DESIGN, IMPLEMENTATION AND VALIDATION OF ICT DELIVERY SYSTEM FOR LARGE CLASS OF COMPUTER APPRECIATION COURSE

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ABSTRACT

The persistent use of traditional lecture method in teaching large class of science-based courses such as Computer Appreciation Courses (CAC) in Colleges of Education has been identified as one of the major factors responsible for the trends of poor performance and administration in these courses. Researchers have shown that Information and Communication Technology (ICT) has been identified as a more effective tool of teaching large class of science-based courses in developed countries. The study, therefore, designed, developed, and validated a Computer Appreciation Course Instructional Package (CACISP) that can enhance teaching, learning and administration of large classes of Computer Appreciation Courses in Colleges of Education in Lagos, Nigeria. The study, adapted Aggarwal and Yogesh design framework and the Rapid Application Development (RAD) Model of software development. It also based on learner-centred constructivist and teacher-centred transmission models. Validation results showed that CACISP enhanced instructional delivery, administrative functions and also perform task contained in its software requirement specification. The research therefore, recommends proceed to the next stage of integrating the package for experimental purpose in Colleges of Education in Lagos, Nigeria in order to see the effects on students' achievement, attitude and time *spent in writing the test.*

Keywords: ICT, CACISP, Teacher-centered mode, Learner-centred mode, Instructional delivery

INTRODUCTION

The ability of ICT to improve the delivery of instruction has been receiving widespread attention in recent years. All over the world, educational institutions, businesses and governments are working in different ways to realize the potentials of ICT and also to provide better educational opportunities for the citizenry. Even-though a cross section of society today has accepted ICT as an important part of national culture; Education has been slow to adopt it as an integral tool within the classroom (Cuban, 2001, and Elliott 2004). Many reasons for this lethargy have been reported in literature, and they range from inadequate professional development to non-availability of ICT gadgets. The relatively low rate of use of the state of the art information technology in our educational system generally has been decried by various researchers (Abimbade 2001, Ajiboye 2002, Guihot 2002 and Ogar 2004). According to Yoloye, Alabi, Adekawonishe (2005), in spite of ICT's role in National development of any country, the education sector in particular, tertiary institutions in Nigeria are yet to meaningfully integrate ICT's into their teaching-learning and related activities.

The situation analysis has shown that among all the generally accepted modes of teaching, lecture technique is central to the teacher centred (traditional) method of teaching-learning process in handling the large class courses in Colleges of Education in Nigeria. Also, contrary to the stipulated number of twenty five students per class NCCE (2002), the students are mostly grouped together in one large class. These large class courses are mostly the underpinning courses that must be offered by all the student teachers in Colleges of Education in Nigeria.

Due to a large number of students and lack of space, lecturers have to reschedule their lectures by dividing the students into groups. Thus, the lecturers concerned have to repeat the delivery of the same topic to different groups at different times. This would have resulted to waste of time that would have been spent on other useful activities. The scoring of scripts and recordings of scores of course work assessment test to a large number of students are done manually. All these factors have led to the delay in publishing results. In addition course work assignment and scores are lost sometimes. In this context, teaching would not be thorough, students may not benefit maximally because of the large crowd. Lecturers are expected to finish delivery of the course contents within a specified period of time. These and many other problems have created enormous pressure on the lecturers, forcing them to work unrelentingly and lending them little time for rethinking on how they can enhance their delivery through the use of ICT. This has impacted negatively on the morale of lecturers. The

practice may also affect the students' performance in these courses. This could have resulted in students' poor performance in achievement tests. Students (60.6%, 61.9% and 59.8%) who wrote the test scored below 50% consistently for the three academic sessions. FCE(T) Akoka (2007) This trend is alarming. The overall students' achievement in Computer Appreciation Course was consistently low. It indicates that computer appreciation course is very unpopular among the students of colleges of education. This may have made them to develop negative attitude towards the course. In this situation, they may not develop ICT skills as expected. The goal for introducing the course at that level may be defeated. Nigerian youths may not be able to meet up with the 21st century challenge dominated by technological innovations and emerging technologies. With this trend, students' success in the work place in doubt. All these will strongly suggest that it may not be possible for Nigeria to join the rest of the developed nations in the world unless urgent steps are taken to redress the present situation. An instructional strategy that is capable of meeting these challenges is what is required to improve students' achievement in Computer Appreciation Course. This justified the selection of ICT-based instructional delivery system.

Since, there is no way to reduce the large number of students in the colleges of education without causing problem, this study sets out to find out how lecturers in Colleges of Education would use ICT to enhance their lecture presentation made in handling large class courses in their domain. It is also justified because it would motivate students to embrace the learner-centred system of learning than the teacher-centred system of learning. In addition, administration of achievement test, scoring of scripts, recording of scores and publishing of result will be done without delay. It may reduce paper work and error that arise during administration of results. It would promote appropriate record and thereby monitor students' progress. Also, it will make lecturers to recognise and pay better attention to differences in the learners through Computer Assisted Instruction and Computer Manage Instruction.

The objective of educational software development is to enhance the standard of teaching and learning, and by utilizing the concept of instructional design, simulating visual displays, and relevant and corrective feedback, the computer in the classroom can offer numerous effective and efficient learning experiences. It has been considered necessary to design a package that will suit our peculiar needs. In this study, Computer Appreciation Course Instructional Software Package (CACISP) was designed, developed, implement and validated against the Software Requirements Specifications (SRS) in order to proffer solution to the large class problem in teaching, learning and administration of Computer Appreciation Course in Colleges of Education in Lagos, Nigeria. When CACISP is used in the place of the conventional lecture technique, it will either form ICT teacher centred strategy (transmission model) or ICT learner centred strategy (constructive model).

In the ICT-teacher centred strategy, the lecturer will use the computer software package along with the multimedia projector to project the lectures on the screen. The students listen to the lecturer while seeing the projected lectures. The lecturer explained the lectures in modules. Apart from the lectures, the students are given study materials to augment the lectures. The students have the opportunity to ask questions and get feedback. In the ICT learner centred strategy the lecturer only teaches the rudiments of how to use the package. Computers are provided for this purpose. The lecturer ensures that the learners are in the interactive session of 1hr per week. However, the student after collecting the CD containing the eight module lectures is free to use it anywhere and anytime without restriction. He or She is not provided with textbooks or other study materials. He carries out self-test assignments, which the software will score and store results automatically. In this scenario, learners are in control, learn at their pace, responsible for the gaining of knowledge of skill and are expected to take initiative to learn.

When CACISP is used in administration, it is used for writing and scoring of achievement test, recording time spent on achievement test, storing of scores in data base, and publishing of result without delay. CACISP would generate comparative scores (pre-requisite, pre-test and post-test) individual student record of achievement, and so on. This would result in reduction of time wasted and lecturers' workload. CACISP would change the lecturer from the traditional lock-step giver of information into that of presenter, manager and facilitator of learning.

Educational software and Life Cycle

Educational software programs are the software package with which learners interact when being trained or being assessed using a computer. An essential component of the software development process is the life-cycle model where the entire process is based. Many different software life-cycle models have been proposed and they draw on tasks associated with the development and maintenance of software. Software program life-cycle typically include: Requirements analysis and specification, Design phase, Implementation and unit testing, Integration and system testing, and Operation and maintenance phases (Agarwal and Yogesh, 2001).

Requirements analysis and specification phase: The main aim of this phase is to document all functions, performance and interfacing requirements of the software. The requirements describe the "what" of the system. This phase creates a large document, designed in a natural language; it contains an outline of precisely what the

system can do without describing how it can be done. This document is called Software Requirement Specification (SRS) document. Design phase: The main aim of this phase is to change the requirement specification to a structure that is correct for implementation using some programming language. Here, the overall software architecture is determined, and the top level and detailed designed tasks are performed. The work is documented and called Software Design Description (SDD) document. The information contained within the S.D.D needs to be sufficient to begin with the coding phase. Implementation and unit testing phase: In this phase, the design is implemented. In case the S.D.D is finished, the implementation or coding phase proceeds smoothly, because all the details needed by way of the software developers is included in the S.D.D during testing; the main activities are focused on the examination and modification of the code. Small modules are initially tested in isolation. This is known as termed as unit testing. The objective of unit testing is to ascertain that each independent unit is accurately implemented. This provides an opportunity to ascertain that the interface amongst the modules is also correct. Integration and system testing phase: Effective testing will certainly promote the delivery of better quality software products, more satisfied users, reduced maintenance expenses, as well as more accurate and reliable results. This phase is very costly and consumes thirty percent (30%) to fifty percent (50%) of the cost of a standard project. The testing of the whole system is called system testing, whereas software is a part of the system. This is necessary to build confidence in the developers prior to the software been delivered to the user or released in the market. Operation and maintenance phase: Every software development group has to encounter the task of software maintenance, whenever the software inaugurates the operation and maintenance phase of the life cycle. The time spent and energy necessary to keep the software operational after launching is very important. The maintenance of Software is an extremely wide task which includes the correction of error, improvement of features, removal of outdated features, and optimization. The aim of this is to sustain the software over time.

Statement of the problem

The persistent use of lecture technique to teach the large class leads to lack of interest, under-achievement in Computer Appreciation Course and waste of scarce resources. There is therefore the need for ICT-based instructional delivery system, which could enhance students understanding of scientific concepts and which might facilitate effective teaching, learning in large classes. This study therefore designed and developed a software package, Computer Appreciation Course Instructional Package (CACISP) that would enhance instructional delivery, teaching, learning and administration of large-class Computer Appreciation Course in Colleges of Education in Lagos State. It also validates the output with the specification requirement of the software document (SRS) of CACISP.

Objective of Research:

i. To provide an alternative means of learning with the use of computer
ii. To develop a package that can be used as a teaching and learning instructional software
iii. To develop a system that can save the lecturers time by marking, scoring and storing the students test.
iv. To develop a package that can be used for pre-test, post-test and control group quasi-experimental design research.

Scope of the Research: The scope of this study was to design, develop, implement and validate an ICT delivery system that can enhance teaching, learning and administration of large-class Computer Appreciation Course in Colleges of Education in Lagos State, Nigeria. This present work terminates at the validation stage of CACISP life cycle.

Research questions: This research attempted to provide answers to the following questions:

Q1: Would CACISP operate with windows Operating Systems XP or higher versions?

Q2: Would CACISP be used to carry out instruction in ICT-Teacher Centre and ICT-Learner Centred modes?

Q3: Would CACISP be able to Control entrance into the Examination and Administrator units, record time spent in writing achievement tests, logs out students after the time allowed expired, mark achievement tests, stores Students scores in the database, display results on request ?

Q4: Would CACISP accept, store, process data from the ICT-Teacher Centre and Control groups and produce a broadsheet of comparative scores of pre-requisite, pre-test and post-test in tabular form for all students that write the achievement test (examination).

Q5: Would CACISP produce individual students' record scores and recall them on request?

Research Methodology: The design of this study is product development. This study involved the product development design of Computer Appreciation Course Instructional Package (CACISP).

Package or Product Development of CACISP

The product or package development of Computer Appreciation Course Instructional Package was based on Aggarwal and Yogesh (2001) software design framework and software life cycle development of Rapid Application Development (RAD) MODEL. The RAD Model involved four phases:

- **Requirement Planning Phase**: This involves User's needs analysis;
- **User's description Phase:** This is where the user spelt out the purpose of the software;

- **Construction phase:** This combines the detailed design, coding and testing;
- **Cut over Phase:** This incorporates acceptance testing and user's training.

Fig.1 shows the block diagram of Rapid Application Development (RAD) Model.

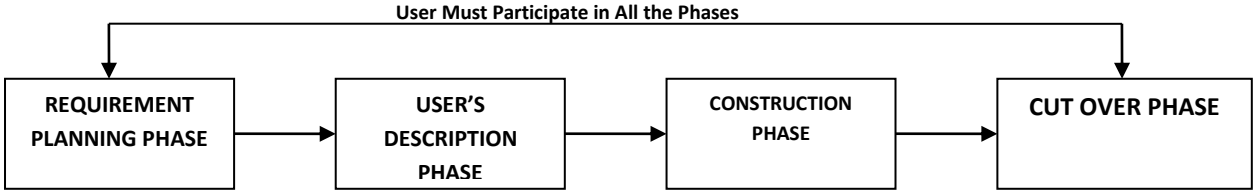

FIG.1: RAPID APPLICATION DEVELOPMENT (RAD) MODEL

Development Stage of the Package

The purpose of design phase was to produce a package that would meet the Software Requirement Specification (SRS). The design framework shown in fig.2 was adapted in the development of CACISP.

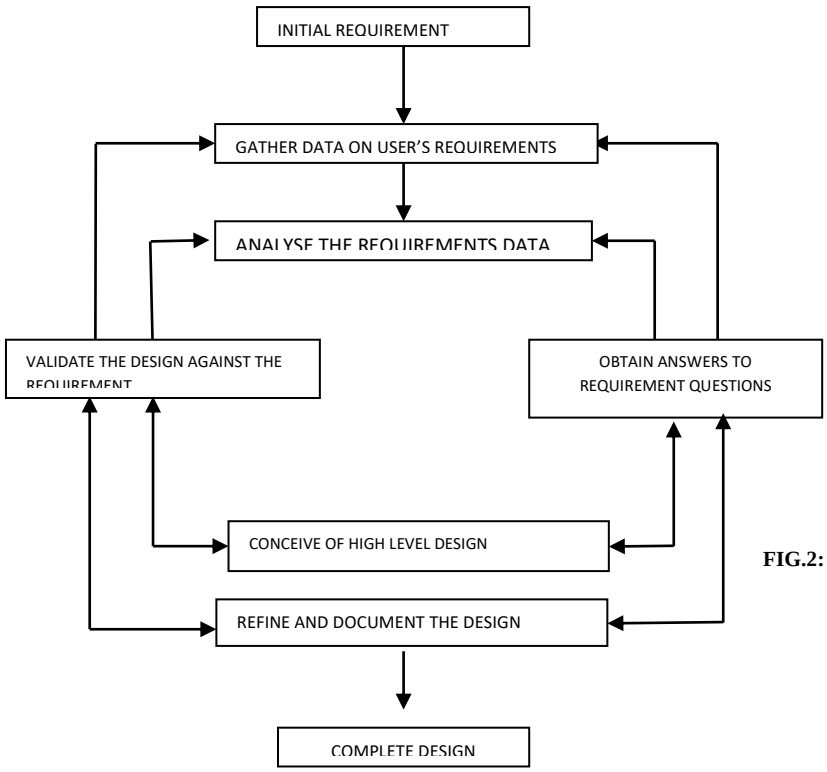

FIG.2: DESIGN FRAMMEWORK

Source: Software Engineering by Aggarwal and Yogesh (2001).

In designing this package, the target group, the language level, the purpose of the package, the pedagogical approach, and the appropriate use of technology were thoroughly considered as stipulated by Ana, Graham and Paul, 2003.

Users' needs Analyses and Software Requirements and Design

The package was designed especially for handling the large class of Computer Appreciation Course in Colleges of Education in Lagos State. In planning, the requirements are that the software should carry out teaching, learning and administrative functions. CACISP should be usable in the ICT teacher-centred and ICT learner-centred modes of instruction.

In the ICT teacher-centred mode, the lecturer should be able to use CACISP to effectively teach the large class course and process the students' results. In addition, lecturer needs reference manual containing information on minimum hardware configuration and software, step-by-step instruction on installing the package, detailed information on the contents of the package and information on the number of hours of tuition the package contains. When used in the ICT learner-centred mode, the students should be able to efficiently navigate the lecture module and learn independently. The students are expected to write achievement test through CACISP. For this group, the software should be able to automatically record the time spent for the test and marked the scripts, generate individual record of achievement, broadsheet of all the students that participate

in the achievement test. Learners need clear instructions on how to install and start the program. The students' energy should be devoted on to the content of the materials and not understanding how to use them. The level or difficulty of the program should be clear to the learners. If the student quits the program before completing, it should be possible to re-enter at the point where he/she gave up.
CACISP was designed to have three main modules: **E-tutor, Examination** and **Administration.** Students and lecturers were restricted to the E-tutor while only the researcher had assesses to the Examination and Administration Modules in order to prevent leakage of the questions and tampering with the records in the database. Also, the design of instructional display and instructional enhancers were included in order to enhance the effectiveness of CACISP. In addition, CACISP was designed to either serve as a single-user or a multi user.

From the above, the final design specifications were analyzed to produce the Software Requirement Specification (SRS) document for the package. This document states that CACISP should be able to:

- Operate with X^p , Vista or Windows 7 version;
- Carry out instruction of teaching and learning, examination, and administration functions.
- Control entrance into examination and administration through passwords.
- Record the actual time spent in writing the examination and logs out the student immediately allowed time expires.
- Score the achievement test, store students' scores in database and display the results at the expiration of the test.
- Produce a broadsheet of comparative score (pre-requisite, pre-test and post-test scores) in tabular form for all students that write the examination.
- Produce the individual student's record scores and should be recallable on request through student's matriculation number.
- Accept, store and process data from the ICT Teacher centred and control group.

This document became the Software Requirement Specifications (SRS) for CACISP development.

Modular Feature of CACISP

The most important factor that characterized the design of CACISP is modularity, which is the solo feature of software that enables a program to be intellectually manageable. It boosts the design quality, which also reduces implementation, debugging, testing, documenting, and maintenance of software product. A modular system is made up of well-defined, manageable units along with well-defined interfaces among the units. Discrete attributes of a modular system, which are common with CACISP included:

E-Tutor: This section contained eight (8) weeks lecture modules. It did not require any password to enter this module. A click on E-Tutor **ICON**, would lead to the sub-topics to be covered for that week. The lecture topics contained in this module are: Components of the Micro Computer, Windows Operating System, Interacting with Microsoft Word, Analyzing with Microsoft Excel (1), Analyzing with Microsoft Excel (2), Application of Computer in Education, Networking and Internet, and Creating an E-mail Account.

Examination: This section contained the achievement test, which could only be navigated through the use of password (GseExam). Under examination condition, the examinees would be required to supply their personal data (your college, name, matriculation number, **SEX,** level of study and group) without which they cannot continue. After this they are expected to click on the **START ENGINE ICON**, which would lead them to the examination questions. Immediately after this, the timing would start to count down from 25minutes. If the student finishes before the 25 minutes duration, he or she would be expected to click the **FINISH ICON.** The time spent by the student and his score would be stored in the database and can as well be displayed on request. If the student could not finish within the 25 minutes duration he or she would be timed out.

Administrator: This was the unit where all the administrative protocols could be accessed through a password (AdminGse) and the Name of User. Each protocol has an **ICON**. The **ICON** clicked by the user would depend on function he wanted the **CACISP** to perform. The administrative protocols (tasks) as contained in this module are: Enter data for manual tests, Preview Comparative Scores Analysis Table for a study Group, Preview a study Group's performance table for one test taken, Preview Comparative Scores Analysis Chart for a study Group, Preview a study Group's performance Chart for one test taken, Preview a Student's Scores Report, Preview All Students' Performance and Deleting Information.
Installation Guide: In order to install the package, the following steps must be followed:

- Open the CACISP folder in your CD
- Click on the setup **ICON** to run the setup program for the package
- Follow the instructions to install
- Note: Do not change the default installation folder i.e.: **c:\program files\cacisp**. This may lead to unexpected error.

- When the setup program is finalizing the installation, an error message may come up, just click the **ignore** button to complete the installation process.

User Guide

- Locate the CACISP program group by going to Start- programs- CACISP folder
- Click the CACISP **ICON** to launch the package. The welcome screen appears.
- After the welcome screen, a dialog box appears informing the user to either select the course code for the course or exit the package. When GSE 108 is selected, three options appear namely:
- Click here to run E-Tutor
- Click here to take examination
- Administrator

If the **E-tutor** option is selected, it takes the user to the **E-Tutor** environment. All the lectures for the 8-week course can be accessed. Both the examination and administrator options have been password protected. Regardless of which one is selected, a **login dialog frame** appears below. The user is expected to type in the appropriate password, then click on the login button to gain entry to the examination module only. Almost all the sections of the package make use of the **arrow buttons**, which serve as links to navigate through the package. The lecture contents are displayed using a plain frame window adjacent to the navigating menu. Some lecture contents have more than one window; hence arrows are also within each frame window to enable users to view all hidden contents. The package is highly interactive; hence users will experience little or no difficulty in navigating through the package.

Design and Implementation Stage

This is where the detailed design, coding and testing were combined to produce a prototype of CACISP. The development team included the researcher, course lecturers, and the software engineer or Programmer. The researcher designed the software while the course lecturers provided the course content as stated in the National Commission for Colleges of Education (NCCE) curriculum of 2002. The software engineer combined the information provided by the researcher to produce CACISP prototype, which was subjected to qualitative tests to ascertain its functionality, reliability, usability, maintainability, portability and acceptability. The prototype was refined at various stages to correct or include some functions, which were not originally included in the design specifications. The tests carried out validated the software developed against the requirement.

The Computer Appreciation Course Instructional Software Package (CACISP) application was designed on the client/server architecture, which is a design technique in Software Engineering. The package was implemented with the Microsoft Visual Basic 6.0 Software Development kit as the Client Side and the Microsoft Access database application package on the Server Side. The Client Side provides the full interface where the user interacts with the application. The Visual Basic kit allows the Software Engineer to use some in built controls in order to allow the user to interact with the package. Some of these controls include the command buttons, option button, textbox and image controls. With full knowledge of Structured Query Language, (SQL), the client side can effectively store and retrieve information from the server side (i.e. the database application) via the Microsoft data link. This package has been fully implemented on the Microsoft Windows operating system and hence, some fundamental adjustments are required for it to run on other operating systems. The server side is the storage point for all data to be gathered by the user. The database is a relational database management system and hence, it makes use of tables to store records. The database schema has been well designed for optimum efficiency and constituency. Since the user can only interact with the client side, a tremendous amount of effort was put into making the interface design as simplistic as possible. The lecture contents were directly impacted via image controls so that the user can graphically view the contents pane by pane. The test engine for the package allows a user to be evaluated on his/her understanding of the course itself. The test engine has been synchronized to appear question by question. To view a new question, the user just clicks on the next button. The answers to the questions have been defined in the server side. The evaluation module is activated once the user has parsed all questions or when the time period has elapsed. The timing function is achieved through the use of a timer control provided by the software development kit.

The CACISP application also allows the user to generate reports. The reports are either in text format or in graphical format. This is also achieved by manipulating the server side information with the structured query language. The result is a precise and accurate processing and filtering of those records to meet the required specifications of the package.

Validation Stage of CACISP

The validation of CACISP was carried out to authenticate its reliability and effectiveness. The validation covered the three levels of CACISP manipulations: ICT learner-centred, ICT teacher-centred and the Control groups assigned to arbitrary *SCHOOL-A, SCHOOL-B, and SCHOOL-C* respectively for validation purpose. The sample data used were obtained by selecting and grouping thirty (30) students in the 200–level who had knowledge of GSE 107 to write the examination with and without the use of computers. The students in school-

A (control group) and school-B (ICT teacher-centred) wrote the test conventionally while the students in school-C (ICT learner-centred) wrote the test with CACISP.

Results and Discussion.

Research Question One: Would CACISP operate with windows Operating Systems XP or higher versions?
This question was to determine whether or not CACISP can operate with different versions of windows Operating Systems. Following the steps in the, installation guide, CACISP was installed in three versions of windows operating systems: XP, Vista and Windows 7. The results show that CACISP easily installed in the three window operating systems of interest without stress or any difficulty. The three main Units: E-tutor, Examination and Administrator were also tested and were confirmed functioning perfectly.

Research Question Two: Would CACISP be used to carry out instruction in ICT-Teacher Centre and ICT-Learner Centred modes?
The first part of this question was to ascertain whether or not CACISP can be used by lecturers to deliver lectures in the ICT- Teacher centred mode while the second deals with whether the CACISP can be conveniently used in the ICT-learner centred mode by learners. CACISP is expected to carry out instruction in both modes.
Use of CACISP in ICT-Teacher Centre mode: The requirements were:

(i) A teacher who is expert in the course
(ii) A laptop with windows operating system with any version of interest (X^P, Vista or window7).
(iii) A multimedia projector of 2000 and above luminous.
(iv) A 72x72 white screen
(v) A synchronized power source of 2kw rating/ An inverter of 2kw source.
(vi) Ten (10) 200-level students who were already exposed the Pre-requisite Course (GSE 107) were randomly selected and their score were collected from the lecturer that taught them

Pre-test was administered with the course: computer appreciation course GSE 107. The lecturer taught the students using CACISP. He taught the eight weeks module within two weeks. After which a post test was carried out. The students wrote the achievement test conventionally and scripts were marked by the lecturer and scores recorded manually. Time spent for the test was recorded using a wristwatch. The maximum time was 25 minutes.
Use of CACISP in ICT-learner Centred Mode: For this mode, the following requirements were provided:

i. Ten (10) desktop computers with windows operating system of either version X^P or Vista or windows 7.
ii. Ten (10) students randomly selected. They were taught the rudiments of installation process by the course lecturer.
iii. Ten (10) CACISP CDs were given to the students.

The learners were to make use of the modules in the E-tutor which they can access without restriction anywhere, anytime, any day within two weeks. Data collected in this group are:

1. Pre-requisite scores obtained from the pre-requisite course computer Appreciation course (GSE 107).
2. Pre-test scores: were obtained before they were exposed to GSE 108. They used CACISP to write the pre-test, scores and time spent in writing the scores were automatically recorded by CACISP and stored in the Data Base. Only the researcher has access to the examination unit.
3. Post-test scores: After two weeks, the learners were examined in a central place. At this point also, 10 desktop computers with windows operating systems of X*P*, Vista or Windows 7 were provided. Each learner to a system and were allowed to write post test examination. It was the researcher that lunched them into the examination environment. It was CACISP that controls time to finish the test. Time spent by the learners were recorded by CACISP, stored the achievement scores and time spent in the Database.

From the above, CACISP was successfully used for teaching the learners in the ICT-Teacher centred mode. The lecturer was able to teach the students conveniently while the students in this group listen to the teaching which appealed to their two senses (audio and seeing) and participated in the self test drill provided at the end of each module. They were not permitted to individually use CD. They have access to other study materials. They wrote both pre-test and post-test conveniently and scripts were marked manually and scores recorded. The learners were able to learn in the ICT-Learner centred mode. The learners were in control of their learning, they were not restricted to a particular place or time. They could decide to use it even while in the house if allowed. They were able to install CACISP following the installation guide provided.

Research Question Three: Would CACISP be able to Control entrance into the Examination and Administrator units, record time spent in writing achievement tests, logs out students after the time allowed expired, mark achievement tests, stores Students scores in the database, display results on request ?

From the philosophy of design of CACISP, the end user or adopter should have access to both Examination and Administrator Units through their respective passwords GseExam and AdminGse. For validation and field tests purposes, access to these units is reserved for the researcher. From the results, the lecturer in the ICT-Teacher centred could not have access to neither the examination nor administrator units of CACISP. In order to write the pre-test and post-test Examination with CACISP, in the ICT-Learner centred, the researcher was only involved because he only has these passwords. The learners wrote the pre-test and post-test using CACISP. For CACISP to generate the expected results, the researcher uses the administrative protocols of the administrator. The results are shown in Table1

Table 1: Results Generated For ICT-Learner centred Group

S/N	Name	Gender	Matric No	Level	Score	Percentage	Time Spent
1	WALE TINUBU	M	01/ABC/101	NCE-2	33	66	00:10:57
2	GRACE AKU	F	01/DEF/102	NCE-2	34	68	00:14:52
3	SARAH LAMIDO	F	01/GHI/103	NCE-2	29	58	00:12:36
4	CHIKE NWEKE	M	01/JKL/104	NCE-2	35	70	00:19:17
5	NOSA EMEYA	F	01/MNN/105	NCE-2	39	78	00:12:34
6	KANAYO BASIL	M	02/ABC/201	NCE-2	31	62	00:09:54
7	BRIGHT OMOKARO	F	02/DEF/202	NCE-2	33	66	00:23:09
8	AUSTIN OKOCHA	M	02/GHI/203	NCE-2	29	58	00:11:05
9	DANIEL KANU	F	02/JKL/204	NCE-2	34	68	00:13:53
10	SHERIFF LAMIDO	M	02/MNN/205	NCE-2	38	76	00:16:14

The results in Table1 were generated and displayed confirmed that CACISP marked scripts. Also, from Table 1, the times spent for writing the examination in the ICT-Learner centred mode were automatically recorded. The results indicated that all the learners spent less than 25minutes, this showed that CACISP records time spent for writing test and logs out students when the allowed time expired. The results on table showed that CACISP marked the achievement tests of pre-test and post-test. It also recorded the time spent for both examinations. CACISP displayed these tables on request by the researcher. It displays individual student statement of result of pre-test, post-test scores. Hence CACISP successfully carries out administrative functions.

Research Question four: Would CACISP accept, store, process data from the ICT-Teacher Centre and Control group and produce a broadsheet of comparative scores of pre-requisite, pre-test and post-test in tabular form for all students that write the achievement test (examination) and graphically compare the pre-requisite, pre-test, post-test scores of the three level of assessment?

From Table 2 and Table 3, one can conveniently affirm that CACISP accept, store, process data from ICT-teacher centred and Control groups. As seen From Table 2 and Table 3, CACISP can automatically generate the broadsheet of comparative score of pre-requisite, pre-test and post-test scores. Figures 4 and 5 show their corresponding graphical representation generated by CACISP.

Table 2: Comparative Results Generated For ICT-Teacher Centred Group

S/N	Name	Gender	Matric No	Pre-requisite Score	Pre-Test Score	Post-Test Score
1	BAYO AYINLA	M	01/GGG/321	21	23	25
2	SEGUN ONI	M	01/CCC/322	19	24	28
3	THOMAS LINK	M	01/DDD/323	29	30	32
4	GRACE HARUNA	M	01/YYY/324	22	24	24
5	LARRY WEND	M	01/AAA/701	22	25	27
6	OMOTOLO OWOTUNDE	F	01/BBB/702	20	25	28
7	NUHU RIBARI	M	01/CCC/703	23	25	26
8	SAINT MOSES	F	01/DDD/704	24	28	30
9	HASSAN IMAN	M	01/EEE/705	21	24	25

Table 3: Comparative Results Generated For Control Group

S/N	Name	Gender	Matric No	Pre-requisite Score	Pre-Test Score	Post-Test Score
1	MARK LENIN	M	03/TED/29910	11	11	20
2	BARRY AKANDE	M	03/TED/10001	14	14	14
3	SIMON ATINUKE	F	02/DDD/3991	19	19	25
4	BOLANLE AKALA	F	01/EEE/39101	16	16	17
5	SUSAN IKPE	F	03/TED/66601	21	21	23
6	AYODEJI MAKINDE	M	03/TED/66602	23	23	25
7	IDOWU AYODELE	M	03/TED/66603	25	25	24
8	AKOJA AJARA	F	03/TED/66604	26	26	25
9	MODUPE IDOWU	F	03/TED/66605	22	22	23

Research Question Five: Would CACISP produce individual students' record scores and recall on request?
CACISP when instructed appropriately produced individual student's records for all category of students (Control, ICT-Teacher centred and ICT-Learner centred) Table 4a, 4b and 4c shows the individual student's record for ICT-Learner centred, ICT-Teacher centred control groups respectively.

Table 4a: Individual Students' record score for ICT-Learning Group

Matric Number:	04/BED/17113	Name:	KUTI B . J
Study Group		ICT LEARNING	
Pre-requisite Score:	27	Percentage Score	54
Pre Test Score	18	Percentage Score	36
Post Test Score	28	Percentage Score	56

Table 4b: Individual Students' record score for ICT-Teaching Group

Matric Number:	04/26387	Name:	OKE TITILAYO MARIA
Study Group		ICT TEACHING ONLY	
Pre-requisite Score:	30	Percentage Score	60
Pre Test Score	13	Percentage Score	26
Post Test Score	31	Percentage Score	62

Table 4c: Individual Students' record score for Control Group

Matric Number:	021532	Name:	Mustapha Tony
Study Group		CONVENTIONAL	
Pre-requisite Score:	22	Percentage Score	44
Pre Test Score	20	Percentage Score	40
Post Test Score	26	Percentage Score	52

Also, these records can be recalled on request through these respective matriculation numbers.

CONCLUSION AND RECOMMENDATION

An ICT-based instructional delivery system, Computer Appreciation Course Instructional Software Package (CACISP) that can enhance teaching, learning and administration of large class of computer appreciation course in colleges of Education in Lagos State has been designed, developed, implemented and validated. The results meet with the stated software requirement specification of the CACISP. For the ICT learner centred group, CACISP automatically marked the scripts, recorded the time spent on achievement test,

recorded scores in database, generated individual student record of achievement containing the pre-requisite, pre-test, and post-test scores, broadsheet of comparative scores of pre-requisite, pre-test, and post-test scores for all the students in the group. It also generated graph that compared the pre-requisite, pre-test, and pot-test scores. For the Control and ICT teacher-centred groups, scripts were marked manually, and results of pre-requisite, pre-test, and post-test scores as well as time spent on achievement test were manually fed into CACISP for processing. CACISP was able to record scores in database, generated individual student record of achievement containing the pre-requisite, pre-test, and post-test scores, broadsheet of comparative scores of pre-requisite, pre-test, and post-test scores for all the students in these groups, and generated graph that compared the pre-requisite, pre-test, and post-test scores. The results showed that CACISP performed all the tasks contained in the design specifications.

Now that CACISP had been validated as an instructional package based on the specified outcomes, the research therefore, recommends proceed to the next stage of integrating the package for experimental purpose in Colleges of Education in Lagos, Nigeria in order to see the effects on students' achievement, attitude and time spent in writing the test.

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