management and organisational skills, techniques of evaluation, and dexterity in handling the instructional resources and equipment. Amidst these relevant professional competencies to be exhibited, the instructor or teacher is inadvertently on test before the learners. To pass the noncredit examination, he needs to adequately prepare himself, the class, the environment and the educational technology resources and equipment. It is required of technical teacher to master the operational guidelines of the equipment or instructional resources and the best method of presentation. This is what instructor or teacher should rehearse in his mind and in the laboratory using the intended instructional materials before the actual presentation in the classroom or workshop. Where an assistant is needed, he should be available before the commencement of the lesson. Combining good techniques for presentation with the above preparations, ultimately, will improve the utilisation and utility of educational technology resources.

*Educational Technology Resources Must Relevant to Instructional Objectives Stated.* The major purpose of utilising any educational technology resources is to facilitate teaching and improving learning in order to realize the expected outcomes of lesson. A strong relationship should therefore exist between the instructional resources and instructional objectives. For instance, a behavioural objective which expects the learner to describe or sketch a hand plane should prompt the use of charts, maps and diagram which illustrates the features. In the same token, instructional resources such as slides, transparencies, motion picture, and television are effective in teaching task identification and procedural knowledge and concepts.

*Adapt Instructional Resources to Learner’s Instructional Differences.* Learners differ from one another. Thus, in some sense, they always require special attention. There are several approaches to cope with the problem. One common approach is to group the learners. Another approach is to apply techniques and measures that lead to individualized instruction to teach each student’s needs. Adapting instruction to meet individual needs may require utilising special
Innovative Applications of Educational Technology Tools in Teaching and Learning

methods and instructional resources. The instructional resources should be interesting and motivating to all; to enable each child to progress at his pace and ability level. Fast learners and slow learners alike should benefit ultimately from the use of instructional resources. Also, factors related to individual differences that must be considered when utilising instructional resources are the learners' background or experiences, emotional needs, and physical and psychological needs. No particular instructional resources in realities possess the potentialities for satisfying the immediate needs of all learners at any given time. Combined resource is a way out (multimedia). Multimedia approach implies the uses of more than one type of instructional resources in a given lesson, instructor or teacher needs to acquire skills on how to combine suitably different categories of instructional resources for teaching.

Educational Technology Resources Should Be Utilized When Necessary and Appropriate. There is no law that stipulates when the instructional resources should be introduced during classroom teaching or workshop practice, the point emphasised here is that instructional materials should be introduced in a lesson at the most appropriate time and when necessary provided it will achieve its objective as considered relevant in the lesson context. Instructional resources could be introduced at the beginning, middle, or end of the lesson. The choice is that of the instructor or teacher and according to his plan. Nevertheless, the most effective instructional resources are the one introduced in "the nick of time." Experience and common sense will guide the practicing instructor or teacher more than research evidence.

Educational Technology Resources Should Not Substitute the Teacher. There may be a need to warn TVET teachers in effective utilisation of instructional resources. On no account should instructional resources should substitute the instructor or teacher; rather it should serve as a good supplement. This is a common mistake among technical teachers, even the highly experienced. With this understanding, teachers will appreciate their primary goal of guiding learning in audiovisual programs (i.e., educational television and instructional television) and audio programs (i.e., radio broadcast); there must be a point when the teacher's explanation or illustration is important to students.
Summary

Technical vocational education and training has been defined as the process of teaching individuals the systematic skills, knowledge, and attitude involved in the production of specific products or services, while educational technology is the systematic, planned approach of integrating suitable instructional materials and devices into teaching-learning plan for successful attainment of clearly stated technical vocational education goals or instructional objectives. Educational technology tools are widely utilised in teaching for example, instructional usage of involve such activities as preparing for courses, searching the Internet for course contents, making presentation in the class, carrying out laboratories experiments, preparing e-mail for sending course materials and lesson contents to students.

References


Innovative Applications of Educational Technology Tools in Teaching and Learning


Blessing Foluso Adeoye, Ph.D.

Development and Management in Vocational Technical Education.
Onitsha; Cape Publishers


