ICT "TOOLS" TO IMPROVE QUALITY ASSURANCE IN AFRICA EDUCATIONAL SYSTEM (NIGERIA AS CASE STUDY)

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Abstract

This research paper uses the term "tools" to include the computer hardware, software, and connectivity put together under the title Information and Communication Technology (ICT). Authors of this research work considered Indicators of declining quality and wastage in the education system to include; high drop-out and Failure rates, rampant examination malpractices, poor reading and writing skills among students at all levels. The focus of this paper is on how qualitative education can be guaranteed in African schools through the use of ICT to reduce failure rates in examinations. This research work uses the extent to which the graduates of an educational system meet the educational set goals to determine the quality assurance. Section 1 of the paper discusses the concept ICT in related to education system; Section 2, literature review discusses educational goals, and quality assurance; Section 3 discusses the research methodology as in research framework- which is based on design of computer software refers to as "**expert tutor**" system by author to teach a topic in Biology (Sense Organs) and research methodology-compared the usefulness of expert program tutors designed by the researchers and **face-to-face** classroom teaching; Section 4 presents finding and analyses of the results; section 5 discusses the results; Section 6 gives the conclusions based on Implication of the expert tutor design on educational practice, policy and Future research directions.

Keywords: ICT (information communication and Technology), Educational System, Expert tutor, Examination, and Quality assurance.

1. Introduction

Information Communication & Technology (ICT) refers to a powerful collection of elements which include computer hardware, software, telecommunication networks, workstations, robotics and smart chips (Yekini and Lawal 2010). ICT tools can help learners to picture scientific ideas or to develop conceptual idea (Jonassen, 2002).

Since we live in information society, everyone is expected to be ICT literate which entails;

- **Awareness**: As you study ICT (computers), you will become aware of their importance, versatility, pervasiveness, and their potential for good and ill in our society
- **Knowledge**: You will learn what computers are and how they work. This requires learning some technical jargons that will help you deal with the computer and with people that work with computers. and
- **Interaction**: This implies learning to use a computer to perform some basic tasks or applications (Yekini and Lawal, 2011).

This paper examine how ICTs can be use to improve the quality assurance in Africa educational system using Nigeria as a case study. It presents and application of ICTs to teaching subjects in schools towards better performances in examination

The author of this research derived and algorithms for teaching Sense Organs in Essential Biology Text book for Senior Secondary Schools by M.C. Michael. The algorithm was coded using PHP and SQl to designed a computer software refers to as **"expert tutor''**. That imitates the normal face-to-face method of teaching that is common in all schools.

Four hundred and seventy students were sampled. The sampled students were divided into two equal groups i.e. 235 in each group. The students were used as an experimental tool to test the efficacy of expert tutor and face-to-face method of teaching.

First group were taught the topic Sense Organs with expert tutor installed on a standalone computers and the second group were taught the same topic using **face-to-face** method with teacher physically presents in the class.

The entire population of the students sampled was then put together in the same hall and the same written examination was given to them under the same condition.

The paper was marked accordingly and the result was analyzed. Result of the analyses was then discussed followed by conclusion which is based on the implication of the designed program (expert tutors) on educational practice, policy and future research directions.

2. Literature Survey

2.1 Goals of Education

What constitutes appropriate goals for education varies from one society to another.
David Perkins' 1992 paper contains an excellent overview of education and a wide variety of attempts to improve our educational system. He analyzes these attempted improvements in terms of how well they have contributed to accomplishing the following three major goals of education (Perkins, 1992, p5):

- Acquisition and retention of knowledge and skills.
- Understanding of one's acquired knowledge and skills.
- Active use of one's acquired knowledge and skills

These three general goals **acquisition & retention, understanding**, and **use of knowledge & skills**, helps guide formal educational systems throughout the world. They are widely accepted goals that have endured over the years. They provide a solid starting point for the analysis of any existing or proposed educational system. We want students to have a great deal of learning and application experience both in school and outside of school.

All three goals use the term knowledge and skills. The term **knowledge** as encompassing the full range of data, information, knowledge, and wisdom. The term **skill** is taken to mean both physical skills and mental skills. Thus, the term knowledge and skills is intended to encompass the full range of physical and mental development.

2.1.1 Education Goal # 1: Acquisition and Retention

Our current educational system can be described as "memorize, regurgitate, and forget." Students learn to "study for the test." Often the test is one in which memorization and regurgitation works well. However, the human mind has a strong propensity to forget memorized information that it does not understand and that it does not frequently use. Thus, most of what is memorized for a test

is quickly forgotten. The retention part of goal 1 is not well served by this approach to learning.

2.1.2 Education Goal # 2: Understanding

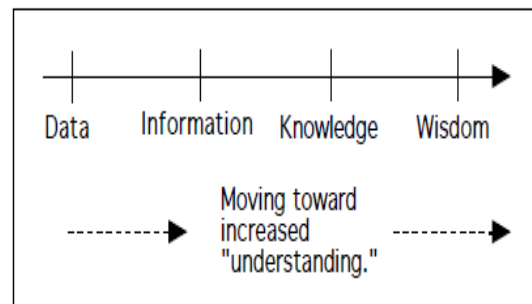In talking about understanding, it is helpful to consider the "scale" pictured below (figure1).

Figure 1: Trends of understanding

The following quotation provides definitions of the terms data, information, knowledge, and wisdom in the specific context of biology (Atlantic Canada Conservation Data Centre). The ideas from this specific discipline easily carry over to other fields.

Individual bits or "bytes" of "raw" biological **data** (e.g. the number of individual plants of a given species at a given location) do not by themselves inform the human mind. However, drawing various data together within an appropriate context yields **information** that may be useful (e.g. the distribution and abundance of the plant species at various points in space and time). In turn, this information helps foster the quality of **knowing** (e.g. whether the plant species is increasing or decreasing in distribution and abundance over space and time). Knowledge and experience blend to become **wisdom**--the power of applying these attributes critically or practically to make decisions.

2.1.3. Education Goal # 3: Active Use

One of the major goals in education is transfer of learning from a specific classroom-learning environment to other environments. We want students to be able to use their school-acquired knowledge and skills at home, at work, at play, and at school immediately, and far into the future, and in varied settings.

2.2. Quality assurances in Educational System

2.2.1. Quality and Quality Control

The worth of any educational system as an investment lies in its capability to continuously serve its customers (students, parents, employers or labor, the society) better and remain relevant. Educational planners are therefore faced with two main challenges: providing for quantity and

for quality.

Quantity is concerned with numbers, that is, getting as many citizens as possible to school within the shortest time allowed while quality is about how good or bad the products are and answers the question: What manner of education? Of the two, quantity is easier to deliver than quality. If universal free education is backed up with adequate resources (teachers and teaching facilities), school enrolment is guaranteed to increase. How to ensure quality education is the aspect that presents educational managers the most challenging task (Ijaiya, 1991).

It is in the aspect of quantitative growth that educational planners even in Nigeria can lay claim to some success though a lot is still required to be done. In the process however, quality seems to have suffered with all the attendance consequences. Yet without quality, education becomes wastage and even poses danger to the individual beneficiary and the society (Ijaya, 1991).

Indicators of declining quality and wastage in the education system include high drop-out and Failure rates, rampant examination malpractices, poor reading and writing skills among students at all levels. Evidence of wastage abounds among the teeming population of students who repeat General Certificate Examination (G.C.E) and Joint Admission Matriculation Board (JAMB) Examination every year. There is also evidence of client reaction as many parents take their children to private schools within or outside the country for those who can afford to.

In recent years, the trend in many countries has been towards restructuring of school management. Decentralization has received more attention as a means of reducing wastage and ensuring greater quality, that is, quality control is exchanged for quality assurance (West - Burnham, 1994).

Quality is perceived differently by various professionals who often use the term. While, for instance, an accountant sees the quality of a product in terms of cost-effectiveness, a customer is likely to judge it on the basis of its reliability. However, quality is something everyone considers good and wants to have (Cole, 1996).

Quality has to do with whether something is good or bad; it is about the standard of something when compared with other things. It therefore pre-supposes that there is a standard set. In manufacturing industries, standard or Quality control is therefore directed at determining the extent to which a product meets that standard (Cole, 1996) defines quality control as "basically a system for setting standards and taking appropriate action to deal with deviations outside permitted tolerances".

2.2.2. Quality Assurance or Quality Control

Quality control practices in Nigerian education are based essentially on;

- School inspection
- Monitoring
- Control

All these measures appropriate for obtaining data on policy implementation and for strategic planning, and aid public accountability, they are of little value when comes to managing classroom learning processes (West - Burnham 1994).

School inspection has been criticized for its inadequacy to assist classroom teachers to improve their performance (Tuoyo, 1999). West-Burnham (1994) also sees inspection as an external imposition which prone to rejection by teachers. This is more so when inspectors behave like tin-gods (Ijaiya, 1991).

School inspection is particularly criticized its limitations as a post-mortem examination of certain school activities, searches for lapses and wastages rather than preventing them and the seeks rectification which is often more costly (West-Burnham, 1994) terms of time, money and energy to the student, government, teachers : parents. Neither the parents nor the pupils expect failure. Most child come to school with hope and enthusiasm to learn but somewhere ale the process, many fail even though teachers are teaching.

The need to enhance productivity and minimise wastage has led to a new but "broader, organisation-wide approach to quality" away from the traditional view of quality control to quality assurance (Cole, 1996, p. 237) which has been variously termed Quality Management (QM), Total Quality (TQ), Total Quality Management (TQM) (West - Burnham, 1992; Cole, 1996; Bush and Coleman, 2000).

3. Research Methodology

3.1. Research Framework

Research framework- which is based on design of computer software refers to as "**expert tutor**" system by author to teach a topic in Biology (Sense Organs)

i. Procedure

In this paper, we use the definition: a procedure is a detailed step-by-step set of directions that can be interpreted and carried out by a specified agent. Our focus is on procedures designed to solve or help solve a specified category of problems. Remember, definition of problem includes accomplishing tasks, making decisions, answering questions, and so on. We are particularly interested in procedures that humans can carry out and in procedures that computers can carry out. Figure 2 below is designed to illustrate the overlap between procedures that ICT systems can carry out and procedures that humans can carry out. Point of intersection now gives the expert system we designed to experiment our research.
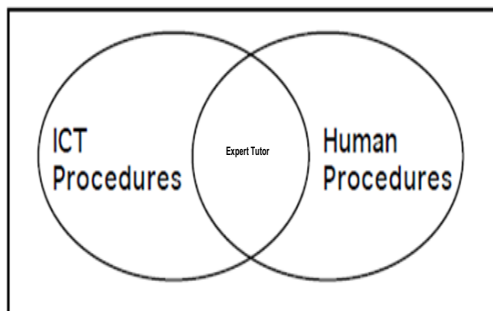
Figure 2: Overlap of ICT and Human Procedures

ii. **Types of Procedures**

In this section, we explore two of procedures:

- Algorithm. An algorithm is a procedure that **is guaranteed** to solve the problem or accomplish the task for which it is designed. You know a paper and pencil algorithm for multiplying multi-digit numbers. If you carry out the procedure (the algorithm) without error, you will solve the multiplication problem.

- Heuristic. A heuristic is a procedure that is designed to solve a problem or accomplish a task, but that **is not guaranteed** to solve the problem or accomplish the task. A heuristic is often called a rule of thumb. You know and routinely use lots of heuristics. They work successfully often enough for you so that you continue to use them. For example, perhaps you have a heuristic that guides your actions as you try to avoid traffic jams or try to find a parking place. Perhaps you use heuristics to help prepare for a test or for making friends. Teachers make use of a variety of heuristics for classroom management.

The authors use the algorithm procedure to illustrate detailed step-by-step set of directions that can be interpreted and carried out by a specified agent to teach Sense Organs in Biology for Senior Secondary Schools students. The algorithm is presented in section 3.1.3.

iii. **Algorithm for Teaching Sense Organs**

ProcedureName:- Teaching sense organ in SS 3

1.   Procedure:- trigger the system
2.   Procedure:- click on the subject
3.   Procedure:- click on module 1

 This module gives the overview of sense organs

4.   Procedure:- click on section 1--- Description of sense organs and their functions
5.   Procedure:- click on section 2----skin as a sense organ
2.1: description of skin as a sense organ
2.2: view the diagram showing components of skin

2.3: question & answer from teacher to student
Hint:
If the response by the students is at least 65% okay move to next section. If not repeat section 2
6.   Procedure:- click on section 3: Organ of smelling (Nose)
  b.   Description of nose as sense organ
  c.   Process involved in perception of smell
  d.   View the diagram of nose and its components
  e.   Question & answer from teacher to student
Hint:
If the response by the students is at least 65% okay move to next section. If not repeat section 3
7.   Procedure:- click on section 4:   Organ of Taste (Tongue)

4.1. Description of taste as sense organ
4.2. Click here to view diagram of tongue and its component
4.3. Question & answer from teacher to student
Hint: If the response by the students is at least 65% okay move to next section. If not repeat section 4

8.   Procedure:- click on section 5:   organ of sight (eye)
5.1. Description of eye and it components
5.2. Click here to view structure of eye
-       Front view
-       Vertical view
5.3. Question & answer from teacher to student
Hint:
If the response by the students is at least 65% okay move to general questions and answer. If not repeat section 1-5

 3.2.   **Research Methodology**

Research methodology-compared the usefulness of expert **program tutors** designed by the researchers and **face-to-face** classroom teaching when use in teaching students.

**3.2.1.**   **Face-Face Tutor:**

In this case the teaching is carried out with students and teacher physically present in the class and the procedure is followed as listed in section 3.1.3.
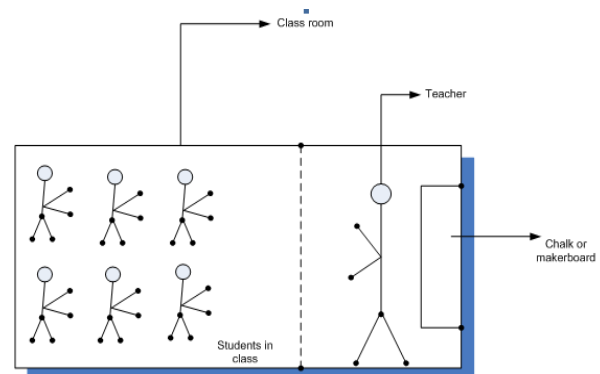
Figure 3: Face-Face Tutor

3.2.2. Expert System Tutor:

A computer based learning system a.k.a **Expert System Tutor** was designed for a class in Biology for SSS3 class. This system was designed by coding each procedures for modules discussed in section 3.1.3. The procedure is coded using PHP and Sql. The choice of the programming language is necessary in case one need to deploy the program on internet so that it can be accessed anywhere. If this system is connected to the internet this will allow the students & teacher to interact online. Model for this method of teaching as proposed by the authors is as shown figure 3.
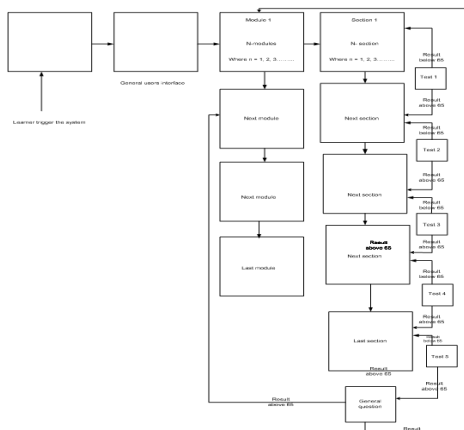
Figure 4: Expert Tutor Model

4. Finding/Case Study/Results

Four hundred and seventy students were selected from SS3 classes of the selected Secondary Schools in Lagos state, Nigeria as shown in table1:

SCHOOLS	NUMBER OF STUDENTS
EWUTUNTUN SENIOR GRAMMAR SCHOOL	70
MAFOLUKU GRAMMAR SCHOOL	48
UNITY HIGH SCHOOL	81
STATE HIGH SCHOOL ALIMOSHO	78
EJIGBO HIGH SCHOOL	26
MUSHIN GRAMMAR SCHOOL	46
IGBOBI COLLEGE	54
BADAGRY GRAMMAR SCHOOL	67
TOTAL	470

Table 1: Selected Schools for Our Experiments

The selected students were divided into 2 groups each of 235 students as in table 2. Expert tutor system was used to teach one group Sense Organs in Biology, and face-face method was used to teach the other group the same topic.

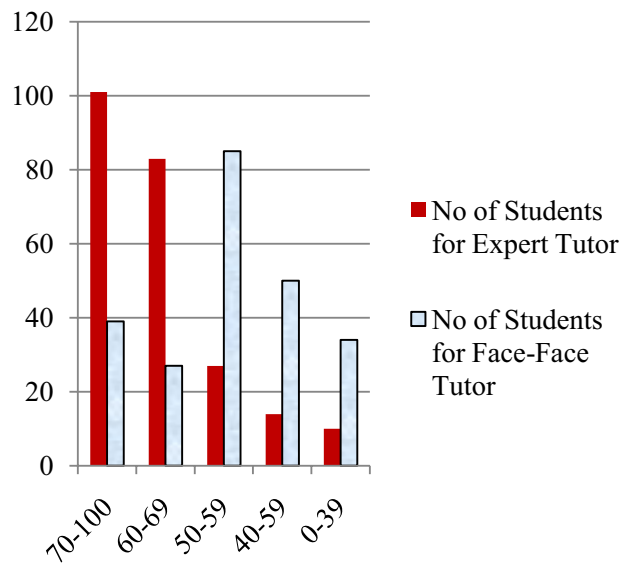| No of Students for Expert Tutor	235
No of Students for Face-Face Tutor	235
Total Number of Students	470

Table 2: Population of Students Sampled in Groups

The 2 groups were then mixed up and the same exam questions that covered the module were given to them under an exam malpractice free condition and the result is tabulated as presents in table 3.

Score Range	70-100	60-69	50-59	40-59	0-39
No of Students for Expert Tutor	101	83	27	14	10
No of Students for Face-Face Tutor	39	27	85	50	34

Table 3: Results of the Exams after the Teaching
Table 3 was then converted to column chart as in figure 5.

Figure 5: Chart for Results in Table 1
We pegged the pass mark at 50marks, which is average of the overall scores for the examination given. Table 4 gives the results of students in each group that scores 50marks and above.

No of Students for Expert Tutor	211
No of Students for Face-Face Tutor	146

Table 4: Results for score above 50%

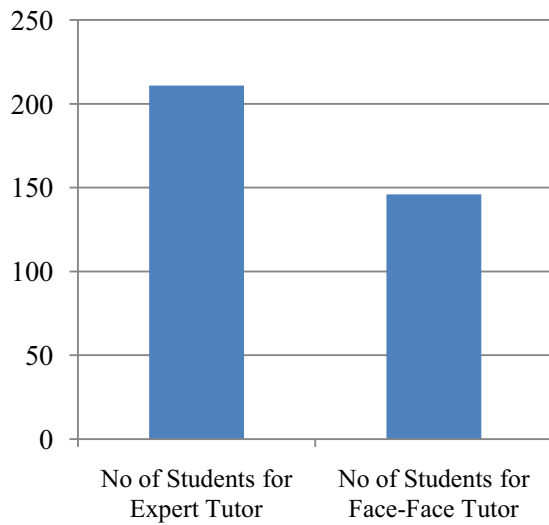Table 4 was then converted to column chart as shown in figure 6.

Figure 6: Chart for Results above 50%

Result in table 4 presents was converted to percentage as in table 5, which was then converted to figure 7.

No of Students for Expert Tutor	89.8
No of Students for Face-Face Tutor	62.1

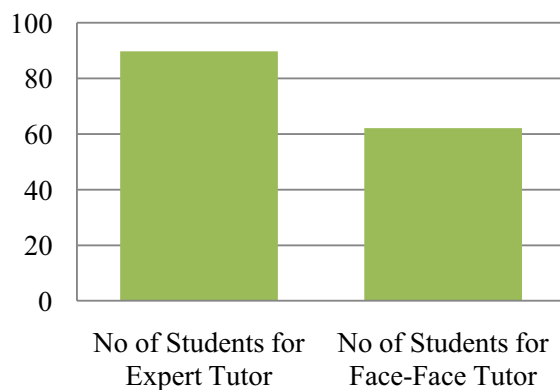**Table 5: Results (Score above 50%) in Percentage**

Figure 7: Chart for Results in Percentage

5.   Discussion of Results

From the result table 5, it was observed that students with expert system have the best results with average scores of 89.3% and students with face-face have 62.1%. With this

the researchers' then find out that expert tutor yield better result compared to face –to-face method.

In the literature review we discussed educational goals according to Perkins, 1992 as:

- Acquisition and retention of knowledge and skills.
- Understanding of one's acquired knowledge and skills.
- Active use of one's acquired knowledge and skills

We are of the opinion that educational goals to guarantee quality assurance must include **moral behaviors'**. We cannot justify moral goal from Expert System as face-to-face method is the only means by which these could be enforced i.e. discipline, enforcement of rules and ethics of teaching. This implied that people with face-to-face method may be better in terms of moral behaviour because the class is physically presents in the class to direct and control the class accordingly.

6.   Conclusions

There is no doubt that this paper has proved that expert tutors could reduce failure and promote better quality of assurance in our educational system.

Consequent to that, it is ideal that educational policy maker must integrate ICT in all level of educational system to promote quality assurance at all levels. The expert tutor of the type discussed in this paper should be adopted as supplementary to face-to-face classroom teaching.

Also Text book authors and publishers must be enforced to design an expert tutor copy in CD and sold with every textbook to be used in our schools.

Government must ensure that all schools especially from secondary level in Africa have a computer laboratory with functioning computers, having expert tutors for all subjects, installed for students to practice on their own.

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