_____

Impact of Expert System as a Tool to Improve Teaching and Learning in School

Nwigbo Stella N
Research scholar
Department/Subject:
Computer Science
Jain university

Dr. Madhu B K
HOD, Information sciences Engineering,
R.R, Institute of Technology,
Hesaraghatta Main road, Banglore.

Abstract: The capacity of information and communications technology (ICT) has grown exponentially over the last 10 to 15 years. IDA report emphasized that the information and communications technology (ICT) sector has undergone a revolution over the last decade in all developing countries. The performance of the sector has been driven by market liberalization, which has in turn stimulated private sector investment and competition. This, to a great extent has made impact on the education sector. There is no doubt, changes in the following have evolved due to ICT:

- Teaching and learning practice in institutions of any level.

New teaching ideas, approaches and methodologies have being developed, relying on ICT, for example distance education, home schooling, cross curriculum, and virtual reality.

Keywords. *Information and communication technology, liberalization, competition, Expert system, and impacts*

_____*****_____

INTRODUCTION

Teaching as a practice, presents some challenges. One of these challenges is lack of understanding by the students. Traditional means of teaching has not overcome this hence, the introduction of Expert system. This Study introduces the use of Expert system in teaching. It defines the concept, examines some literature on it, and presents how to build it and some of its benefits and challenges. It further presents some future framework for the effective use of Expert systems for the development of education.

Introducing an expert system as tool in the teaching and learning process in the Nigeria educational system is a much needed step to improving the process, this is because it is filled with a few challenges involved. The advent of computer system has definitely opened way to Computer Aided Instruction (CAI) for which an expert system is one. An expert system is a well known area of artificial intelligence which is a computerized tool designed to enhance the quality and availability of knowledge required in educational system. The general society sees CAI/expert system as inevitable and a must in teaching and learning process. Borrowing a leaf from the civilized world in their knowledge preservation and distribution, it now becomes necessary for the Nigeria educational system to adopt CAI, and especially expert to duplicate the rare knowledge and experience of a few experts in different fields of education and to place the Nigerian educational system at par with their international counterparts. Though expert system has enormous benefits, they remain un-established as a useful technology due to few research and documentation. This research work proposes that the effective introduction of Impact of expert system in teaching and learning process in Nigerian educational system should be adopted as its advantages over traditional chalk-talk method is innumerable.

Nwigbo (ud) stated that an expert system is computer software that attempts to act like a human expert on a particular subject area. it uses knowledge base of human expertise for problem solving or to clarify uncertainties where normally one or more human expert would need to be consulted. Knowledge-based expert system or simply expert system use human knowledge to solve problems that normally would require human intelligence. These expert system represent the expertise knowledge as data or rules within the computer. These rules and data can be called upon when needed to solve problem. Books and manuals have tremendous amount of knowledge but a human has to read and interpret the knowledge for it to be used. Conventional computer programs perform tasks using conventional decision-making logic containing little knowledge other than the basic algorithm for solving that specific problem and the necessary boundary conditions.

_____

_____

HOW EXPERT SYSTEM WORKS
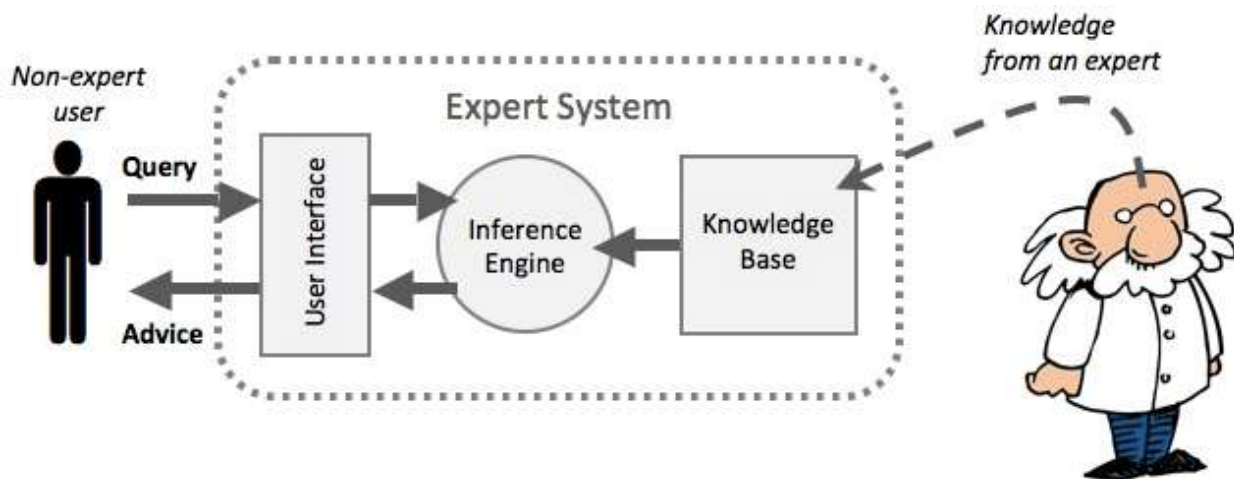
PROBLEM STATEMENT

This study is therefore to investigate into the use of Impact of expert systems as a tool for efficient teaching and learning process in the educational system in Nigeria.

CHAPTER TWO
REVIEW OF RELATED LITERATURE
2.0 INTRODUCTION

This chapter deals with the review of related literatures. And literatures will be reviewed in the following headings:

    i.   The concept of Expert System
    ii.   Expert system

Effective teaching and learning

Expert systems concept

Since Artificial Intelligence (AI) was introduced in early 1970s, the goal of AI scientists has always been to develop computer programs that can think and solve problems at the level compatible to human experts. An expert system is usually a computer program which performs complex data processing similar to evaluation made by a human expert.

The term ``expert system" could be applied to any computer program which is able to draw conclusions and make decisions, based on knowledge, represented as a database, it has. An expert system doesn't have to be a replacement for a human expert. Such systems are often used as a support when a human cannot collect all vital information due to theirs amount or complexity. That is why there is a need for systems that work in real-time and perform theirs functions faster and better then a human is able to do. There is also another reason, computer programs are much more cheaperthen human experts (not in terms of their value, which may not be compared, but maintenance: costs of educations, salaries etc.). If there is a way to duplicate a part of knowledge a human expert has, it is economical to do that using a computer program.

EXPERT SYSTEMS

Expert systems are part of a general category of computer applications known as artificial intelligence. Expert System (ES) is a Systemthat uses human knowledge stored inside a computer to solve problems that requires human expertise to solve. It is an intelligent computer programme that uses knowledge and reasoning procedures to solve difficult problems that need certain expertise to solve the problems.A computer application that performs a task that would otherwise be performed by a human expert. For example, there are expert systems that can diagnose human illnesses, make financial forecasts, and schedule routes for delivery vehicles. Some expert systems are designed to take the place of human experts, while others are designed to aid them.

EFFECTIVE TEACHING AND LEARNING PROCESS
Expert System

Traditional learning is characterized by limited time spent on various topics, limited access to teachers and difficulty in transferring lecture information to the real world situations. Meanwhile, teaching in the modern era requires teaching requires more knowledge of multiple concepts and complex relationships, enhanced interaction with students where they can explore more with the course materials. However, computer-based training has been shown to positively influence the amount of material learned, the time taken to learn it, and the enjoyment of the learning experience (Garcia et al, 1993). The rapid accessibility of high-tech graphics, animation, video and sound capabilities and the proliferation of multimedia authoring software have made it very easy to quickly produce impressive presentations and interactive modules.

CHAPTER THREE
RESEARCH METHODOLOGY

The term methodology is the overall approach and perspective to the process which outline the entire research

170

_____

plan, my research work is a descriptive research to find out new facts by using expert system in teaching the students and comparing this method with the human expert, previously the human expert has been teaching and no improvement.

This is descriptive survey method adopted in this research which enable the researcher to make use of a sample out of a large population.

The study was carried out at the University of Port Harcourt, Nigeria. Two faculties that were involved in the teaching and learning of expert related systems were selected for the study. They include Faculty of Engineering and Sciences. From the Faculty of Engineering, three Departments were selected: Mechanical Engineering, Electrical Engineering and Electronic/Computer. Whereas from the Faculty of Science, three Departments were also selected: Computer Science, Mathematics/Statistics, Physics.

3.1.1 Scope / Limitation of Study: included students in the Faculties of Science and Faculty of Engineering.
3.1.2 Population of the Study: The population of the study is One hundred and fifty students were randomly selected from each of the two faculties to give 300 respondents.

3.2.1 Simple Random Sampling. – 300 Students was randomly Selected

however, only 246 questionnaires were usable hence sample size was based on this number.

3.3 Instrumentation (Structured Questionnaire)
 3.3.1 The Instrument was Verified by Guide.
 3.3.2 Administration of Instrument

A structured questionnaire was administered to 300 students selected from the Faculty of Science and Faculty of Engineering. The questionnaire was divide into seven sections A to G. Section A elicited information on personal characteristics of respondents; section B elicited information on types of expert systems available to the teaching and learning process. Section C elicited information on expert systems used in education sector. Section D elicited information on human systems used in the study area. Section E elicited information on impact of expert systems on performance of students. Section F elicited information on impact of human systems on performance of students, while Section G elicited information on perception/satisfaction of teachers and students on application of expert systems. Data were analysed using frequency, percentage and t test.

 1.4 Collection of Data using Respondent
  1.4.1 Collection of Data using Objective
  1.4.2 Collection of Data using Hypothesis

 1.5 Collection of Data using Algorithm
  1.5.1 Other Methods that improve Teaching and Learning

Khan (2010, a) investigated into the effect of using multimedia in teaching children with varying educational needs. In his investigation, children with autism and Down's syndrome were taught with same multimedia content without any e-learning facility. It was observed that both groups enjoyed the classes but while the children with autism could convert it into learning, the children with Down's syndrome could not. It was observed that the latter group's enjoyment was limited to having fun and did not translate into learning. In his work he recommended that each group be offered different teaching strategies as their need vary due to their different conditions. This implies that the use of multimedia in teaching children is dependent on the need or problem. Different problems require different multimedia content designs.

Ahmad et al (2010), in their investigation into the result of incorporating multimedia in the teaching of mathematics, observed that students who were taught mathematics with the use of multimedia scored higher than those who were taught using only the traditional textbooks and board method. In the teaching of mathematics, the use of multimedia revealed lots of techniques in the solving mathematical problems. Plots were properly shown to the students with minimal errors in their presentations.

<u>**CHAPTER FOUR**</u>
IMPLIMENTATION PHASE 1 (RESPONDENT ANALYSIS)

In Cause of Analyzing the data based on the data obtained using respondent, we have the following results

 The respondents in the study area were first degree undergraduates and for this reason the duration of study obtainable was either 4 years (11.4%) or 5 years (78.9%) with most of the respondents falling into the latter category. The study obtained data for the CGPA of the students and from the results the CGPA of 4.00 (45.1%) had the highest number of respondents with 3.00 (30.9%), 5.00 (17.5%), 1.00 (4.9%) and 2.00 (1.6%) following in that order. This implies that the respondents as sampled, who had knowledge of expert systems, were largely above average in academic performance since the cumulative percentage of the respondents within the CGPA of 3.00 – 5.00 is 93.5%. The result also provides relevant information on the respondents' access to computers which shows that 87.0% of the respondents had access to a computer while 13.0% had no access to a computer. A large percentage of these computers were Personal computers (91.9%), while the rest were either School owned laptops (6.5%) or School owned desktops (1.6%). The above is also the reason why majority of the respondents had knowledge of Basic computer usage

_____

(94.7%) while the rest had no knowledge of basic computer usage (5.3%).

The result from table 1b showed that 65.4% of the respondents had knowledge of Expert system while 31.3% had no knowledge of expert system; furthermore, 34.6% had experience in the use of expert system while 62.2% had no experience. This thus implies that though a large percentage (above average) of the respondents had knowledge of expert systems, there yet remained an experiential gap in the use of these expert systems in the educational institution as the results show that the number of respondents who had experience in the use of the expert systems was below average.

Majority of the respondents who had experience in the use of expert systems fell within the category of Below 1 year (74.0%) while the least category was 3 – 4 years (1.6%), thus indicating that even the few respondents who had experience in the use of expert systems had not had sufficient experience to make them technically efficient in the use of expert systems. The results further showed that majority of the respondents (68.3%) had no access to other forms of artificial intelligence (A.I) with only 31.7% indicating access to other A.I's. With respect to their respective levels of access by the respondents, the other artificial intelligence they had access to includes: Natural Language processing (8.5%); Robotics (11.4%); Speech understanding (11.0%); Speech (voice) Recognition (11.0); Computer vision and scene recognition (0%); Intelligent Computer aided instructions (6.1%); Neural computing (0%); Intelligent agents (0%); Automatic programming (19.9%); and Translation of languages and summarizing news (9.3%). It can be inferred from this results that the respondents' access to other forms of Artificial Intelligence is abysmally low given that the percentages fell below average in all the identified forms of A.I stated above with the highest being Automatic Programming (19.9%).

CHAPTER FIVE

IMPLIMENTATION PHASE 2 (OBJECTIVES / HYPOTHESIS & RESULTS)

In cause of analysing the data based on the objective and hypothesis, the following results was obtained.

1. Impact of Expert Systems on Performance of Students in the study area

Results:

From the results, it can clearly be seen that the respondents agree to the fact that Expert system will be highly beneficial to them as students and to the educational system in the study area.

2. Impact of Human Expert System on Performance of Students

Results:

The results show that the respondents are clearly not satisfied with the effectiveness and efficiency of Human systems in the educational system and apparently consider the expert systems as a panacea to the present challenges. The mean scores obtained from both benefits of human and expert systems have been juxtaposed into a column chart which presents a visual delineation of the difference in the benefit of both systems.

it can be seen that out of twenty (20) listed benefits, Expert systems had higher mean scores in sixteen (16) benefits as against three (3) for Human systems, and just one (1) benefit (Benefit 14) where both Expert systems and Human Systems had the same mean score (2.5). This clearly shows that the respondents consider Expert systems to be more efficient than Human system in the educational system in higher institutions.

3. Perception/Satisfaction of Respondents on the application of Expert Systems

Results:

The result also shows that the respondents disagree to three statements which are: Expert systems will result in unemployment of teachers and so should not be employed in the teaching and learning process (2.4),Expert systems are difficult to use and mastery requires a long time (2.4), andThe implementation of expert systems in educational institutions is less exciting and activity based as against the conventional human systems (2.4). These statements are negative and seeing that the respondents expressed disagreement to them, it can be deduced that the respondents generally consider Expert systems to be of great importance and benefit to the educational system in the study area rather than be detrimental to the already existing modus operandi as is obtainable with the human systems.

Hypothesis 1:Satisfaction of Students on use of Expert System by Gender

Results:

the t-test of student perceived adoption of the use of expert system by gender. The mean adoption score of 1.42 was for male while female mean adoption score was 0.92. The t-cal value of 2.046 and is greater than the t-tab value of 1.98, these suggest that there is significant difference between adoption of male on one hand and female on the other.

Hypothesis 2:Human System of Student on the use of Expert system by Gender

Results:

the t-test of student perceived human system of the use of expert system by gender. The mean human system score of 11.32 was for male while female mean human system score was 11.15. The t-cal value of 0.118 which is less than the t-tab value of 1.98 suggest that there is no significant

172

_____

_____

difference between satisfaction of male on one hand and female on the other.

Hypothesis 3:Z-Test Analysis of the Difference between Male and Female Students Performance Exposed to Expert System
Results:

the z-test of analysis on the difference between male and female students performance exposed to expert system. The mean score for male was 2.30 and while that of female was 1.38. The z-cal value of 3.822 is greater than the z-tab value of 1.96 suggest that a significant difference exist in the gender of students performance exposed to expert system.

CHAPTER SIX
IMPLEMENTATION PHASE 3 (ALGORITHM)
6.0 Pseudo Code for the Education Data mining
Step 1. Tabulate the result set and finding on the Excel in predefined format
Step 2. Define the Field whether "Agreed" Or "Dis-Agreed"
Step3. Take the initial step of classification for Agreed whose mean value is greater than 2.50

```
DataRow[] foundRows =
DtClassify.Select("F5='Agreed'");

foreach (DataRow row infoundRows)
    {
dtclss.Rows.Add(row.ItemArray);

    }
```

Step 4. Reduce Problem set to Agreed scenario
Step 5. Above step is value based classification, now the problem set has to do the textual analysis.
Step 6. For textual analysis we go with bag of words approach ,
6.1 : Determine Subject of Sentence
  6.2: Determine sentiment of bag of words
  6.3 : Classify for the Human or Expert System
  6.4 : Calculate the Positivity Percentage for the Expert Systems
Step 7 . Repeat Step 6 until All sentences in problem sub domain are scanned
Step 8 . Read Positivity Percentage
Step 9: Exit

6.1 Data Mining

1	ExpertSystem Increased probability, frequency, and consistency of decision making in students	2.9	1	Agreed
2	ExpertSystem Enhanced utilization of most of the available data to students	2.5	1.1	Agreed
3	ExpertSystem Increased dynamism through modularity of structure	2.2	1.1	Disagreed
4	ExpertSystem permits objectivity by weighing evidences without bias or sentiments	2.6	1.1	Agreed
5	ExpertSystem encourages investigations into subtle areas of a problem	2.3	1.2	Disagreed
6	ExpertSystem gives emphasis on individual students by record keeping of their learning ability and speed	2.6	1.2	Agreed
7	ExpertSystem creates a convenient environment for you to ask queries and find out their solutions	2.7	1.1	Agreed
8	ExpertSystem increases your individual performances in core and elective courses	2.7	1	Agreed
9	ExpertSystem increases your ability to design programmes and problem solving plans	2.8	1.1	Agreed
10	Humans provide us knowledge of experience	2.9	1.1	Agreed
11	ExpertSystem provides a congenial way to find out errors and fix them	2.6	1	Agreed
12	ExpertSystem improves your cognitive abilities and makes mental processes more productive	2.8	1.1	Agreed
13	ExpertSystem exposes you to a broader knowledge base and facilitates access to practicable knowledge	2.9	1	Agreed
14	ExpertSystem improves your mathematical and deductive skills	2.6	1.1	Agreed
15	ExpertSystem improves your ability to run feasibility analyses	2.5	1.2	Agreed

_____

		of projects and programmes			
16	ExpertSystem provides you access to expert advisory services which helps to improve their individual performances	2.5	1.1	Agreed
17	ExpertSystem enhances your creativity in intellectual exercises and in problem solving situations	2.7	1.1	Agreed
18	ExpertSystem has improved your CGPA	2.6	1.1	Agreed
19	ExpertSystem has improved your interactive skills and inter personal relationships in group situations	2.6	1.1	Agreed
20	ExpertSystem has improved your perceptive skills thereby enhancing your ability to optimize programmes and courses to suit your objectives	2.4	1.1	Disagreed
21	ExpertSystem improves your technical abilities in handling practical learning exercises	2.7	1.1	Agreed
22	Humans increases our research ability	2.8	1.1	Agreed
23	Humans interaction one to one increases concentration	2.6	1	Agreed
24	Humans provide real time knowldege on diversified topics	2.8	1.1	Agreed

MAJOR CONTRIBUTION OF RESARCH WORK

it increases your ability to design programmes and problem solving plans, It improves your cognitive abilities and makes mental processes more productive, It creates a convenient environment for you to ask queries and find out their solutions, It increases your individual performances in core and elective courses, It enhances your creativity in intellectual exercises and in problem solving situations, It improves your technical abilities in handling practical learning exercises, It permits objectivity by weighing evidences without bias or sentiments, It gives emphasis on individual students by record keeping of their learning ability and speed, It provides a congenial way to find out errors and fix them, It improves your mathematical and deductive skills, It has improved your CGPA, It has improved your interactive skills and inter personal relationships in group situations, Enhanced utilization of most of the available data to students, It provides you access to expert advisory services which helps to improve their individual performances, and It improves your ability to run feasibility analyses of projects and programmes.

Benefits of human systems identified included Increased probability, frequency, and consistency of decision making in students, it gives emphasis on individual students by record keeping of their learning ability and speed, It increases your individual performances in core and elective courses, It improves your mathematical and deductive skills, It improves your ability to run feasibility analyses of projects and programmes, It has improved your perceptive skills thereby enhancing your ability to optimize programmes and courses to suit your objectives, and It improves your technical abilities in handling practical learning exercises. The respondents Disagreed on the following benefits of Human systems: Increased dynamism through modularity of structure, Enhanced utilization of most of the available data to students, It encourages investigations into subtle areas of a problem, It exposes you to a broader knowledge base and facilitates access to practicable knowledge, It enhances your creativity in intellectual exercises and in problem solving situations, It has improved your CGPA, It has improved your interactive skills and inter-personal relationships in group situations, It permits objectivity by weighing evidences without bias or sentiments, It creates a convenient environment for you to ask queries and find out their solutions, It provides you access to expert advisory services which helps to improve their individual performances, It provides a congenial way to find out errors and fix them, It improves your cognitive abilities and makes mental processes more productive and It increases your ability to design programmes and problem solving plans. The results show that the respondents are clearly not satisfied with the effectiveness and efficiency of Human systems in the educational system and apparently consider the expert systems as a panacea to the present challenges.

The study further concludes that there is no significant difference between satisfaction of male on one hand and female on the other. Also, there is significant difference between adoption of male on one hand and female on the other. There is no significant difference between satisfaction of male on one hand and female on the other. However, significant difference exists in the gender of students performance exposed to expert system.

_____

CHAPTER SEVEN
CONCLUSION

This study concludes that from all the findings using Objective, Hypothesis & Algorithm. It can be deduced that the respondents generally consider expert system to be of great important and benefit to the educational system in the study area rather than be detrimental to the already existing modus operandi as is obtainable with the human system, also the z-test of the analysis on the difference between male and female students performance exposed to expert system. The mean score for male was 2.30 and while that of female was 1.38. the z-cal value of 3.822 is greater that the z-tab value of 1.96 suggest that a significant difference exist in the gender of students performance exposed to system.

MOTIVATION

➢ There is a scarcity of human experts in the various subject areas as it stands today.
➢ The traditional methods of instructional seem to lack much motivation to students.
➢ The human experts do not give enough of individual attention to students.
➢ The expert system from available data has been found to overcome the challenges enumerated.

REFERENCE

[1] Nwigbo, S. N and Agbo, O. C. (ud) Expert System: A Catalyst In Educational Development In Nigeria. Proceedings of the 1st International Technology, Education and Environment Conference. African Society for Scientific Research (ASSR) and Co-Published By: Human Resource Management Academic Research Society 566

[2] Garcia, O.N, Perez, R. A., Silverman, B. G. (1993) "On Teaching AI and Expert Systems Courses", IEEE Transactions on Education, Vol. 36, No. 1.

[3] Khan, A.R., Amin, H.U.,Zia, Ur Rehman (2011).Application of Expert System with fuzzy logic in teachers performance evaluation –(IJACSA) International Journal of Advanced Computer Science and Applications vol. 2. No 2

[4] Khanna, S, AkhilKaushik, ManojBarnela T.I. (2010). Expert Systems Advances in Education , National Conference on Computational Instrumentation CSIO Chandigarh, INDIA, 19-20 March 2010

[5] Ahmad et al (2010), in their investigation into the result of incorporating multimedia in the teaching of mathematics, observed that students who were taught mathematics with the use of multimedia scored higher

_____