KIU Journal of Education (KJED)
Volume 3 Issue 1
Page 66 - 81
April - May 2023
https://www. kjed.kiu.ac.ug

Ok I need help! Can CTCA rescue Teaching and Learning Machine Language in an African secondary school?

[1] Michael Adelani Adewusi, [2] Tokunbo Odekeye and [3] Kazibwe Sophia

[1]College of Education, Open and Distance Learning, KIU, Uganda
michael.adewusi@kiu.ac.ug
ORCID ID 0000-0002-8003-6761

[2]Osun State University
Department of Educational Technology, Osun, Nigeria
ola.odekeye@uniosun.edu.ng
ORCID ID 0000-0002-9973-6741

[3]Kampala International University
Department of Political and administrative studies, Kampala, Uganda
sophia@kiu.ac.ug

[1]Corresponding author

Abstract

This study was conducted to determine if the use of the Culturo-Techno-Contextual Approach (CTCA), a learning strategy that incorporates the use of cultural knowledge (indigenous knowledge), contextual drawing from the immediate environment to illustrate teaching, and the component of technology, can improve learning. What is the purpose of machine language? It is a difficult-to-learn concept in the computer studies curriculum of Nigeria, despite being the basis of computer programming. It is hypothesised that (i) there is no statistically significant difference in (a) academic achievement and (b) attitudes between males and females when taught in machine language. (ii) There are no statistically significant interaction effects of sex and training method on (a) academic achievement and (b) attitudes of students in machine language. A total of 207 computer studies students in senior secondary year two (SS2), comprising 106 females and 101 males, participated in the study. The instruments used to gather data were the machine language attitudes questionnaire (MLAQ) and machine language achievement test (MLAT), which had reliability coefficients of 0.71 and 0.70, respectively. The one-way MANCOVA multivariate F (Pillai's Trace) was not significant [F = 0.49; P > 0.05]. Univariate tests on achievement [F (1, 203) = 0.72; P > 0.05] and attitude [F (1, 203) = 0.36; P > 0.05] failed to attain statistical significance. Hypothesis one was not rejected because there was no statistically significant effect of student gender on (a) academic achievement and (b) attitudes when taught using CTCA and the lecture method. The two-way MANCOVA multivariate F (Pillai's Trace) was not significant [F = 2.26; p > 0.05]. The interaction effect between sex and training method on achievement [F (2, 199) =.90; P =.41] was not significant, but on attitude [F (2, 199) = 3.67; P =.03] attained statistical significance. The study concluded that educators are encouraged to use the CTCA and could demonstrate how it could be used as a pedagogical design for improving the achievement and attitude of students in computer studies and other subjects offered in senior secondary schools by capitalising on its assets. The strategies will assist both teachers and students in gaining respect for local activities and culture, its wisdom and ethics, indigenous science and technology, and the use of local resources, thereby enhancing sustainability, and they will encourage collaboration among students, resulting in improved academic achievement and attitude. Both males and females performed on neutral ground. Giving both male and female students the opportunity to excel on a neutral ground without having any influence over the other.

Key words: Culturo-Techno-Contextual Approach (CTCA); Machine Language; Collaborative

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

1. Introduction

With the continued use of traditional or conventional methods of teaching and learning, Nigeria's educational system has gradually lost its status as the leading and most important institution in society (Adewusi, 2021). The notion that the educational system produces excellence in identifying and developing an individual's potential through academic achievement is a delusion. The country's academic system established and implemented the first National Education Policy in education in 1982, and there have been few improvements and adjustments at various levels of the educational system (Adeleye, Luiz, Muthuri, and Amaeshi, 2020; Raimi, Suleiman, Odipe, Tolulope, Modupe, Olalekan, and Christianah, 2019; Mabuza, 2018). Ashby (2019) and Gunter (2018) identified and recommended an enriched curriculum to ensure students' relevance to their local indigenous practises and manpower development in learning, which will improve their academic performance. However, this had not been adopted by the majority of academic learning institutions, which continued to use the conventional method.

It is essential to attend to the needs of the learners and the diverse needs of students by taking the academic system specifications into account (Erümit & Etin, 2020) in order to enrich the teaching and learning methods with local and cultural practises that will further enhance their learning. This was agreed upon by Naeem Atanda Balogun, Fabian Aiterebhe Ehikhamenor, Omenogo Veronica Mejabi, Rafiat Ajibade Oyekunle, Olayiwola Wasiu Bello, and Oluyinka Titilope Afolayan (2020) that the government must educate, train, and implement local and cultural policies in education, for example, teaching and learning strategies.

In addition, the primary objective of any educational system in operation is to create a system that has a positive impact on future generations. The system must be user-friendly and perform all tasks flawlessly. Introducing cultural and indigenous practises to the teaching and learning of machine language in the secondary school system, in which the concept is to prepare students with complete knowledge of computing devices (see Baron, Drot-Delange, Grandbastien, & Tort, 2014), should further strengthen their understanding of the concept when implemented. This is significant in this 21st century era of artificial intelligence, the internet of things, block chain technology, and so on.

The CTCA requires the integration of culture, technology, and context frameworks into each lesson. The initial step occurs prior to class, while the final step occurs at the conclusion of or after class. The physical boundaries of the classroom are not a restriction on CTCA.

Steps

Inform students beforehand of the subject to be covered in class.

1. Request that each student (a) consider indigenous knowledge or cultural practises and beliefs associated with the topic or concept. Students should be informed that their reflections will be shared with the class when the topic is taught, and (b) using their mobile phones or other internet-enabled devices, they should search the web for relevant lesson resources (the first technology flavour of the approach).

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

2. At the beginning of the lesson and following the teacher's introduction, students are divided into mixed-ability, mixed-gender groups to share individual reflections on (a) the indigenous knowledge and cultural practises and beliefs associated with the topic and (b) summaries of ideas derived from web resources. All of these web-based and cultural reflections are recorded and presented to the entire class by the group leaders. The instructor concludes the lesson by sharing relevant indigenous knowledge and cultural practises.

3. The instructor advances the lesson by drawing practical examples from the immediate school environment. Students can physically observe such examples to make science (or any subject) tangible. This is one of the approach's "context" flavours. The instructor should pepper their delivery with content-relevant humour.

4. As the lesson progresses, the class is reminded of the importance of the indigenous knowledge and cultural practises documented by the groups to the comprehension of the concepts. If cultural beliefs are associated with misconceptions, the teacher clarifies them.

5. At the conclusion of the lesson, the teacher sends all students an SMS or WhatsApp message with a maximum of 320 characters (two pages) summarising the lesson. These messages are to be sent by student group leaders following the first lesson. This is another technological flavour of the strategy.

The frameworks provide a particular perspective, or lens, through which we examine a topic such as CTCA (Durbarry, 2017). There are many different lenses, such as psychological theories, social theories, organisational theories, cultural theories, technology theories, and, of course, several philosophies, that may be used to define concepts and explain phenomena such as the CTCA.

2. Purpose of the Study

The purpose of this study is to determine the impact of CTCA, a learning strategy that incorporates the use of cultural knowledge (indigenous knowledge), contextual drawing from the immediate environment to illustrate teaching, and technological components to enhance learning. Specifically, the purpose of the study was to determine the impact of the gender of the students (male and female) on their achievement and attitude when taught using the teaching strategies and to establish the extent to which gender and teaching methods interact with achievement and attitude when taught using the strategy (Awaah, F., Okebukola, P.A., Ebisin, A., Agbanimu, D., Peter, E.O., Ajayi, O.A., Gbeleyi Fewer studies have reported CTCA's impartation of learning strategies in terms of gender and teaching methods for machine language.

This research tested the following hypotheses: There is no statistically significant difference between male and female academic achievement and attitudes when machine language is taught. (ii) There are no statistically significant interaction effects of gender and training method on (a) academic achievement and (b) machine language student attitudes.

Studies have reported findings regarding the effects of gender on academic performance (see Weinstein, Nunes, & Karpicke, 2016; Caspersen & Smeby, 2020), but few studies have been conducted to determine whether a teaching and learning strategy has an effect on gender and

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

teaching method when using CTCA to teach machine language. It addresses the issue of gender in academia (Adewusi, 2021). Hegarty (2001) advises using a performativity viewpoint to deconstruct gender because gender's definition is complex and crucial. Gender is a non-essential concept based on societal standards (Morgenroth and Ryan, 2018). As gender is culturally and historically distinctive, internally contradictory, and changeable (Hegarty, Ansara, & Barker, 2018).

Gender stereotypes restrict women's activity in the utilisation of ICT, according to Olatoye and Nekhwevha (2021; Buskens and Webb, 2009; Edwina, 2005). Women are believed to be behind in ICT-related subjects (Hallberg, Kulecho, & Okoth, 2011). Males utilise ICT more than females (Mahdi and Al-Dera, 2013). Tezci (2009) found that gender affects ICT use. Agbatogun (2013) found no gender effect on ICT use.

Steegh et al. (2019) found that gendered patterns in math and scientific interest start in early life, grow across time, and predict advanced course selection in secondary education. Teens can participate in out-of-school learning programmes like math and scientific competitions as they discover their abilities and interests. This raises the question of whether math and scientific competitions promote female and male interests equally.

Gnambs (2021) found that ICT literacy is crucial for teens to engage in modern society. Previous research on gender and ICT literacy found inconsistent results. His study explored cross-sectional and longitudinal gender impacts on ICT literacy among German 15-year-olds (N = 13,943) over three years. Over the study period, ICT literacy rose. At 15, gender disparities in ICT literacy were minor, but at 18, they favoured boys. ICT confidence benefited the males at age 15 but did not change afterwards. Gender role hypotheses were not substantiated. The study identified modest gender disparities in ICT literacy. The little observed effect does not warrant worrisome inferences about girls' ICT literacy (Adewusi, Odekeye, Egbowon, Alade, & Akindoju, 2022).

3. Methodology

The research employed a variety of methods. The use of quantitative and qualitative approaches in combination or jointly provides a greater understanding of research problems and complex phenomena than either approach alone (Jaiyeole, 2020). The study's target population consists of 207 senior secondary school students from public secondary schools in Lagos State.

This study employed pre-tests (achievement and attitude) to determine the entry level of the students, eliciting both achievement and attitude data from the students regarding how they perceive and perform academically with regards to the topics or concepts of machine language. In addition, the experimental groups received the treatment (CTCA), while the control groups were instructed using the conventional lecture method. The treatments lasted six weeks; each week, the CTCA group spent 80 minutes discussing various topics with the teacher.

The lessons were held on the weekends and consisted of post-tests. There were no discernible differences in the administration of the tests between the groups with regard to the time allotted, the supervisor, or the students' willingness to participate. In order to improve test reliability, the classroom was devoid of distractions, boredom, and fatigue.

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Lesson on Running a Machine Language Programme

In summary, students were taught the instructions that make up a software programme, which are organised in the form of a sequence of instructions. Any one of these instructions must first be turned into machine code, which is a set of simple binary codes that tell certain parts of the central processing unit to start working. The objectives of this lesson are for students to be able to: list the functions of the central processing unit; and describe the functions of the central processing unit by the time the lesson is over.

Culturo-Techno-Contextual Approach Application

Contextual: human life cycle

During the human life cycle, the human body continuously evolves and changes (changes occurring from one particular component to another, i.e., CU, ALU, and REGs), and food (decoding, encoding, or fetching) supplies these changes with fuel (instructions). Pregnancy, childhood, childhood, childhood, puberty, older adolescence, adulthood, the medium-sized generation, and seniors are the main phases of the human life cycle. Appropriate diet (logical instructions) and exercise guarantee health and well-being at each stage of life.

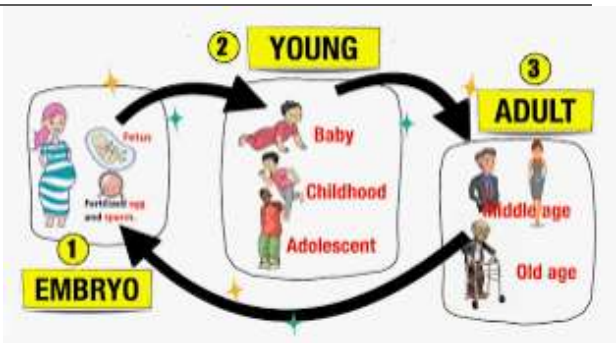


Figure 1: Human life cycle

Cultural: Construction Technique in Ancient Yoruba Building

The "bricklayers" (onimonde) in ancient Yoruba construction would stand in one place while the rest of the workers formed a chain (or several chains) and threw the laterite from person to person until it reached the "bricklayers." This process was known as "ju si mi, ki nju si o," which translates to "throw it to me, and I'll throw it to you." After laying the foundation and letting it dry for three to four days, the walls of the house were built up gradually, pausing every one foot six inches to two feet (45 to 60 centimetres) to let the laterite dry. This process is called the fetch-decode-

execute cycle, whereby the chain formed by the laymen is the process of decoding till it reaches its destination, which is the mould, and the process continues till the desired structure is formed.

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Figure 2: Traditional constructed house by the Yoruba tribe

Lesson on Machine Language Instruction

In summary, students were made to understand that the vast majority of software developers do not compose their programmes using sequences of binary digits. They use a variety of programming languages, including Java, C++, and Python, among others. These are sometimes referred to by another name: high-level programming languages. High-level languages have to be translated into binary code before the central processing unit can operate on them (machine code). Because they are more similar to standard written English than binary numbers, high-level languages have the advantage of being simpler for humans to write and comprehend. This is because they are more like the language that is spoken every day. The objectives of this lesson are for students to be able to: understand low- and high-level languages; enumerate machine language converters.

Culturo-Techno-Contextual Approach Application

Contextual: Languages (linguistic or non-linguistic)

Humans are capable of communicating with one another. Only our imagination limits our ability to exchange knowledge, beliefs, opinions, wishes, threats, commands, thanks, promises, declarations, and feelings. The human can laugh to express fun, enjoyment, disrespect, amusement, joy, appreciation, bitter feelings, or cry for indignation, excitement, or fear. We can tighten our fists to express determination, wrath, or danger; lift our eyebrows to express surprise or displeasure; and so on.

Species and non-humans can share data, but none of them is known to have a communication mechanism with a complexity comparable to language in any way. They interact primarily through non-linguistic means like smiling, laughing, screaming, fist-clenching, and eyebrow-raising. Chimpanzees, gorillas, and orangutans can exchange various types of information with different types of shrieks, compose their faces in many ways, and move their hands or arms in different movements, but they have no words or sentences. Bees can tell where to find sweetness by moving into fleas. Birds sing various songs to protect or attract mates to their territories. Human-to-human communication and understanding what is being transmitted are very possible.

Even when humans do not understand each other's languages, it is much more difficult for humans and non-humans to communicate. Human-to-human communication can be likened to machine language, while human-to-non-human communication is a non-machine language that is difficult to understand by a human.

Figure 3: Languages – linguistic/non-linguistic

Cultural: Yoruba tribe Family Relationships

Considering your relationships with your siblings, cousins, and neighbours because you share the

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

same parents and have almost all of the same DNA, you are very closely related to your brothers and sisters. You also have a lot in common because you grew up with the same household rules, food, and behaviour. This relationship here can be likened to machine language that a computer can understand without any interpreter, translator, or compiler.

Your cousins and you have a close relationship, though it is not as strong as your relationship with your siblings and other immediate family members. You share DNA (in smaller amounts than your immediate family members), family history (at the grandparent rather than parent level), and many of the same family rules and behaviours. The relationship here is not as well translated as the siblings' relationship.

Your relationship with your neighbours is unique. You most likely do not share anything with them. Your relationship with your neighbours is unique. You most likely do not share any close DNA or family history with them, but your family and they may have traded tools or dinner recipes and spent so much time together that you consider them relatives even if they are not. The relationship here is a non-machine language that requires an interpreter, translator, or compiler for the computer to understand.

Figure 4: Yoruba tribe Family Relationships

Lesson on Instruction set and Assembly language

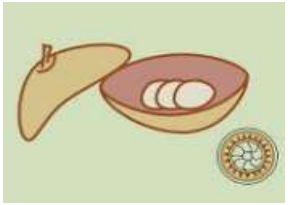
In summary, students were taught that instructions are decoded into a series of operations that are performed in a specific order. These instructions are given to the ALU and control unit that are located within the CPU. Students should be able to do the following by the time the class is over: Explain how instructions are coded as patterns; describe the process through which the computer differentiates between data and instructions; and recognise the locations of the memories.

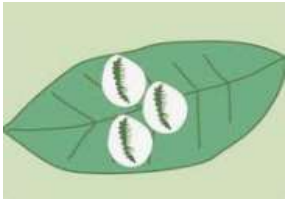
Culturo-Techno-Contextual Approach Application

Cultural: Aroko among the Yorubas

An aroko is a symbol, item, or collection of such things that a messenger typically breaks up and gives to another person in order to convey a message that the recipient must decipher. Most of the time, it is transmitted by hand via a carrier or messenger, and it is a traditional form of communication in Yoruba society. It is wrapped in leaves and placed in a calabash, sack, or other appropriate container.

The message recipient might be compared to the operand, which is the memory location; the symbolic object is the opcode, which is what is to be acted upon; and the medium, which could be compared to the leaves, bag, or calabash, is the carrier for the instructions to be carried out.





ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Figure 5: Aroko among the Yoruba tribe

Contextual: Food Recipe

Using a food recipe as an example, the opcode might be chop or mix. In the analogy of a recipe, the thing that the opcode is acting upon is an ingredient (such as an onion). So the opcode chop could act on the operand onion. If the operand refers to a place in memory, this could be seen as the chopping board. The operand (data) of the onion could be in the memory location of the chopping board. The instruction could be to chop the onion on the chopping board.

Figure 6: The traditional chopping board

4. Instrument

A machine-language attitudes questionnaire (MLAQ) with three sections "A", "B", and "C" was used to collect data. Section "A" is used to collect respondents' demographic information, and Section "B" contains 18 questions rated on a four-point scale: strongly disagree (SD), disagree (D), agree (A), and strongly agree (SA). And section "C" is a quantitative section asking if the student has any additional information. It was administered as a pre-treatment and post-treatment test to all groups (experimental and control) during the course of the study.

The machine language achievement test (MLAT) consists of two "A" and "B" sections. Section "A" collects respondents' demographic information, whereas Section "B" consists of 30 multiple-choice questions with options A through D. During the study, the MLAT was administered as a pretest and posttest to all three groups (two experimental and one control) before and after the implementation of the treatments.

The study's experts considered the instruments to be reliable. The instrument had respective reliability coefficients of 0.71 and 0.70.

5. Data analysis and results

Using IBM SPSS version 25, the two data sets (consisting of achievement and attitude in pre- and post-test scores) generated during data collection for the study were analysed.

For the first hypothesis, which states that there is no statistically significant difference in (a) academic achievement and (b) attitudes between males and females when taught in machine language.

Table 1.1.1: Descriptive Statistics of Training method mean and standard deviation

	Sex	Mean	Std. D	N
Posttest Achievement Score	MALE	20.82	4.22	101
	FEMALE	20.61	3.95	106
	Total	**20.72**	**4.08**	**207**
Posttest Attitude Score	MALE	52.00	5.37	101
	FEMALE	52.83	5.04	106
	Total	**52.43**	**5.21**	**207**

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Table 1.1.2: Test of Equality of Covariance

Box's M	**.89**
F	.29
df1	3
df2	8174592.56
Sig.	.83

Table 1.1.3: Levene's Test

	F	df1	df2	Sig.
Posttest Achievement Score	.91	1	205	.34
Posttest Attitude Score	.16	1	205	.69

Table 1.1.4: Global F test

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.005	.49	2.000	202.000	.614
Wilks' lambda	.995	.49	2.000	202.000	.614
Hotelling's trace	.005	.49	2.000	202.000	.614
Roy's largest root	.005	.49	2.000	202.000	.614

Table 1.1.5: Multi-Analysis of Covariance of total achievement and attitude tests of Sex

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Posttest Achievement Score	11.76	3	3.92	.23	.87
	Posttest Attitude Score	149.07	3	49.69	1.85	.14
Intercept	Posttest Achievement Score	840.07	1	840.07	49.97	.00
	Posttest Attitude Score	4351.70	1	4351.70	162.40	.00
Pretest Achievement Score	Posttest Achievement Score	9.50	1	9.50	.57	.45
	Posttest Attitude Score	40.14	1	40.14	1.50	.22
Pretest Attitude Score	Posttest Achievement Score	.00	1	.00	.00	1.00
	Posttest Attitude Score	70.28	1	70.28	2.62	.11
Sex	Posttest Achievement Score	2.23	1	2.23	.13	.72
	Posttest Attitude Score	22.14	1	22.14	.83	.36
Error	Posttest Achievement Score	3412.43	203	16.81		
	Posttest Attitude Score	5439.52	203	26.80		
Total	Posttest Achievement Score	92250.00	207			
	Posttest Attitude Score	574506.00	207			
Corrected Total	Posttest Achievement Score	3424.18	206			
	Posttest Attitude Score	5588.59	206			

6. Report of findings

The first hypothesis, which sought to determine whether there is a statistically significant impact of gender on academic achievement and attitude when students are taught using the cultural-techno-contextual approach (CTCA) and lecture method, was analysed using the analysis of covariance (MANCOVA). Due to the utilisation of an intact class and the absence of randomization, it was efficient to apply MANCOVA to determine the initial differences between the groups. We have confirmed that the groups were not significantly different through Box's M test (F =.29; P =.83), and Levene's test shows that the groups are normal: [Achievement (F =.91) =.34; P >.05]; [Attitude (F =.16) =.69; P >.05]. The one-way MANCOVA multivariate F (Pillai's Trace) was not significant [F = 0.49; P > 0.05]. Univariate tests on achievement [F (1, 203) = 0.72; P > 0.05] and attitude [F (1, 203) = 0.36; P > 0.05] failed to attain statistical significance.

Decision

The first hypothesis states that there will be no statistically significant effect of student gender on (a) academic performance and (b) attitudes when taught using CTCA and lecture methods. Hypothesis one was not rejected because there was no statistically significant effect of student gender on (a) academic achievement and (b) attitudes when taught using CTCA and lecture methods.

For the second hypothesis, which states that there are no statistically significant interaction effects of sex and training method on (a) academic achievement and (b) attitudes of students in machine language.

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Table 1.2.1: Test of Equality of Covariance

Box's M	12.24
F	.80
df1	15
df2	192220.71
Sig.	.69

Table 1.2.2: Levene's Test

	F	df1	df2	Sig.
Posttest Achievement Score	.706	5	201	.62
Posttest Attitude Score	.387	5	201	.86

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Table 1.2.3: Multi-Analysis of Covariance of achievement and attitude tests of sex and training method

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Posttest Achievement Score	166.58	7	23.80	1.45	.19
	Posttest Attitude Score	569.73	7	81.39	3.23	.00
Intercept	Posttest Achievement Score	806.61	1	806.61	49.27	.00
	Posttest Attitude Score	4325.72	1	4325.72	171.52	.00
Pre-Test Achievement Score	Posttest Achievement Score	13.05	1	13.05	.80	.37
	Posttest Attitude Score	27.08	1	27.08	1.07	.30
Pre-Test Attitude Score	Posttest Achievement Score	.03	1	.03	.00	.97
	Posttest Attitude Score	27.20	1	27.20	1.08	.30
Training Method	Posttest Achievement Score	112.05	2	56.02	3.42	.04
	Posttest Attitude Score	271.34	2	135.67	5.38	.00
Sex	Posttest Achievement Score	3.25	1	3.23	.20	.66
	Posttest Attitude Score	20.68	1	20.68	.82	.37
Training Method * Sex	Posttest Achievement Score	29.45	2	14.73	.90	.41
	Posttest Attitude Score	185.01	2	92.51	3.67	.03
Error	Posttest Achievement Score	3257.81	199	16.37		
	Posttest Attitude Score	5018.86	199	25.22		
Total	Posttest Achievement Score	32250.00	207			
	Posttest Attitude Score	374506.00	207			
Corrected Total	Posttest Achievement Score	3424.18	206			
	Posttest Attitude Score	5588.59	206			

Table 1.2.4: Global F test

Effect		Value	F	Hypothesis df	Error df	Sig.
Training Method * Sex	Pillai's Trace	.04	2.26	4.00	398.00	.06
	Wilks' Lambda	.96	2.27	4.00	396.00	.06
	Hotelling's Trace	.05	2.28	4.00	394.00	.06
	Roy's Largest Root	.05	4.45	2.00	199.00	.01

The data for hypothesis two, which aimed to determine the statistically significant interaction effects of sex and training method on (a) academic achievement and (b) attitudes of students in machine language, were analysed using analysis of covariance (MANCOVA). Due to the utilisation of an intact class and the absence of randomization, it was efficient to apply MANCOVA to determine the initial differences between the groups. We have confirmed that the groups were not significantly different through Box's M test (F =.80; P =.69), and Levene's test shows that: [Achievement (F =.71) =.62; P >.05]; [Attitude (F =.39) =.86; P >.05]. The two-way MANCOVA multivariate F (Pillai's Trace) was not significant [F = 2.26; p > 0.05]. Univariate effects on achievement [F (2, 199) = 3.42; P =.04] and attitude [F (2, 199) = 5.38; P =.005] attained statistical significance. The interaction effect between sex and training methods on achievement [F (2, 199) =.90; P =.41] was not significant, but on attitude [F (2, 199) = 3.67; P =.03] attained statistical significance.

Decision

The second hypothesis asserts that there will be no statistically significant interaction effects of sex and training method on (a) academic achievement and (b) attitudes of students in machine language. Since there is a statistically significant influence between sex and training method when taught using CTCA and lecture methods, hypothesis five is not rejected.

7. Discussion of results

The implication of hypothesis one further shows that the male and female students' initial differences in achievement and attitude are not the same, and after the treatment, both male and female still do not have the same differences. It further indicated that the treatments were effective on both males and females, not considering their differences. Both males and females performed on neutral ground. Giving both the male and female students the opportunity to

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

excel on a neutral ground without having any influence over the other. This finding was in line with Adeyemi (2012), who concurred based on his research that there is no substantial effect between male and female students' accomplishments in science and social studies.

"Gender" is shorthand for "all the qualities of male and female that a specific society has established and allocated to each sex," and it refers to both male and female (Dave-Ugwu & Nwosu, 2018). According to Obiora (2020), gender can be defined as "the personality traits, attitudes, actions, values, relative power, influence, positions, and expectations (feminist and masculine) that society ascribes to the two sexes on a differential basis." The curriculum, teaching materials, job choices, and general conduct of students and teachers alike are all influenced by factors related to a person's gender, making gender a significant consideration in the educational system (Dave-Ugwu & Nwosu, 2018). In the context of teaching and learning, as well as this study, it has to do with things that affect both males and females.

In addition, Okwara, Upu, and Akwu (2020) found that when an instance of an academic performance gap between male and female students is detected and acknowledged as undesirable or problematic, gender concerns in science and technology education occur. The low enrollment of female students in science, technology, and mathematics is due to gender stereotypes that have assigned separate responsibilities to men and women in society. Across all levels of education in Nigeria, females are substantially underrepresented in terms of enrollment, engagement, and performance in science and technology.

This study's findings contradict those of Saanu (2015) and Agbanimu, Okebukola, Peter, Ebisin, Onowugbeda, and Adesina (2021), who showed no significant difference in gender or attitude among students taught using the training methods.

Inconsistencies in the results of the current and prior works presented are likely the result of other factors, such as the teacher's experience and personality, to name a few.

Nzekwe (2018) continued by stating that boys do better than girls in science subjects and that a gender-sensitive teaching technique is more advantageous in terms of student achievement and interest in science than a typical instructional method. Fehintola and Yahya (2019) report that females prefer a cooperative academic environment over a competitive learning environment for optimal performance. When comparing the performance of boys and girls in science, it was discovered that when a competitive instructional method is used, boys always dominate learning activities in coeducational institutions. The literature review indicated inconsistencies in the effect of gender on the science achievement of students.

Quansah, Ankoma-Sey, and Dankyi (2020) reported that self-confidence, career indecision, a STEM role model, locus of control, and the possibility of a STEM-related job were significant to the academic progress of female students. Students with a strong locus of control were more likely to choose STEM programmes and perform well academically. This evidence adds validity to the social-cognitive career theory, which asserts that academic motivation can be described as a consequence of goals and interests. According to Marshall, McGee, McLaren, and Veal (2011), there is

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

a connection between interest in a decision action, learning experiences, and self-reference confidence.

The majority of new instructional materials that students encounter in the classroom can be connected to a background of previously taught relevant concepts and information. When a student can store information in long-term memory, he or she has learned something significant (Ausubel, 2012; Novak, 2010). A student who has effectively learned a concept is able to recall the material and apply it with ease to new situations.

The example of two physics students who have received instruction on electric circuits provided by Okebukola (2020) lends credence to this. One of the students can redraw the electric circuit but cannot fix an electrical problem caused by a circuit break, such as a broken pressing iron. The other individual is able to identify the issue with the defective iron as a circuit break and repair it. Student B comprehended the concept of electrical circuits in a meaningful manner. This characteristic may be observed in male students (see Nnamani & Oyibe, 2016).

This finding in Hypothesis 2 agrees with the findings of Adeyemi (2012), Mbonu (2018), Ezedinma and Nwosu (2018), and Okotcha (2018), who all agreed from their research that there is no significant interaction between teaching method and gender on students' achievement in basic science and social studies. This finding is also in line with the findings of Akintade (2017), who discovered that there was no interaction impact between therapy and gender on the academic achievement of learners in his study.

Based on the results of this study, the researchers concluded that there is no interaction effect between sex and teaching method on academic achievement in learning machine language. But there is an interaction effect between sex and teaching methods in the attitude towards learning machine language among the students. It is gender-unbiased in terms of academic achievement, and this produces no significant interaction effect in machine learning academic achievement, but there are indications of gender influences in their attitude towards machine learning in secondary school.

Due to the fact that the results of this study demonstrated that gender did not play a significant role in the way their achievement was affected by the training methods, it is imperative that these training methods be effectively employed in the delivery of machine language lesson content in secondary schools. If the goal of this course is to be accomplished, then a training strategy that is more forward-thinking and engaging than CTCA needs to be conceived of and put into practise in computer science classes.

8. Ethical Consideration

Students were briefed on the objectives, purpose, and procedure of all class activities, as well as the rules and regulations governing each group, at the outset of the study. Before beginning the study, students confirmed that they understood the procedure for the research study and accepted the terms necessary for them to complete their tasks. It is significant to note that throughout the

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

research study, all students participated in the activities carried out by all groups. Not allowing any student to be disadvantaged at the conclusion of the study.

9. Conclusion and recommendation

The primary objective of the study was to determine whether the CTCA strategy for teaching and learning computer concepts such as machine language would improve the academic achievement and attitude of students in relation to gender and teaching method such that no significant differences would be accounted for.

Similar studies conducted both inside and outside of Nigeria provided equal support for the position of this study. Despite the fact that the purpose of this study is not to generalise to the entire population due to the sample size and number of computer concepts examined, we deem it beneficial to make the following suggestions:

It is hoped that the results of this study will be beneficial to secondary school computer studies and science teachers and a variety of other teachers. These teachers could utilise the assets of the CTCA to demonstrate how it could be used as a pedagogical model for improving the achievement and attitude of students in computer studies and other subjects offered in Nigerian senior secondary schools.

Second, the approach could assist secondary school science teachers who wish to enhance science instruction. Thirdly, educational planners and curriculum developers who decide on secondary school curricula may wish to consider the study's findings in order to recommend the CTCA as a science teaching design in secondary schools.

With the successful completion of this study, the benefits accruing from the CTCA will be regarded as a significant contribution to the literature on computer studies teaching techniques.

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

References

Adeleye, I., Luiz, J. M., Muthuri, J. N., & Amaeshi, K. (2020). Business Ethics in Africa: The Role of Institutional Context, Social Relevance, and Development Challenges. Journal of Business Ethics, 161(4), 717–729. https://doi.org/10.1007/s10551-019-04338-x

Adewusi, M. A. (Ed.). (2022a). Learning Analytics in a Designed Learning Platform during the Covid-19 Pandemic (95th ed.). NARST. https://www.researchgate.net/publication/360774116_Learning_Analytics_in_a_Designed_Learning_Platform_during_the_Covid-19_Pandemic

Adewusi, M. A., Egbowon, S. E., Abodunrin, I., & Rahman, K. (2021). The Combined Culturo-Techno-Contextual Approach (CTCA) and Peer-Led Team Learning (PLTL) Strategies to Teaching and Learning Machine Language in Secondary Schools in Breaking Its Difficulty. Advances in Multidisciplinary and Scientific Research Journal, 29, 141–154. https://doi.org/10.22624/aims/abmic2021-v2-p11

Adewusi, M. A., Odekeye, T., Silas, E. E., Rahman, A., & Akindoju, O. G. (2022). Requirement Engineering in Learning Analytics (Machine Learning) in an Indigenously Designed Learning Platform: A Case Study. Advances in Multidisciplinary and Scientific Research Journal, 1, 119–126. https://doi.org/10.22624/aims/rebk2022-p112

Allotey, G. A. (2019). Ghanaian teachers' beliefs about giftedness and gifted education teaching strategies in mathematics and science (Doctoral dissertation, Queensland University of Technology). https://eprints.qut.edu.au/132445

Awaah, F., Okebukola, P. A., Ebisin, A., Agbanimu, D., Peter, E., Ajayi, O. O., Gbeleyi, O. A., Onyewuchi, F., Oladejo, A., Adewusi, M. A., Ademola, I., Onowugbeda, F., Odekeye, T., &

Lawal, R. (2021). Influence of gender and career interest on African university students' perceived difficult concepts in the study of public administration. Teaching Public Administration, 39(2), 227–245. https://doi.org/10.1177/0144739420968870

Ballenca, J. A., & Fogarty, R. J. (n.d.). How to teach thinking skills within the common core: 7 key student proficiencies of the new national standards. Solution Tree Press.

Balogun, N. A., Ehikhamenor, F. A., Mejabi, O. V., Oyekunle, R. A., Bello, O. W., & Afolayan, O. T. (2020). Exploring information and communication technology among rural dwellers in sub-Saharan African communities. African Journal of Science, Technology, Innovation and Development, 12(5), 533–545. https://doi.org/10.1080/20421338.2019.1700668

Baron, G., Drot-Delange, B., Grandbastien, M., & Tort, F. (2014). Computer Science Education in French Secondary Schools. ACM Transactions on Computing Education, 14(2), 1–27. https://doi.org/10.1145/2602486

Caspersen, J., & Smeby, J. (2021). Placement training and learning outcomes in social work education. Studies in Higher Education, 46(12), 2650–2663. https://doi.org/10.1080/03075079.2020.1750583

Costanza, M. N., Lelbrecht, B. C., Cooper, W., & Sanders, W. R. (2009). Peer-to-peer training facilitator's guide: Development and

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

evaluation. Northrop Grumman Technical Services Reston VA. https://apps.dtic.mil/sti/citations/ADA508309

DeCoito, I., & Estaiteyeh, M. (2022). Transitioning to Online Teaching During the COVID-19 Pandemic: an Exploration of STEM Teachers' Views, Successes, and Challenges. Journal of Science Education and Technology, 31(3), 340–356. https://doi.org/10.1007/s10956-022-09958-z

Durbarry, R. (2017). Quantitative research. In Research Methods for Tourism Students (pp. 98-113). Routledge.

Erümit, A. K., & Çetin, İ. İ. (2020). Design framework of adaptive intelligent tutoring systems. Education and Information Technologies, 25(5), 4477–4500. https://doi.org/10.1007/s10639-020-10182-8

Garon-Carrier, G., Bégin, V., Brendgen, M., Vitaro, F., Ouellet-Morin, I., Dionne, G., & Boivin, M. (2021). Classroom Placement and Twins' Social Behaviors in Elementary School: Providing Empirical Evidence to Inform Educational Policy. Educational Policy, 36(7), 1850–1875. https://doi.org/10.1177/08959048211015626

Gosser, D. (2012). Department of Education Promising and Practical Strategies to Increase Postsecondary Success: Promising and Practical Strategy: Peer-led Team Learning.

Indrasiri, K., & Siriwardena, P. (2018). Microservices for the Enterprise. Apress, Berkeley.

Jaiyeola, E. F. (2020). Lecture on Conducting Mixed Methods Research [Video]. https://youtu.be/13pP9QfLXt8. https://youtu.be/13pP9QfLXt8

Khoza, S. B. (2018). Educators' reflections of the Swaziland junior secondary Integrated consumer science curriculum: towards development of a unique content area. https://ukzn-dspace.ukzn.ac.za/handle/10413/17713

Mavilidi, M. F., Drew, R. J., Morgan, P. B., Lubans, D. R., Schmidt, M., & Riley, N. M. (2020). Effects of different types of classroom physical activity breaks on children's on-task behaviour, academic achievement and cognition. Acta Paediatrica, 109(1), 158–165. https://doi.org/10.1111/apa.14892

Momennejad, I., Otto, A. R., Daw, N. D., & Norman, K. A. (2018). Offline replay supports planning in human reinforcement learning. eLife, 7. https://doi.org/10.7554/elife.32548

Mutua, M. S. (2014). Academic motivation and self-regulated learning as predictors of academic achievement of students in public secondary schools in Nairobi County, Kenya. Kenyatta University. http://ir-library.ku.ac.ke/bitstream/handle/123456789/10921/Academic%20Motivation%20and%20Self-Regulated%20Learning%20as%20Predictors%20of%20Academic%20Achievement%20of%20Students%20in%20Public%20Secondary%20Schools%20in%20Nairobi%20County,%20Kenya(1).pdf;sequence=3

Okebukola, P. A. (2019). The Culturo-Techno-Contextual Approach (CTCA). https://www.academia.edu/download/64857010/CTCA_Book_Adewusi_section_230_242_2_.pdf

Okebukola, P. A. O. (2014). Open and Distance Education: A catalyst for production of quality teachers and the transformation of Nigeria. A paper presented at 4th National Teachers Summit held at National Teachers Institute, Kaduna. https://www.academia.edu/download/35551049/Okebukola-Open_and_Distance_Learning_and_Teacher_Education_in_Nigeria.pdf

Raimi, M. O., Suleiman, R. M., Odipe, O. E., Tolulope, S. J., Modupe, O., Olalekan, A. S., &

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07

Christianah, M. B. (2019). Women Role in Environmental Conservation and Development in Nigeria. Social Science Research Network. https://doi.org/10.2139/ssrn.3425832

Reeder, S. (2018, December 1). College in the High School: An Alternative Remediation Model. https://shareok.org/handle/11244/316301

Tinsley, J. D. (1973). The General Introduction of Education about Computers for Primary and Secondary Schools. Educational Media International, 10(1), 2–12. https://doi.org/10.1080/09523987308548721

Tshidaho, M. (2018, November 5). Teacher's understandings of implementing curriculum: a comparative study between Botswana and South African rural primary schools education system. https://ubrisa.ub.bw/handle/10311/2215

Vygotsky, L. (1987). Mind in Society. Harvard University Press.

Weinstein, Y., Nunes, L. D., & Karpicke, J. D. (2016). On the placement of practice questions during study. Journal of Experimental Psychology: Applied, 22(1), 72–84. https://doi.org/10.1037/xap0000071

Wentzel, K. R. (2020). Motivating students to learn. Routledge.

ISSN: 2790-4172 | https://doi.org/10.59568/KJED-2023-3-1-07