IMPLEMENTING A CULTURO-TECHNO-CONTEXTUAL PEDAGOGY TO ENHANCE COMPUTER STUDIES IN SECONDARY SCHOOLS: A CASE STUDY OF UYO SENATORIAL DISTRICT.

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ABSTRACT

This study investigates a new pedagogy for Computer Studies with the implementation of Culturo-Techno-Contextual Approach (CTCA) in Secondary Schools in Uyo Senatorial District of Akwa Ibom State, Nigeria. The CTCA approach is an amalgam, designed on the power of three frameworks- (a) cultural context in which learners are immersed, (b) technology-mediation to which teachers and learners are increasingly dependent out and (c) locational context which is a unique identity of every school and which plays a strong role in the examples and local case studies for science lessons. The pace of closing the digital divide is quite slow and needs to be quicken up. Mixed method research design was adopted for the study as explanatory sequential design, data was collected from the target population using a purposive sampling technique. Data obtained was analyzed, recommendation was teaching and learning need to take account of students' cultural background in order to identify different traditional and social beliefs attached to computer concepts and use it as a guide during teaching/learning process to ease students' understanding of difficult concept.

KEYWORDS: CTCA, Computer Studies, ICT, Science, technology-mediation.

INTRODUCTION

Culturo-Techno-Contextual Approach (CTCA) is powered and drawn on a method of science teaching developed in 2015 by Okebukola for teaching in African settings after many years of experimentation with different methods to address some of the challenges towards meaningful learning of science. The CTCA approach is an amalgam, designed on the power of three frameworks- (a) cultural context in which learners are immersed; (b) technology-mediation to which teachers and learners are increasingly dependent on; and (c) locational context which is a unique identity of every school and which plays a strong role in the examples and local case studies for science lessons. Fresh approaches are needed to address persistent problems and provide students with appropriate needs for today's classroom.

CTCA is a teaching method based on culture, technology, and context to ease difficulties in students' understanding of concepts. Scientific knowledge is created from human imagination and logical reasoning. This creation is based on observations and inferences of the natural world (Cobern & Loving, 2020). Science is part of social and cultural traditions. It is influenced by the society and culture in which it is practised. About 87% of the global youth population are in Africa and they are faced with limited access to education and economic opportunities. There is the need to embrace an empowering pedagogy that considers the socio-cultural context of the learner. A pedagogy that is action-oriented, issue-based, participatory, and critically reflective (Kyle, 2020).

The term, Computer Studies have been used inter-changeably. In some cases, it has been referred to as computer education while in other cases; it is called computer literacy. In whatever way it is called, it means the same thing. Computer education is the ability to make the generality of the people computer literate while Computer literacy is the ability to read, write and speak the language of the computer. It can also be looked at as a process of educating the people on how to use a computer to run a programme and diverse applications including business, industry and commerce. Computer studies as defined by Edhuze (2003) is the teaching and inculcating in the learner the basic skills required to independently manipulate the computer to achieve educational goals. The thrust of computer studies as a subject is aimed at making students acquire skills and competencies required in the digital world of competitiveness. Such basic skills and competencies upon graduation makes them conversant with terms and practices embedded in the world of computer. Computer studies is therefore a subject organized to enable people understand the functions, uses and limitations of the computer and to provide an opportunity for the study of the modern methods of information processing.

Adomi and Kpangbani (2010), refer in their study that it was in 2004 that the Nigeria government made the first attempt to introduce computer education in schools. The plan was to establish pilot schools and diffuse computer education innovation first to all secondary schools, and then to primary schools. Unfortunately, the project did not really take off beyond the distribution and installation of personal computers. Then again, the Federal Ministry of Education launched an ICT-driven project known as School-Net which was intended to equip all schools in Nigeria with computers and communication technologies, (www.snng.org), (Adomi 2005). It was thereafter that the Federal Government of Nigeria commissioned a Mobile Internet Unit (MIU) which was operated by the Nigerian National Information Technology Development Agency (NITDA). The MIU is a locally-made bus that has been converted into a mobile training and cyber center. Its interior has ten workstations, all networked and connected to the Internet. Also at the African level, at the African Summit of the World Economic Forum in Durban, South Africa, that the New Partnership for African Development (NEPAD) launched the e-Schools Initiative,which is intended to equip all African high schools with ICT equipment including computers, radio and television sets, phones and fax machines, communication equipment, scanners, digital cameras and copiers, among other things (Adamu, Auwal and Muhammad, 2022). The intention of Nigeria to include computer studies into the secondary school curriculum dates back to 1988 when the National Policy on Computer Education was enacted and launched.

The quest for pedagogical tools that can help break the barriers to meaningful teaching and learning is on the increase. To cross this hurdle, attention is now being shifted toward culturally responsive and contextually relevant approaches. The culturo-techno-contextual approach is one of such approach. Culture and society makes each other. On account of this, society makes culture thereby allowing for its preservation and transmission from the past into the future by learning. Yared & Taha (2015) posit that culture is the subtotal of the material and immaterial tools, artworks, and works of art of a people and knowledge accumulated by the people. The people's knowledge, otherwise referred to as indigenous knowledge systems are perceived as "a conglomeration of thought systems or worldviews that have evolved among various local communities over a considerable length of time. It is the product of human reflection, creativity, and resourcefulness. Ogunniyi, (2013) poist that it is the total of organised human interactions with nature and represented in various forms: verbal, graphic or written".

Problem Statement/Justification

Over the years, different instructional approaches have been deployed to teach difficult concepts in computer studies such as: Flowchart, Algorithm, Problem solving skills, Machine Language, Program development Cycle has evolved significantly and has moved from primarily teacher-centered methods to more student-centered and active learning strategies yet the outcome has not been encouraging as students tend to perform woefully in it. This study therefore investigates the effects of implementing culturo-techno-conceptual approach in computer studies in teaching problem solving skills.

It is for a great concern and a variety of reasons, the mastery of the provisions of the computer studies curriculum would seem to be hindered in Nigerian schools. Harder hit are topics that students find difficult to learn. The problem that this study seeks to solve is to find out the method that can break the barriers to learning of problem-solving skills. In seeking a way out, the study of methods that have dominated the science education literature alerts us to the fact that most have failed to realize that culture and context play significant roles in student learning. The traditional teaching (lecture method style) has failed significantly and teaching must begin to culturally immerse and contextually situate the methods of teaching science. This is the under-girding principle of the culturo-techno-contextual approach (CTCA) experimented with in this study.

Objectives of the Study

The purpose of this study is to seek new pedagogies for Computer Studies in implementing Culturo-Techno-Contextual Approach in Secondary Schools in Uyo Senatorial District.

Specifically, the study seeks to;

(i) investigate achievement level of students on problem-solving skills that inhibit their meaningful learning of difficult concept.

(ii) Determine if culturo-techno-contextual approach (CTCA) is effective in breaking the barriers to learning of difficult concepts.

The Research Questions that will guide this study are:

(1) What is the achievement level of students in problem solving skills that inhibit their meaningful learning of the concept?
(2) To what extent will the use of culturo-techno-contextual approach (CTCA) be effective in breaking the barriers to learning of difficult concepts?

The following hypotheses which are stated in the null form will be tested

1. Ho1: there will be no statistical difference in achievement in problem solving skills of students taught using the CTC Approach and those in the Lecture method group.
2. Ho2: there will be no statistical difference in the culturo-techno-contextual approach (CTCA) to effectively break barriers of students taught using the CTC Approach and those in the Lecture method group.

Literature Review

The use of computers effectively has become an essential part of everyone's education (Goode, **2010**). Literature indicates that early approaches (1960s-1980s) to computer use was teacher-centered instruction, teaching through traditional methods like lectures, textbook readings, and rote memorization were common. Focus then was on programming languages, where emphasis was placed on syntax and the mechanics of writing code, often with little context or practical application. There was also limited use of technology; computers were becoming more prevalent, their use in the classroom was often limited to demonstrations or simple programming exercises.

In 1980s-2000s) there was a shift towards student-centered learning and the rise of **constructivism**. In the then era, the idea was that students actively construct their own knowledge through experience and interaction with their environment gained traction. The approach used hands-on, non-computer activities to teach fundamental computer science concepts, making them more accessible and engaging, with emphasis on problem-solving and critical thinking. Students were encouraged to apply their knowledge to solve real-world problems thus fostering deeper understanding. This gave birth to and growth of **computer-assisted instruction (CAI)**, which led to software and online tools development to provide interactive learning experiences and personalized feedback.

From the 2000s to the present 2025 addressed as the modern approach. The focus is c**ulturally that of a responsive teaching**, the approach recognizes the diverse backgrounds and experiences of students; culturally responsive pedagogy with the aims to connect computer science concepts to students' lives and cultures, with integration of technology, more sophisticated software, simulations, online resources in use to enhance learning and provide opportunities for exploration and experimentation. Here, the focus is on computational thinking, developing problem-solving skills that are applicable to various domains, not just computer science. Collaborative learning comes in to play as students work together on projects and activities, fostering teamwork and communication skills. Acquisition of skills such as bookkeeping, clerical and administrative work, stocktaking, commercial practice now constitute a set of computerized practices that form the core of Information Technology (IT) skills package: spreadsheets, word processors and databases (Reffell & Whitworth, 2012). The importance of computer education and the usage of computers, the successful teaching and learning of computer science that can harness these gains are largely hinged on good teaching methods adopted for teaching the course/programme to enhance student's understanding. Efforts of curricula design have concentrated on expanding participation in Computer Studies education by introducing innovative approaches, but few have focused on addressing long standing equity issues through their choices of culturally relevant materials and activities (Kafai et al., 2019). Research has indicated that Sociocultural influences, such as family practices and access to quality secondary school education also contribute to developing a technology identity (Goode, 2010). Implying that culture and society influence educational outcomes, especially in computer science education, also teaching methods are critical in training that enhances the effective use of technology, but not without cultural influences.

Literature has indicated that teaching methods were eurocentric in context, during the 1960's after independence. It became more localized through curriculum reforms and other

interventions. Gains from such curricula designs and interventions were recorded credit to the interventions, while overall poor performance persists (Ademola, 2020; Okebukola, 2021; Oladejo, 2021). But it became clear that an area to which scant attention has been paid is the method of delivering the science curriculum (Okebukola, 2020). As a result, researchers have recently recommended the Culturo-Techno-Conceptual Approach (CTCA) for teaching.

The culturo-techno-contextual approach is Afrocentric teaching approach invented by Peter A. Okebukola and launched in 2015. It combines the power of indigenous knowledge, technology-mediated learning and locational context which is a unique identity of every school to produce meaningful learning. Okebukola, 2020 CTCA is a new and unique tool designed to help teachers and students break the traditional barriers to meaningful learning of STEM and non-STEM subjects. Students are expected to construct their own explanations learnt from their teachers or reading. According to National science teachers' association (NSTA, 2015), the 11 question "Can you explain that?" is answered in various ways in classrooms. Classroom communities may "explain" by clarifying one's meaning (providing definition), identifying a causal mechanism (explaining why something occurred), or justifying an idea (explaining why one believes the idea) (Braaten and Windschitl, 2011).

Several studies have investigated the effect of CTCA on students' achievement against the lecture method of learning engagements in various topics in computer studies Adolo, (2020). Networking, Olabiran, (2020), Computer Ethics and Human Issues, Agbanimu, (2020). Algorithm and Flowchart, all research findings indicate a statistically significant difference in support of CTCA a learning tool to break the barrier of students understanding difficult concepts.

Theoretical Framework of CTCA

In implementing CTCA, students are engaged in activities which demand that they (a) draw on their topic-relevant to indigenous (cultural) knowledge; (b) use technology to seek pre-lesson knowledge of the topic to be taught; (c) work in groups to share knowledge gleaned from their socio-cultural interactions and web-based resources; (d) draw on their prior knowledge of the topic when class is in session and (e) relate lesson examples to their local contexts. CTCA works along Vygotsky's Theory of social constructivism. Vygotsky's sociocultural theory asserts that learning is an essentially social role in the development of social process, as well as higher psychological functions (Jaramillo, 1996; Learning, 2012). CTCA is about the learner seeking information about indigenous (cultural) knowledge on a topic from parents and others before coming to class. It is also about a social process of interacting with classmates (peers) to share knowledge in groups. Sociocultural theory includes a relationship between the teacher and student based on social interaction. When using CTCA, teachers create an organised learning environment leading to the tendency of students to be more engaged with the learning material.

Okebukola's Eco-Techno Cultural Theory of CTCA

Okebukola and Jegede in a research of over two decades of gathering supporting evidence proposed the ecocultural theory of science learning (Okebukola & Jegede, 1990). In this theory, which is a STEM slant of the general theory of ecoculture, it holds that the context (ecology) where teaching and learning of science takes place as well as the microcultures of students and teachers exert noteworthy effects on learning. The link of the effect are two bridges. The first bridge is the link between experiences derived from the learning context and the subject matter to be learned. In this bridge for example, it can be seen that in relating practices of electroplating that students can observe in their immediate school environment, perhaps in a nearby blacksmith workshop and

the topic of electroplating in a chemistry class. The second bridge has a longer span, tucked deep in the cultural orientation of learners. This cultural bridge links indigenous knowledge and cultural practices that are related to a STEM concept. The effect of the two bridges is likened to a catalyst accelerating the formation of neural networks which are evidentiary that learning has taken place.

In the framework of culture in CTCA the prominent feature within is indigenous knowledge (IK) (Ademola, et al, 2022). IK is the product of the process of viewing the world through the lens of communities, a distillate of their understanding of how the world works and how such understanding can be deployed for their wellbeing, welfare and improved quality of life. With CTCA in science classroom, all lessons are connected with students' indigenous knowledge systems, making the subject matter relevant and meaningful. On the subject of technology in the CTCA amalgam, findings of several surveys aggregate to suggest that learners flock to YouTube, Wikipedia resources, WhatsApp, Facebook and other technology-related resources for their online activities, leading the CTCA research team to target these technologies (Al-Adwan, & Smedley, 2012). Since students already have some appetite for emerging technologies, the idea in CTCA is to take advantage of such interest.

METHODOLOGY

Design of the study: The study will employ explanatory sequential design of a mixed method .to seek new pedagogies for Computer Studies in implementing Culturo-Techno-Contextual Approach in Secondary Schools. This study employed a qualitative element to the design with an interview session, this approach also helps to discover the link between the variables and produce statistical findings to aid generalizations (Creswell, 2014; Tetteh et al., 2022, adopting a Quasi experimental, narrative and interpretative design Jaiyeola, 2020). The researchers adopted the quasi-experimental-control group design involving pre-test and post-test. As the name implies, "quasi-experiments" aim to approximate "experimental methods" in situations where "full experimental control" is not possible, in studies were researchers are attempting to identify the consequences of social change in naturalistic settings (Awaah et al., 2021). Before the treatment, the pre-test was administered to both groups to determine each students' base ability. The experimental group was taught spreadsheets using the CTCA. The control group was taught the same topic using the lecture method. A post-test was administered to both groups at the end of the treatment, a quasi-experiment does not rely on random assignment, but subjects are assigned to groups based on non-random criteria. In this study, existing schools and classrooms were adopted without altering the existing numbers in the classroom, conditions were left intact., hence the adoption of the quasi-experimental design. Cook and Campbell, (1986) the drive to generalist research results to natural strict settings precludes the use of one traditional experimentation that is called the tradition experimental control and isolation. Therefore the justification for quasi-experiment.

Population and Sample: The population of the study were all senior secondary school II (SS2) students in the study area in public secondary schools. The sample used for the study comprised schools; of four groups for the control group comprised 82 and four groups of 112 from the experimental group. The quasi-experimental-control group research design involves selecting groups upon which the variable is tested without any random pre-selection process. Therefore, a randon sampling technique was adopted to select schools for the study, this way all schools in the

study area have a chance of being selected and findings from the study can be generalized. The sample was of mixed ability and mixed-sex groups (Awaah, 2021).

Description of study Area/Site:

Uyo Senatorial district is a district of 9 local government areas and, capital of Akwa Ibom State. In this study, the secondary schools are selected by geographical settings to allow for equal representation and results can be generalized. Selection on strata techniques were employed to select 8 schools.

Description of Data/Data Collection:

Excel Spread sheet achievement test was employed to collect data in this study. CTCA and spreadsheet perspectives: Spreadsheet is a topic that has been perceived to be difficult in secondary schools. Students were taken through the following lessons under the spreadsheet:

(1) Definition of spreadsheet package.

(2) Examples of spreadsheet packages.

(3) Functions of parts of spreadsheets.

(4) Uses of spreadsheet packages.

The researchers designed a twenty (20) multiple-choice items instrument, adopted and modified from past Senior Secondary Certificate Examination (SSCE), and some questions were retrieved online for multiple-choice questions on excel spread sheet

The instrument was subjected to test-retest reliability test to ensure that the excel spread sheet achievement test was consistent and accurate. The instrument went through a pilot test administered to 20 students from a school in the study area that was not part of the sample selected for the study, same test was re-administered to the same students after two weeks. Participants were tagged with identifying numbers to avoid a mismatch in the first and second administration, that the end of both test the first and second responses were then collated and subjected to stability testing and the reliability coefficient of $r = .75$ was derived. An acceptable level of $r \geq 0.7$ indicates the instrument is reliable and accurate, under similar conditions, where it continues to measure what it is designed for. The reliability was tested using a Split Half reliability check, tested and analysed using SPSS; for acceptable reliability Validity of the instrument was reviewed by 3 experts in computer science. After the endorsement of validity, the test was administered to participants. It contained 20 multiple choice questions from the topic spreadsheet. Questions comprised options A-D, participants were required to choose the answer that best describes the answer to the question. The responses informed the researchers on the efficacy of the CTCA compared to the lecture method.

Procedure for data collection

Permission was sought from the sampled schools authorities for the experiment. The researcher ensured a cordial atmosphere where the participants felt relaxed and ready to participate. The two groups followed the procedure adopted for the treatment, the CTCA for the experimental group using the lecture method.

O_1 X O_2 X O_4 E (Schools A and C

O_3 -- O_5 -- O_6 C (Schools B and D

Where O_1 O_3 = Pretest , $O_2O_4O_5O_6$

E = experimental group

X = treatment: Culturo-techno centexual approach

Source(s) By researchers.

The experiment procedure was modified from the original steps involved in teaching, using CTCA as stated by Okebukola (2020). In this study the researchers adopted the procedure for teaching using CTCA as shown in the steps outlined.

Step 1: The teaching started with previous knowledge assessment, researchers asked questions to seek information on indigenous knowledge (Palm trees harvesting), cultural practices in the family and among friends, their understating of programming, use of mobile phones if they had one and other internet-enabled devices to search the web for resources and watch YouTube videos on the topic on excel spreed sheet.

Step 2: The teacher welcomed the students to the class and divided the students into

groups of 7 consisting of both sexes with mixed academic intelligence.

Step 3: Each group was given 8 minutes to discuss and share their various opinions and insights on the allotted topic. Data sorting.

Step 4: The teacher selected a group leader from each group to give a detailed summary of their discussion on the topic. The students discussed the findings of their indigenous knowledge relative to "data sorting" about their family farm life's, relatives, environment, and internet sources. After 8 minutes, the teacher instructed all the leaders of the various groups to report their findings from their group's perspective.

Step 5: The teacher then proceeded with the topic "concept of data sorting" by relating the topic to cultural attributes (cultural approach), pointing out several examples and instances concept of data sorting can be related to daily in the community life and farming culture. Sorting of palm product/ by-products according to economic importance: from palm fruits (4 palm oil), palm kennel (4 kennel oil), palm fronds (4 brooms), to palm bunch husk (4 scoring sponge) in Data sorting in Excel from largest to smallest size.

Step 6: The teacher advanced the instructional process by applying a contextual approach while teaching the topic to the students to help them familiarize themselves with the use of concept of data sorting.

Step 7: After the class, the teacher sent what was learn (content) to the students through WhatsApp.

The procedure was modified from the original steps involved in teaching, using CTCA as stated by Okebukola (2020).

In the teaching method used for the control group, the researchers followed the procedure below.

Step 1: The teacher introduced the topic and its various definitions to the students.

Step 2: The teacher then guided the students to list the examples of concept of data sorting in excel

Step 3: The teacher asked the students to explain the concept of data sorting as they understand it, and the students responded.

Step 4: The teacher corrected the students where necessary.

Step 5: The teacher finally guides the students to mention the areas of uses of concept of data sorting.

Data analysis.

Data collected was generated from the Excel spreadsheet achievement test analysed using SPSS version 23, analysis of covariance (ANCOVA) was used to test for statistically significant difference between the CTCA and lecture method in learning of concept of data sorting at alpha level $p < 0.05$. Qualitative data from students were analysed using content analysis. The experimental phase entailed data (quantitative) generated from the topic Data Sorting in Excel from largest to smallest. Qualitative data from students were gathered to establish why teaching data sorting with CTCA makes the student understand Excel Spreadsheet better. Some assumptions were met, such as the normal distribution of the population, homogeneity of variance, random assignment, and homoscedasticity of data (Korede, 2020). The initial differences of the learners were taken into consideration which led to giving out a pretest to both experimental and control groups before the treatment to elevate baseline activity, and the achievement pretest is known as Covariate (Olelewe & Agomuo, 2016).

Results

Research Question 1: What is the achievement level of students in problem solving skills that inhibit their meaningful learning of the concept? Mean and Standard Deviation were used in answering the research question and the summary in Table 1.

Table 1: Mean and Standard Deviation of specific difficulties students have with problem solving skills that inhibit their meaningful learning of the concept.

Treatment		**Pre-test**		**Post-test**		
Groups	**n**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Gain**
CTCA (Experimental)	110	67.18	7.02	69.35	7.435	2.17
Lecture Method (Control)	82	64.45	10.80	66.52	5.133	2.07
Total	**192**					

Source: Field data (2025)

The result in Table 1 reveals the CTCA group demonstrated an increase in mean achievement from pretest (*M* = 67.18, *SD* = 7.02) to post-test (*M* = 69.35, *SD* = 7.44). While the pre-test for Lecture group (M = 64.45, SD= 10.80) and post-test (M = 66.52, SD = 5.133). This shows that there was a moderate performance in the post-test scores of the two groups but CTCA group has the highest gain score of 2.17 against 2.07 of the lecture method. This means that CTCA enhanced students' achievement in problem solving skills than their counterparts in the control group taught using lecture method.

Research Question 2: Will the use culture-techno-contextual approach (CTCA) effective in breaking the barriers to learning of difficult concepts? Mean and Standard Deviation were used in answering the research question and the summary in Table 2.

Table 2: *Mean and Standard Deviation of the use of CTCA effective in breaking the barriers to learning of difficult concepts.*

Treatment		**Pre-test**		**Post-test**		
Groups	**n**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Gain**
CTCA (Experimental)	110	67.04	10.455	69.79	12.075	13.78
Lecture Method (Control)	82	65.30	11.58	65.67	9.806	13.37
Total	**192**					

Source: Field data (2025)

The result in Table 2 reveals the pre-test achievement score (M = 67.04, SD = 10.455 and post-test (M = 69.79, SD = 12.07), the result further shows the pre-test achievement score for the lecture group (MD = 65.30, SD = SD = 11.58) and post-test scores (M = 65.67, SD = 9.806). This shows that there was a moderate performance in the post-test scores of the two groups but the CTCA group had the highest gain score of 13.78 against 13.37 of the lecture method. This means the use of CTCA is more effective in breaking the barriers to learning of difficult concepts than the lecture method.

Ho1: There will be no statistical difference in achievement in problem solving skills of students taught using the CTCA and those in the control group.

An analysis of covariance (ANCOVA) was conducted to examine the effect of instructional method (CTCA vs. lecture method) on students' posttest achievement in spreadsheet data sorting, controlling for pretest scores. Results revealed a statistically significant effect of instructional method, $F(1, 189) = 8.66$, $p = .004$, $\eta p 2 = .04$, indicating that instructional method accounted for approximately 4% of the variance in posttest achievement. This means that there is a significant difference in the pre achievement mean score and post achievement mean score in problem solving

skills of students taught using the CTCA and those taught using lecture method. Thus, the null hypothesis was rejected. The result of the finding is presented in table 3.

Table 3: Analysis of Covariance (ANCOVA) for Posttest Achievement in Spreadsheet Data Sorting

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	377.459[a]	2	188.729	4.372	.014	.044
Intercept	15783.728	1	15783.728	365.648	.000	.659
Pretest	1.166	1	1.166	.027	.870	.000
Lecture method_CTCA	373.926	1	373.926	8.662	.004	.044
Error	8158.458	189	43.166			
Total	900156.000	192				
Corrected Total	8535.917	191				

a. R Squared = .044 (Adjusted R Squared = .034)

In order to determine the magnitude of the significant differences across CTCA group and the lecture group, the estimated marginal mean of the groups was carried out the result is represented in Table 4.

From table 4 the result showed that students in Lecture group (method) had the low adjusted post achievement mean score (M = 66.51,SE = 0.73) while the CTCA group obtained higher adjusted post achievement mean score (M= 69.37,SE = 0.63). The effect size was small to moderate (ηp 2 = .04), suggesting that while CTCA had a statistically significant impact on achievement, other factors also contributed to students' performance. This order is represented as LM< CTCA.

T**able 4:** *Estimated Marginal Means for post achievement in problem solving skills of students taught using the CTCA and those in using lecture method*

Lecture method & CTCA	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Lecture Method	66.511[a]	.730	65.070	67.951
CTCA Approach	69.365[a]	.630	68.123	70.607

Ho2: There will be no statistical difference in achievement in the culture-techno-contextual approach (CTCA) to effectively break barriers of students taught using CTCA and those in the control group.

Result from table 5 showed that there was a significant difference in achievement in the CTCA to effectively break barriers of students taught using CTCA and those in the control group *(F* (1,189) = 5.390*; p=0*.028<0.05*, partial eta squared=.028)*. The effect size is 28.0%. There is a significant difference in the per-achievement test and post achievement test score in CTCA to effectively break barriers of students taught using CTCA and those in the lecture group. Accordingly, the null

hypothesis was rejected, indicating a statistically significant difference in achievement test between students taught using the CTCA and those taught using the lecture method. The result of the finding is presented in table 5.

Table 5: *Analysis of Covariance (ANCOVA) for Posttest Achievement in Spreadsheet Data Sorting.*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2188.953[a]	2	1094.476	9.280	.000	.089
Intercept	13362.119	1	13362.119	113.295	.000	.375
PretestBarr	1391.441	1	1391.441	11.798	.001	.059
Lecture method_ CTC	635.708	1	635.708	5.390	.021	.028
Error	22290.860	189	117.941			
Total	913104.000	192				
Corrected Total	24479.813	191				

a. R Squared = .089 (Adjusted R Squared = .080)

Ho2: there will be no statistical difference in the CTCA to effectively break barriers of students taught using CTCA and those taught using Lecture method. The ANCOVA result showed a statistically significant difference between the academic achievement test of group CTCA and the Lecture group, [F (1.89) = 1.55; $p > 0.05$]. Thus the null hypothesis is rejected.

T**able 6:** *Estimated Marginal Means for post achievement in CTCA to effectively break barriers of students taught using CTCA and those in the Lecture group*

Lecture method_ CACTA	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
Lecture Method	65.917[a]	1.201	63.547	68.287
CATCA	69.607[a]	1.037	67.562	71.652

a. Covariates appearing in the model are evaluated at the following values: PretestBarr = 66.30.

Further, the source of the significant difference obtained in Table 7 was traced using Bonferroni post-hoc test.

Table 7: *Bonferroni Post-hoc analysis of post achievement in the culture-techno-contextual approach (CTCA) to effectively break barriers of students taught using CTC approach and those in the control group.*

(I) Lecture method_ CTC	(J) Lecture method_ CTC	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Lecture Method	CTC	-3.690*	1.589	.021	-6.825	-.555
CTC	Lecture Method	3.690*	1.589	.021	.555	6.825

Table 7

indicates that the post-achievement mean score of students exposed CTCA was significantly different from their counterparts taught using lecture method. Also, the difference in the mean scores of students exposed to CTCA and the lecture method was significant, but the CTCA group were the main source of the significant difference. This implies that the treatment (CTCA) had effect on achievement to effectively break barriers of students.

At the end of the quantitative data collection, qualitative analysis of student interviews revealed three dominant themes: (a) activation of prior knowledge, (b) cultural relevance of instructional examples, and (c) technology-mediated learning support. Students reported that culturally familiar examples and pre-class exposure to online resources enhanced their understanding of spreadsheet concepts, randomly sampled and unnamed students responded thus:

Aniekan *(pseudonym)*

}The pre-class assessment enabled me to get a base understanding of the topic before the start of the class".

Ini-iso *(pseudonym)*

"The use of cultural examples made it easier for me to relate to the topic",

Uduak *(pseudonym)*

"The assignments given before class boosted my confidence, so I was able to answer questions confidently in class which also increased my understanding of the topic".

Hope *(pseudonym)*

"The use of the local examples in the teaching made understanding easy. It made the topic look come to life".

Glory *(pseudonym)*

"Using online (internet) sources was of great help in understanding the topic".

Discussion:

Research hypothesis one

The first research hypothesis sought to test that "there will be no statistically significant difference in the achievement in Excel Spreadsheet on "Data Sorting" of the students taught using CTCA and lecture method". The result indicated a statistically significant difference in the achievement in the Excel Spreadsheet of students taught using CTCA and lecture method, thereby rejecting the null hypothesis. This result proves that the CTCA is a better method of teaching Data sorting in Excel spreadsheet than the lecture method.

This study result is consistent with Adeola's (2020) findings on the efficacy of the CTCA in improving the achievement of secondary school students in Adaptation, the researcher employed

CTCA for the experimental group and lecture method to teaching the control group and result obtained statistical showed a difference between CTCA and the control group.

The study finding also agrees with the study of Awaah (2021), the study experimented with the potency of the CTCA in enhancing performance in difficult concepts among Ghanaian undergraduate public administration curriculum. Their study result indicated that CTCA stands as a better teaching method over the lecture method in studying politics and bureaucracy in public administration curriculum in the Ghanaian University (Awaah et al., 2021).

However, the result of this study is at variance with that of Srithep et al (2016) their result showed no significant impact of indigenous strategy like CTCA on students' scientific explanation of biological concepts in a study. This difference may be because the researcher didn't use this strategy in Africa, as Africans have very rich cultural conceptions on scientific issues.

Computer Science studies and other science subjects cannot be taught in abstraction by untrained or unqualified teachers, making science lectures uninteresting and increasing students' difficulties in learning scientific/difficult concepts and principles (Kpaji & Ibrahim, 2015). For significant result on overcoming this barrier, this study has provided an empirical evidence to adopt the CTCA in the teaching of Data sorting, an idea that is consistent with Okebukola et al. (2016) work, a suggestion that pre-service and in-service science teacher preparation should begin to focus more on providing teachers with some CTCA experience in the search for culturally and contextually relevant methods of education.

Two Hypothesis set out to test whether there will be no statistical difference in the CTC Approach to effectively break barriers of students taught using CTCA and those taught using Lecture method. The result showed a statistically significant difference between the academic achievements in the groups; thus, the null hypothesis was rejected.

This finding supports the result of Jegede and Fraser (2015) opined that students exposed to instruction in science which deliberately encompassed the discussion of socio-cultural views about science concepts greatly improved in test performance. Where students are able to explain the concepts in a different way after their exposure to treatment with emphasis on scientific claim, reasoning and evidence. This findings also supported that of Okebukola (2019), in his quote *"Africans should try as much as possible to use their very own strategy in teaching science concepts ,all students have their own conceptions on scientific concept, these conceptions should be considered while teaching the students"*, A conception that gave birth to the invention of Culturo-techno-conceptual approach .

CONCLUSION

This study of a mixed method set out to test two hypotheses, 1) sought to test that "there will be no statistically significant difference in the achievement in Excel Spreadsheet on "Data Sorting" of the students taught using CTCA and lecture method" two hypothesis sets out to test whether there will be no statistical difference in the CTCA to effectively break barriers of students taught using CTCA and those taught using Lecture method. A comparison between the lecture method and the CTCA using ANCOVA showed significant results. The post-achievement mean score of students exposed CTCA was significantly different from their counterparts taught using lecture method . Also, the difference in the mean scores of students exposed to CTCA and lecture method was significant, but the CTCA group was the main source of the significant difference.

This implies that the treatment CTCA had effect on achievement to effectively break barriers for students. The significance favours the experimental group, implying the CTCA is a better model than the lecture method in enhancing students' understanding of Data sorting in Excel spreadsheet in computer studies in secondary schools in Uyo Senatorial Area.

Implications of the Findings

Excel Spreadsheet is perceived to be difficult by students. To assist students improve and move away from these concepts, teachers conceptual and procedural knowledge is important. The mastery of the subject matter, pedagogical knowledge, approach and strategy becomes the master key to class effectiveness. It is evident that, socio-cultural factors exact great influence in learning of difficult concept as a result of students' different cultural background. Teachers should strive to identify factors especially different traditional/cultural and religious beliefs attached to computer concepts in order to reconcile students' previous knowledge and aid easy understanding and acceptance of scientific explanations.

To better assist students develop and improve skills of grasping difficult concepts easily, Teachers should incorporate scientific explanation as part of classroom activities where students will be challenged with tasks that will help them to master the three elements of scientific explanation; claim, evidence and reasoning.

RECOMMENDATIONS

Based on the findings of this report, the following recommendations were made:

1. Teachers need to take account of students' cultural background in order to identify different traditional and social beliefs attached to computer concepts and use it as a guide during teaching/learning process to ease students' understanding of difficult concept.

2. Teachers should provide collaborative learning environment in Excel spreadsheet class since social and cultural influences have a lot of meaningful impact on learners' ability to learn.

3. Computer studies teachers should connect teaching/learning to everyday practical experience

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