USE OF COMPUTER ASSISTED INSTRUCTION (CAI) IN THE TEACHING OF BASIC ELECTRICITY IN TECHNICAL COLLEGES IN ENUGU STATE

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ABSTRACT

The study was designed to determine the use of CAI in the teaching of basic electricity in technical college in Enugu State. Two research questions in line with the purpose of the study were formulated while two null hypotheses were tested at 0.05 level of significance. The study adopted a survey research design. The population for the study was 85 electrical/electronics teachers and 185 year three technical college students studying electrical/electronics related craft works from the six education Zone in Enugu State. Purposive sampling was use to obtain a sample size of 246. A 23 item questionnaire was designed to collect data for the study. The instrument was validated by three experts. Cronbach Alpha Reliability coefficient was used to determine the internal consistency of the instrument. The instrument yielded a reliability coefficient of 0.83 indicating that the instrument was highly reliable. The data collected from the research question which guided the study were answered using mean with standard deviation, whereas hypotheses were tested with t-test. The result of the study showed the guidelines for the use of CAI in the teaching of Basic Electricity and skills required by technical teacher in the use of CAI for the teaching of Basic Electricity in technical college in Enugu State. It was recommended that training and re-training programme should be organized to enable the students to develop the digital/soft skills needed in CAI instructional presentation and teachers in using CAI in lesson preparation should follow the skills and guidelines for effective usage.

Introduction

Technology has revolutionized teaching activities in the classroom through computer assisted instruction and internet. Computer assisted instruction (CAI), an integral part of information technology which has tremendously affected the teaching-learning process and introduce a new methods of teaching. Computer assisted instruction is defined as learning process whereby a learner interacts with and is directed by computer through a course of study or learning task aimed at achieving specific instructional objective (Ukoha and Eneogwe, 1996). The utilization of CAI in teaching-learning activity involves the use of computer, therefore, it is important for every technical teacher to acknowledge and appreciate the use of computer in teaching. Information and communication technology (ICT) which is an integral part of CAI is a new communication and computing technology used for creating, storing, selecting, changing, developing, receiving and displaying many kinds of information (Adewoyin 2009). The efficiencies of CAI in technology based subject according to Ukoha and Eneogwe are hinged on the three levels of interactions possible between a learner and the computer. The levels are (i) drill and practice (ii) tutorial and (iii) dialogue. Through CAI, learners may work independently by interacting with the computer. Fundamentally, a computer in a CAI session, instructs learners by displaying symbols, or pictures on the screen, learners respond by trying their responses on the tele-typewriter keyboard.

Computer assisted instruction (CAI) provides immediate feedback and accurate information processing to the learner; it can handle large number of students at a time provided the accessories needed are available. Learning materials using CAI can be presented in various forms. Chika (2008) stated that CAI can provide access to information source, enable communication, create interacting learning environment and promote change in methods of instruction. Further, CAI brings with it several potentials as a teaching/learning medium. These include self-spaced learning, self-directed learning, the exercising of various senses and the ability to represent content in variety of media. As a medium of instruction CAI is used in teaching-learning activities in technical education programmes

Technical education is a comprehensive term that refers to those aspects of education process involving in addition of general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (FRN, 2013). The central concern in the definition of technical education as presented in the National Policy on education (2013)

anchors on (1) general education (2) study of technologies and related sciences, (3) psycho productive skills/vocational technical skills (4) work attitudes/affective work behaviours, (5) cognitive skills in the subjects concern. Technical education has a philosophy which is a derivative type because it belongs to the area of vocational education (Usoro, 2006). The objectives of technical education according to National Policy on Education (2013) include;

1) provision of trained manpower in applied science, technology and business especially at craft, advanced craft and technical level.

2) provision of technical knowledge and vocational skills necessary for agricultural and economic development, and

3) giving training and imparting the necessary skills to individuals for self-reliance in economic sense.

Technical education at technical college level trains people for paid employment and self-employment in the following area; Basic electricity, electrical installation, auto mechanic, block laying and concreting, metal fabrication and many more. For one to develop adequate skill in these areas, effective instructional method must be used in teaching and learning. Teaching method adopted by a teacher in the classroom or workshop has influence on the mastery of skills presented to the learner. Teaching method according to (Okafor, 2007) is the instructional strategies adopted by the teacher in teaching a particular skill to the learner. Okafor pointed out that teaching methods include demonstration, lecture, activity, project, assignment, discovery, questioning, computer assisted instruction, computer managed instruction and so on. These methods can be used to impact skills to the learner. Development of skills for effective performance in basic electricity demands that technical teachers should select the method that would achieve the objective of the instruction.

However, utilizing computer assisted instruction (CAI) in teaching will positively improve skill development of the students. Ogwo and Oranu (2006) opined that skill development is the ability to make the purposeful movements that are necessary to complete or master a prescribed task. For technical teachers to meet up with the demands of skill development and the global world, they must be dynamic to innovations in the educational system. New applications and methods are being developed resulting in new teaching and training methods in technology (Harum, 2003). Teachers are required to modernize their teaching-learning strategies; this will enable technology subjects such as Basic Electricity to achieve its objectives for which it was introduced. A modern technical teacher is one who can

source for information locally and globally as the world has become a global village, and present it to cause a desirable change in behaviour. CAI as a method of teaching encourages learning as they provide a stimulating environment, promote enthusiasm and provide more directed feedback.

For a teacher to use CAI effectively in teaching and learning, he needs to possess certain skills to be able to impart in to the learners through CAI. The skills according to Obi (2011) include, ability to use computer, ability to use and set projector, ability to use power point in presentation, ability to use basic software in teaching-learning and ability to set hardware in teaching-learning environment. To exercise these skills, certain guidelines are required to set up and use the CAI in teaching-learning. Chika (2008) noted that the guidelines and sequences for effective utilization of CAI in teaching includes; (1) CAI teaching should be provided and followed, teachers CAI instruction should be provided and followed, teachers needs to set or prepare their back up plan, lesson objective should be set before the CAI class and students should be prepared for the CAI system instruction.

Skill development in Basic Electricity is developing mastery in installation, wiring, trouble shooting and repairing of electric facilities. Basic electricity according to Eze (2013) is designed to equip students with knowledge and skills needed for effective working with current, voltage and resistance. It is designed to equip students with knowledge and ability to apply concepts, terms and principles involved in working on or near electrical equipment. The stages of skill development her are the cognitive phase, the associate phase, and the autonomous phase. Cognitive phase takes place when a learner is new to a specific task; the primary thought process starts with, what needs to be done. The learner determines appropriates strategies to adequately achieve the desired goal. Good strategies are retained and inefficient strategies are discarded. The performance is greatly improved in a short amount of time. Associative phase occurs when the learner has determined the most effective way to do the task and starts to make suitable adjustments in performance. Improvements are more gradual and movements become more consistent. This phase can last for a long time. Autonomous phase may take several months to years. Autonomous phase is dubbed because the performer can now automatically complete the task without having to pay any attention to (Lee Donald and Richard, 1999).

Further, for a technical teacher to effectively use CAI in the teaching of Basic Electricity, certain guidelines need to be observed after he/she might have acquired the skills

in using CAI in teaching. These guidelines include; availability, objective of the instruction, age of learner and number of the learner. Okafor (2007) pointed out that the age of the learner, maturity; specific instruction objective and availability of CAI system to be used should be considered before using CAI as instructional method.

The conventional instructional methods and processes used in developing skills among technical college students in Basic Electricity have not yielded the desired result. Evidence has shown that students are performing poorly in project skill performance. The poor performance was blamed on poor quality of technical teachers, overcrowded classroom, and lack of adequate and suitable technological equipment, materials and hand tools (Jegede, 1992 and Nwoji, 2000). Oranu (2003) remarked that these conventional methods used by teachers are teacher centred, content driven, certainly not student centred and students are not given enough opportunities to participate in classroom/workshop instructions. Students taught with these conventional methods are unable to retain their learning and apply it to new situation. Consequently, students lose interest, perform poorly, promote negative attitude and encourage poor retention of learned materials.

The researcher wonders that if this trend should continue unchecked, it would metamorphous to a condition where graduates of technical colleges would not fit in to the society. Therefore, the researcher demands for a change in the instruction procedure that will supplement the conventional method of instruction. The study, therefore determined the relevance of CAI on the development of Basic Electrical skill among technical college students in Enugu State of Nigeria.

Purpose of the Study

The main purpose of the study was to determine the use of CAI in the teaching of basic electricity in technical college in Enugu State of Nigeria. Specifically, the study aimed at determining;

1) the guidelines for the use of CAI in the teaching of Basic Electricity in Technical Colleges in Enugu State.
2) the skills required by technical teacher in the use of CAI for the teaching of Basic Electricity in Technical College in Enugu State.

Research Question

In line with the purpose of this study, the following research questions are formulated as guide to the study;

1) What are the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges in Enugu State?

2) What are the skills required by technical teachers in the use of CAI for the teaching Basic Electricity in technical colleges?

Research Hypothesis

The study was guided by the following hypotheses tested at 0.05 level of significance.

Ho_1: There is no significant difference in the mean rating of technical and students' teachers on the guidelines for the use of CAI in the teaching of Basic Electricity in technical colleges in Enugu State.

Ho_2: There is no significant difference in the mean rating of electrical/electronic teachers and students on the skills required by technical teachers in the use of CAI for the teaching of Basic Electricity in technical colleges in Enugu State.

Method

A survey research design was adopted for the study. According to Alio (2008), a survey research design is one in which a group of people or items are studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group or by collecting and analyzing data from the entire people or items. The study adopted survey research design because the opinion of electrical/electronic teachers and students were sought to collect data for the study.

The population of the study was 85 electrical/electronic teachers and 185 year three technical college students studying electrical/electronic related craft works from the six education Zone in Enugu State (Source: Science, Technical and Vocational School Management Board, STVSMB). Purposive sampling was use to select four Zones out of the six education zones. The selected Zones were; Enugu education zone, Nsukka Education Zone,

Agbani Education Zone and Obollo Education Zone with a total of 74 electrical/electronic related craft works teacher and 172 students. Therefore, the sample size used for the study was 246.

A 23 item structured questionnaire developed by the researcher was used to collect data from the respondents. It consisted of two parts, Part I and II. Part-I was designed to elicit information on the background of the respondents using such information as the status of the respondents. Part II is made up of two sections; section A, and B, which contain 10 items, and 13 items respectively. The instrument was face validated by three experts, one expert from Department of Science and Computer Education (measurement and evaluation) and two experts from Department of Technology and Vocational Education (electrical/electronic technology option) all in Faculty of Education of Enugu State University of Science and technology (ESUT), Enugu. The comments of the validators guided the modification of the final instrument. The reliability of the instrument was obtained using Cronbach Alpha and the coefficient of reliability computed from result of a pilot study conducted with 10 electrical/electronics teachers and 10 students in Anambra State and the reliability index yielded 0.83

All the items were responded to by the subject using a four point scale of Strongly Agree (SA) Agree (A) Disagree (D) and Strongly disagree (SD) the responses were weighted – 4, 3, 2 and 1 respectively.

The instrument was administered and collected by the researcher and three trained research assistant. Out of 246 copies of the questionnaire distributed, 235 copies were properly completed, collected and used for data analysis representing 95.53 percent return rate. Mean with standard deviation was used to answer the research questions. For decision to be reached, the upper and lower limit of the mean would be used.

Strongly Agreed (SA) -   3.50 - 4.00

Agree (A)   -   2.50 - 3.49

Disagree (DA)   -   1.50 - 2.49

Strongly Disagree (SD)-   1.00 - 1.49

The null hypotheses were tested using t-test. Where the value of the obtained t-test was equal or greater than critical value at 0.05 level of significance, then null hypotheses were rejected, otherwise do not rejected.

Results

The findings of the two research questions and the two hypotheses are presented in tables 1 to 4.

Research Question 1

What are the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges in Enugu State?

Data Analysis

Table 1: Mean ratings with Standard Deviation of the respondent's responses onthe guidelines for the use of CAI in the teaching Basic Electricity in technical colleges in Enugu State

S/N	Guidelines for the use of CAI in the teaching	Teachers n= 72		Students n= 163		Overall		Deci.
		X	SD	X	SD	X	SD	
1	Detailed instruction should be provided for students through CAI including their roles and responsibilities before teaching	3.23	0.87	3.34	0.74	3.29	0.81	Agree
2	Teacher should have a backup plan in case of equipment failure during teaching	3.56	0.43	3.31	0.89	3.44	0.66	Agree
3	The training session should be arrange before using the equipment	3.51	0.86	3.67	0.58	3.59	0.72	S. Agree
4	Teachers need to prepare students for the use of the system	2.89	1.06	3.09	0.98	2.99	1.02	Agree
5	Teachers should state a clear specific objective for the instruction	3.22	0.87	3.42	0.71	3.32	0.79	Agree
6	Teachers has to set a clear standard for assessing students' performance	3.20	0.86	3.32	1.08	3.27	0.97	Agree
7	There should be a clear idea of features to use and reasons for using them	2.78	1.03	2.91	0.99	2.85	1.01	Agree
8	Set a clear starting and ending time for each discussion period	3.39	0.79	3.75	0.52	3.48	0.66	Agree
9	Students active participation should be encouraged	3.32	0.91	3.59	0.68	3.46	0.80	Agree
10	Teacher must set rules and make them clear for students to encourage appropriate behaviour in the class	3.48	0.72	2.73	1.04	3.11	0.88	Agree
	Cluster Mean / SD	**3.26**	**0.84**	**3.31**	**0.82**	**3.28**	**0.83**	**Agree**

Note: $\overline{X}$ Mean, SD= Standard Deviation

Table 1 shows the result of data analysis on the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges in Enugu State. The respondents strongly agree that items 3 with mean rating ranging from 3.59 as the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges and items 1, 2, 4, 5, 6, 7, 8, 9, and 10 with mean rating ranging from 2.85 to 3.48 were perceived by the respondents to be agree as the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges in Enugu State. The grand mean of 3.28 with standard deviation of 0.83 was obtained from all the items thereby

showing that the itemized are the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges Enugu State. The low standard deviation of 0.83 indicates that the respondents did not differ remarkably in their views regarding the guidelines for the use of CAI in the teaching Basic Electricity in technical colleges Enugu State.

Hypothesis 1

These is no significant difference in the mean rating of technical and students teachers in on the guidelines for the use CAI in the teaching of Basic Electricity in technical colleges in Enugu State.

Table 2: t-test result of mean rating of technical and students teachers in on the guidelines for the use CAI in the teaching of Basic Electricity in technical colleges in Enugu State.

Status	X̄	SD	N	df	t-cal	t-tab	P	Decision
Teachers	3.26	0.84	72	233	0.387	1.98	0.05	N.S
Students	3.31	0.82	163					

Note: $\overline{X}$ = Mean, SD= Standard Deviation, N= Number, df= degree of freedom, t-cal = t-calculated, t-tab = t- table, NS = Not Significant

The analysis in table 2 shows that the t-value at 0.05 level of significance and 233 degree of freedom for 10 items had their t-calculated value as 0.387, while the critical t-value is 1.98. Since the critical t-value is more than the t-calculated, the null hypothesis is therefore not rejected for these items. This invariably means that no significant differences exists between the mean rating of technical and students teachers in on the guidelines for the use CAI in the teaching of Basic Electricity in technical colleges in Enugu State.

Research Question 2

What are the skills required by technical teachers in the use of CAI for the teaching Basic Electricity in technical colleges?

Table 3: Mean ratings with Standard Deviation of the respondent's responses on the skills required by technical teachers in the use of CAI for the teaching Basic Electricity in technical colleges in Enugu State

S/N	the skills required by technical teachers in the use of CAI for the teaching includes;	Teachers n= 72		Students n=163		Overall		Deci.
		X	SD	X	SD	X	SD	
11	Ability to prepare examination question	3.61	0.49	3.55	0.52	3.58	0.51	S. Agree
12	Ability to create forum for students and teachers interaction	2.59	1.31	2.67	1.22	2.63	1.27	Agree
13	Skills in preparation of lesson notes for students through CAI	3.20	0.97	3.32	0.91	3.26	0.94	Agree
14	Ability to create a module of courses for technology students	3.42	0.71	3.21	0.86	3.32	0.79	Agree
15	Skills in backup courses after CAI session	3.56	0.68	3.53	0.78	3.55	0.73	S. Agree
16	Ability to upload courses material	2.95	1.02	3.07	0.98	3.01	1.00	Agree
17	Skills in editing and offline courses	3.15	0.94	3.36	1.20	3.26	1.07	Agree
18	Skills in internet and offline services	2.74	1.08	2.96	1.10	2.85	1.09	Agree
19	Ability to carry out tasks in workshop with digital devices	3.41	1.01	3.53	0.87	3.47	0.94	Agree
20	Ability to connect video output devices and other presentation system.	3.54	0.63	3.59	0.58	3.57	0.61	S. Agree
21	Ability to utilize e-learning facilities in teaching	3.19	0.91	3.23	1.00	3.21	0.96	Agree
22	Ability to create electronic instructional feedback to learners	3.47	0.96	3.50	0.86	3.49	0.91	Agree
23	Ability to use teaching-learning software in skill development class.	3.65	0.64	3.64	0.55	3.65	0.60	S. Agree
	Cluster Mean / SD	**3.27**	**0.85**	**3.33**	**0.87**	**3.30**	**0.86**	**Agree**

Note: X Mean, SD= Standard Deviation

The data analysis in table 3 shows that items 11, 15, 20 and 23 were identified as strongly agree by the respondents while items 12,13, 14, 16, 17, 18, 19,21 and 22 were identified as agree on the skills required by technical teachers in the use of CAI for the teaching Basic Electricity in technical colleges in Enugu State. A grand mean of 3.30 with standard deviation of 0.86 was obtained in all the items thereby showing that the itemized are the skills required by technical teachers in the use of CAI for the teaching Basic Electricity in technical colleges in Enugu State. The relatively low standard deviation of 0.86 showed that the

respondents had similar views on all the items as the skills required by technical teachers in the use of CAI for the teaching Basic Electricity in technical colleges in Enugu State.

Hypothesis 2

These is no significant difference in the mean rating of electrical/electronic teachers and students on the skills required by technical teachers in the use of CAI for the teaching of Basic Electricity in technical colleges in Enugu State.

Table 4: t-test result of mean rating of electrical/electronic teachers and students on the skills required by technical teachers in the use of CAI for the teaching of Basic Electricity in technical colleges in Enugu State.

Gender	X	SD	N	Df	t-cal	t-tab	P	Decision
Teachers	3.27	0.85	72	233	0.458	1.98	0.05	N.S
Students	3.33	0.87	163					

Note: $\overline{X}$ = Mean, SD= Standard Deviation, N= Number, df= degree of freedom, t-cal = t-calculated, t-tab = t- table, NS = Not Significant

The analysis in table 4 above shows that the calculated t-value at 0.05 level of significance and 233 degree of freedom for the 13 items is 0.458 while the critical value is 1.98. Since the critical t-value is more than the t-calculated, the null hypothesis is therefore not significant for these items. This decision means that no significance difference exist between the mean rating of electrical/electronic teachers and students on the skills required by technical teachers in the use of CAI for the teaching of Basic Electricity in technical colleges in Enugu State.

Discussion of finding

The findings of the study according to research question one showed the guidelines for the use of CAI in teaching basic electricity in technical colleges in Enugu State. The result showed that the itemized are the guide-lines for using CAI in teaching basic electricity. Some of the identified guidelines include, instructional procedure should state the role of students, teachers should have a back-up plan in case of equipment failure, training section should be arrange before using the equipment, teachers should set clear standard for assessing students' performance etc. This agreed with the findings of Olabiyi, Aiyelabowo and Keshinso (2013)

that the guide lines for utilizing CAI in skill development should include that teachers should set a clear starting and ending time for each discussion period, there should be a clear idea of features to use and reasons for using them and teachers should state a clear specific objective for the instruction.

The test of hypothesis one showed that the null hypothesis was not significant. This implies that there is no significant difference between the opinion of the teacher and the student on the guide line for using CAI in teaching basic electricity in technical colleges.

Further, the result of research question two showed that respondents agree that the itemized are the skills required in the use of CAI for teaching basic electricity. The identified skills according to the finding include; ability to prepare question using CAI, ability to create forum for students and teachers interaction, ability to create modules, ability to upload course materials, skill in preparation of lesson notes for students through CAI etc. These finding are in agreement with the findings of Eze (2016). Eze stated that the skills for using CAI in teachers includes that the teachers should have skill in typing of lesson note, uploading of the notes, skill for creating digital classroom for learners and teachers interaction and ability connect video output devices and other presentation systems. The findings were further supported by Chika (2008) that a teacher using CAI should be able to connect all the components of digital devices used in CAI class.

The result of null hypothesis two indicated no significant difference. The implication of this was that significant difference does not exist between the responses of teachers and students on the skills required for using CAI in teaching basic electricity in technical colleges.

Conclusion

The utilization of CAI in teaching basic electricity has been identified as a tool for teaching and learning of technical details in basic electricity. The study however identified the guidelines that are pertinent for effective utilization of CAI in teaching in order to achieve the desired change in the behaviour of the students. The study had made is imperative that these guide lines should be used with the identified skills to develop the skills of the learners. Skill development in technical education is how ever facilitated through the use of ICT facilities. The study is of the conclusion that the guidelines and skills identified used be utilized by the teachers in using CAI for better skill development and knowledge acquisition.

Recommendations

The following recommendations were made;

1.   Training and re-training programme should be organized to enable the students to develop the digital/soft skills needed in CAI instructional presentation.

2.   Facilities needed for CAI instruction should be made available to enable the teachers to use these facilities in teaching.

3.   Teachers in using CAI in lesson preparation should follow the skills and guideline for effective usage.

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