RELATIONSHIP CONNECTING CONTINUOUS ASSESSMENT AND EXAMINATION SCORES IN MATHEMATICS IN SOUTH-WEST NIGERIA COLLEGES OF EDUCATION

RELATIONSHIP CONNECTING CONTINUOUS ASSESSMENT AND EXAMINATION SCORES IN MATHEMATICS IN SOUTH-WEST NIGERIA COLLEGES OF EDUCATION

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Abstract

Nigeria Colleges of Education have been conducting regular and steady internal assessments in order to determine the progress of learning and strengths of students achievement via continuous assessment. This study correlate the performance of internal assessment termed continuous assessment with the final assessment scores called semester examination in Mathematics courses in Colleges of Education in South-west, Nigeria. Ten public colleges of education in south-west, Nigeria comprising of four federal colleges of Education and six state Colleges of Education were randomly sampled for the study. The instruments were pilot tested and the reliability indices attained were r=0.87, r=0.91, r=0.92 and r=0.90 using Crombach Alpha statistical instrument. Researcher-designed questionnaire and the last three years results in Mathematics courses were the instruments that were employed for the collections of data. Three research questions and two hypotheses were formulated and guided the study. The results showed that there was no significant relationship between continuous assessment and final examination grade scores of students in mathematics based on gender. However, there was significant relationship between continuous assessment and final examination grade scores of students in mathematics based on institution ownership. Among others, it was recommended that high premium should be given to continuous assessments irrespective of students' gender and institution ownership. Also, intensive seminar should be conducted for lecturers in Nigerian colleges of education on the relevance and impact of continuous assessment in determining students' academic strengths and progress for making better decision.

Keywords: *Mathematics, Continuous Assessment, Final grade scores, Colleges of Education*

Introduction

Mathematics - one of the branches of science contributes immeasurably to scientific and technological advancement of nations across the globe. Mathematics was perceived as an essential precursor to success in modern society. Its usefulness was visible in sciences, technological innovations, commerce for economic developments and educational advancement of any nation (Tella, 2008; Ampofo, 2019). The roles played by Mathematics in the primary school, Junior and Senior Secondary School (JSS and SSS) as well as Colleges of Education (COE) cannot be underscored. It is a compulsory subject for every learner at these levels. In actual fact, it is a gatekeeper and critical filter for further studies (Ampofo, 2019).

Salman, Yahaya and Adewara (2011) observed that Mathematics seemed to be the most terrifying subject by pupils and students due to figure-phobia related challenges they are being confronted with. However, the knowledge of Mathematics is sine qua non in the field of social sciences, applied sciences and technological related courses. Hence, undergraduates in tertiary institutions are mandated to possess considerable level of knowledge in mathematics in order for such candidate to perform well in the chosen vocation. Salman (2001) further buttressed that there are two classifications of Mathematics undergraduates. There are undergraduates of Mathematics Education and undergraduates studying Mathematics as a major course. The undergraduates that studies Mathematics Education combine education related courses with Mathematics related courses. Mathematics Education is a program that is facilitated by Nigerian Colleges of Education and Faculty of Education in some Nigerian Universities. The program involves combination of Mathematics with Chemistry, Physics, Computer Science etc. The undergraduates that are admitted for mathematics education at the College of Education and University levels are teacher-trainees in Mathematics and they are expected to teach Mathematics at primary and secondary school levels. At the completion of the program, these type of undergraduates would have possessed a good knowledge as professionally qualified teachers to impact the knowledge of Mathematics to Nigerian primary and secondary school pupils and students respectively.

Furthermore, Ebisine (2013) considered Mathematics as the study of symbolic language, numbers and numeration systems, sizes, patterns, shapes and spaces; which could assist in no small measure to generalize and show relationship among variables. Learning and comprehension of concepts are attained in bits hence assessing the concepts learnt must be continuous and not one shot mode of assessment. Kpolovie (2014) further attested that students' academic performance can easily be measured by standardized tests or teacher-made tests. This prompted the introduction of continuous assessment in Nigeria educational system as means of examining students' instructional attainment after they have been taught.

Aina and Adedo (2013) attested that students' academic achievements are measured based on some conditions that subsumes each student's ability, process of access and use of structured knowledge, the tripartite domain of learning (cognitive, affective and psychomotor), motivational and stylistic factors that may have influence on learners' response. Students' academic achievement has to do with learner's ability to study, commit to memory the facts that have been taught and to express certain level of knowledge attainment orally or in written form via assessment termed examination. However, through assessment, students' academic achievements are determined. Assessment is considered as a vital measuring instrument of students' performance in educational process. Ntiko (2001) perceived assessment to be a process for gathering information about a student's academic progress and performance for the purpose

of taking major decisions. According to Adebowale and Alao (2008), assessment facilitates the school to realize an overall objectives of having the desired record about academic progress of each learner in order to make sound and objective judgments based on the cognitive, affective and psychomotor assessments on pedagogic experiences within and outside the classroom. Bichi and Musa (2015) averred that assessment facilitates the determination of student's ability of obtaining and mastering some behavioural competence, thereby establishing basis for quality educational achievement by such student. Assessment is describe as channels through which teacher accesses information related to increase in knowledge, behavioural changes and other related aspects of learners' developmental processes (Oguneye, 2002). It may further be described as deliberate effort of the teacher to evaluate pedagogic experiences acquired by the students in the school learning thereby bringing about a permanent behavioural change of the students. According to Maria (2012), assessment has to do with the totality of school experiences acquired within and outside the classrooms.

Results from assessment are used for the evaluation of educational system, encourages students to enhance improved performance, facilitate better instructional planning, balanced instructional content delivery, as well as enhancement of students to be certified to have attained a considerable level of achievements and mastery of the desired concepts. Assessing and evaluating students' performances play a major role in determining how students comprehend certain concepts taught during the lesson delivery by their teachers. Hence, it can summarily be described as a process of gathering information on student's educational attainment vis-à-vis learning, competence and performance for the purpose of determining improved pedagogical experiences.

One of the notable developments that is traceable to Nigerian educational system has to do with the introduction of Continuous Assessment (CA) for consistent evaluation of pupils and students' performance at all levels of educational ladder. Continuous assessment was an acceptable education policy that is employed for assessing students' academic achievement and progress in schools. Nitko (2004) described continuous assessment as continuous academic exercise for collecting and interpreting related data about student's progress on attainment of learning experiences. Hence, this is used for taking decisions on what should be taught and the condition through which students will learn better. For Quansah (2005), continuous assessment enhances learner to develop effective work and learning habits, with the intention of comprehending students' improved performance through reasonable results attainment in tests and class exercises. Nigerian educational administrators and planners are more conscious and committed to the nationwide curriculum innovation scheme by introducing new courses, injection of new instructional contents into the previous subjects, and theoretical change in the system of measuring of students' academic performance through introduction of major component process of evaluation termed Continuous Assessment in all tiers of educational system (Idowu & Esere, 2009).

Nigerian colleges of education have been assessing students' academic performances based on formative and summative evaluation. However, the use of continuous assessment employs formative evaluation approach with several bits of academic engagements that attracts either 30% or 40% scores and final examination scores of 70% or 60% of the weighted scores of 100%. Faleye and Adefisoye (2016), Nneji, Fatade, Awofala, and Awofala (2012) and Mwebaza (2010) attested that students that were assessed from time to time have tendency of performing better than their counterparts that were more of being assessed through a single examination. Eimann

(2002) further buttressed that the reason behind conduction of continuous assessments is to leave rooms for testing wide range of students' performances over long period of time than via single examination. This exercises that are conducted continuously exemplified a paramount proof that is subjective in the support outstanding performance in Nigerian Colleges irrespective of students' gender or institutional ownership. A lot of research works have been carried out on continuous assessments in various subjects at primary and secondary schools in Nigeria but not in colleges of education and in particular Mathematics. This work is needed because the products of the colleges of education will become teachers of primary schools and Junior secondary schools in future.

Statement of the Problem

Academic performance of individual student is determined by how well each student assimilates, recalls, retains and uses the attained knowledge in solving life problem that has relationship with manipulation of figures. Despite the roles plays by mathematics in tertiary education for self and career improvement, some factors were considered to influence students' achievements in mathematics. Factors that influence students' academic achievement include intelligence, attitude of students towards learning in the school, interest cultivated towards learning, habit cultivate for studying new concepts, self-efficacy, attribution, motivation and mode of assessing students' level of comprehension (Kpolovie, Joe & Okoto, 2014). Udoh (2012) was of the opinion that academic performance of students depends on a number of related variables like educational background, psychological and sociological in nature. Hence, students' performances could be improved through identification and manipulation with each of the enumerated variables to evaluate the students' entry behaviour.

However, the researchers observed that there was no considerable improvement in performance and achievement of students in mathematics courses in South-west Colleges of Education in Nigeria despite the introduction and vital roles played by continuous assessment for students' improved performance and achievement, hence the topic of discussion is highly imperative for research purpose.

Purpose of the Study

The purpose of this study was to find out the correlation between continuous assessment and final examination grade scores in mathematics courses at the colleges of education in South-West Nigeria. Specifically, the study will:

1. determine the correlation between students' scores in continuous assessment and their final examination grade scores in mathematics.
2. assess relationship between students' performance in continuous assessment and final examination grade scores in mathematics based on gender.
3. find out the relationship that exist between continuous assessment and final examination grade scores of students in mathematics in the federal and state owned Colleges of Education

Research Questions

The following research questions were generated for the study:

1. Do students' scores in continuous assessment have any correlation with their final examination grade scores in mathematics?

2. Is there any relationship between students' performance in continuous assessment and final examination grade scores in mathematics based on gender?

3. Do relationship exist in continuous assessment and final examination grade scores of students in mathematics in the federal and state owned Colleges of Education based on institution ownership?

Research Hypotheses

The following hypotheses were formulated for the purpose of this study:

    i.   There is no significant relationship between continuous assessment and final examination grade scores of students in mathematics based on gender.

    ii.   There is no significant relationship between continuous assessment and final examination grade scores of students in mathematics in the federal and state owned Colleges of Education.

Methodology

Research Design

This study was a descriptive research type that employed the use of cross-sectional survey process to collect relevant data for the study. Descriptive method design is a scientific method which involves observing, finding out, describing, interpreting events and ideas the way they are without any external manipulation. Survey was used for this study, because it afforded the researcher the ability to access considerable number of respondents. Researcher-designed questionnaire was adopted for the collection of relevant data from the respondents. A total of seven hundred and forty-two (742) respondents were randomly sampled and participated in the study from 10 Colleges of Education in the South-West, Nigeria that were purposively sampled.

Sample and Sampling Technique

The targeted population for this study comprised all the State and the Federal Colleges of Education students in the South-West, Nigeria. Students in the Departments of Mathematics at the federal and state Colleges of Education in the South-Western part of Nigeria were purposively sampled using random sampling method and participated in this study. The random sampling of Mathematics students were purposively done because they were the focus of this work. The federal and state Colleges of Education in the South-West geopolitical zone in Nigeria were situated in the 6 states of Osun, Ogun, Ondo, Ekiti, Oyo, and Lagos. A total of seven hundred and forty-two (742) respondents were randomly sampled from 10 purposively sampled Colleges of Education; which comprised of two hundred and seventy-two (272) respondents from federal and four hundred and seventy (470) respondents from state colleges of education.

Research Instrument

Structured questionnaire items were used to elicit and collect data from the respondents that were involved in the study from the Department of Mathematics at both federal and state Colleges of Education in the South-western part of Nigeria. Items on the instrument were structured to elicit responses based on Likert rating scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD). The data that were gathered on Strongly Agreed (SA) and Agreed (A) was collapsed as Agreed; while Disagreed (D) and Strongly Disagreed (SD) were collapsed as Disagreed.

Validation and reliability of Research Instruments

In order to establish the validity, the instrument was given to experts in the department of evaluation of the Kwara State College of Education, Ilorin, Nigeria for face and contents validation. 30 copies of the instruments were administered to the students in the Department of Mathematics, Kwara State College of Education, Ilorin, Nigeria for the reliability of the instrument. Cronbach Alpha statistical instrument was used to establish the reliability coefficients of the instrument section by section. The reliability indices attained were r=0.87, r=0.91, r=0.92 and r=0.90 at 0.05 level of significance.

Method of Data Collection

The data generated based on the research questions 1, 2, 3 and 4 that guided this study were collated and analyzed using frequency counts, mean and percentages and t-test inferential statistical instrument was used for the data gathered based on the students' moderating variable on gender (male and female) and college ownership as state and federal colleges of education in the South-western states of Nigeria.

Data Analysis Techniques

Descriptive statistics of percentage and mean with inferential statistics of t-test and correlation method were employed to answer and test the study's research questions and hypotheses respectively. Frequency counts and mean scores were used for the research questions while *t*-test and regression analysis were applied to measure the significance of difference and correlation among the moderating variables used for the research. IBM SPSS Statistics for Windows, Version 20.0 was employed for data entry and analysis. Level of significance was fixed at 95% and $p < 0.05$ was considered to be significant.

Results

Research question 1: Do students' scores in continuous assessment have any correlation with their final examination grade scores in mathematics?

Table 1

Colleges of Education Students' Perception on Correlation of Continuous Assessment Scores with Final Examination Grade Scores in Mathematics

S/N	Correlational Scores Between C.A and Final Exam grade in Mathematics	$\bar{X}$
1	Preparation for continuous assessments in mathematics helps tremendously in final examination.	3.55
2	Continuous assessments in mathematics enhance scoring very high marks in my final examination	3.39
3	Evaluation of mathematics via continuous assessment helps in no small measure than final examination.	3.26
4	Positive association always exists between C.A and final exam grade scores	3.11
5	I often prepare better for mathematics examinations than for tests and assignments.	2.75
6	My colleagues help in no small measure in preparation for mathematics examination than continuous assessments.	2.95

7	Preparation for final examination in mathematics is more interactive with colleagues than continuous assessments.	2.75
8	More often, serious collaboration is enhanced when practicing mathematics for final examination with peers and colleagues than continuous assessments.	2.90
9	I prefer more often continuous assessments to final examinations.	3.33
10	Attempting mathematics continuous assessments is easy to pass than final examinations	3.45
11	Knowledge learnt is retained longer when preparing for mathematics continuous assessments.	3.42
12	More errors are prone to be committed during final examination due to limited time than during continuous assessments	3.44
13	Interactive effect exists between continuous assessment and final examination results.	3.32
	Mean score for correlation between C.A and Final examination scores	**41.75**

The average mean score for correlation between C.A and Final examination scores is 3.21. The items in table 1 revealed that items 1, 10, 11 and 12 affirmed that the preparation for mathematics continuous assessments helps tremendously in final examination (3.55), attempting mathematics continuous assessments is easy to pass than final examinations (3.45), the learnt materials are retained longer when preparing for mathematics continuous assessments (3.42) and more errors are prone to be committed during final examination due to limited time allotted for it (3.44). However, students' responses in items 5, 6 and 7 showed that students are more often prepare better for mathematics examinations than for tests and assignments (2.75), students' colleagues help in no small measure in preparation for mathematics examination than continuous assessments (2.95) and final examination in mathematics is more interactive with colleagues than continuous assessments (2.75). Also, serious collaboration is enhanced when practicing mathematics for final examination with peers and colleagues than continuous assessments. Thus the grand mean score for students' perceived relationship between continuous assessment and final examination was 3.21 out of 4.00. It is therefore inferred that conduction of continuous assessments for students in mathematics found to be expedient for students' better performance in their final examination, thereby having positive correlation with their final examination grade scores in mathematics.

Research Question 2: Is there any association with respect to students' performance in C.A and final exam grade scores in mathematics based on their gender?
Table 2

Students' Gender performances in C.A and final exam grade scores in mathematics

Gender	No	Percent (%)	Sum of mean	Mean ($\overline{X}$)
Male	455	61.30	41.65	3.20
Female	287	38.70	41.90	3.22

Total	742	100.00

Note: The average mean score on students' performances in continuous assessment and final examination grade score was 3.21

Table 2 revealed that the average mean score of male students' performance was 3.20 while for female students' performance was 3.22 in C.A and final exam aggregate in mathematics respectively. The high average means score of (3.21 out of 4.00) for both male and female students showed the presence of high correlation between performances of the students' in C.A and final exam in mathematics. However, average mean score of the female (3.22) students from the sampled Colleges of Education signified high correlation between continuous assessment and the final examination score in mathematics than their male (3.20) counterparts. Hence, it was concluded that regardless of gender (male or female), there was a positive correlation between C.A and final exam aggregate in mathematics.

Research Question 3: Do relationship exists in students' C.A and final exam aggregate scores in mathematics in the federal and state owned Colleges of Education based on institution ownership?

Table 3

Students' performances in C.A *and final exam aggregate in mathematics based on college ownership*

College Ownership	Frequency	Percent	Summation of mean	Mean ($\overline{X}$)
Federal	470	63.30	42.05	3.23
State	272	36.70	41.23	3.17
Total	742	100.00		

Note: The average mean score of students' performances in continuous assessment and final examination grade scores was 3.20 based on the college ownership

Table 3 depicted the mean scores of the performances of students in C.A and final exam aggregate in mathematics in both the Federal and State owned Colleges of Education which are 3.23 and 3.17 respectively. The high average means score (3.20) shows that students' performances in C.A and final exam aggregate in mathematics from both federal and state government owned colleges of education has high correlation. However, students from federal owned Colleges of Education have higher correlation of continuous assessment in the final examination in mathematics when compared with students in the state owned Colleges of Education. Hence, it was inferred based on the high average mean scores that regardless of Colleges of Education ownership, positive relationship exists between C.A and final exam aggregate scores in mathematics.

Hypotheses Testing

Ho1: There is no significant relationship between C.A and final exam aggregate scores of students in mathematics with respect to gender.

Table 4

Independent t-test Results on the Performance of Female and Male Students in C.A *and final examination*

Gender	No	$\overline{X}$	SD	Df	T	Sig.(2-tailed)	Decision
Male	455	29.95	2.95				
				740	-1.70	0.09	Not rejected
Female	287	30.32	2.91				
Total	742						

Table 4 shows the result of the t-value of -1.70 resulting in 0.09 significance value was greater than 0.05 alpha value, which denotes (740) = -1.70, p = 0.09 (p>0.05). Hence, the stated null hypothesis for the study failed to be rejected. The sig.(2-tailed) of the independent t-test for equality (> 0.05) shows that there was no significant relationship between continuous assessment and final examination grade scores of male and female students in mathematics based on gender. However, female students' mean score (30.32) in C.A and final exam aggregate scores was higher than their male (29.95) counterparts in mathematics irrespective of their institution ownership (Federal or State COE).

Ho2: There is no significant relationship between C.A and final exam aggregate scores of students in mathematics in Colleges of Education (federal and state) based on institution ownership

Table 5
Independent t-test Results of Performance of Students in C.A and their exam aggregate scores *in mathematics based on institution ownership*

Institution Ownership	No	$\overline{X}$	SD	Df	T	Sig.(2-tailed)	Decision
Federal	470	29.52	2.98				
				740	-7.26	0.00	Not accepted
State	272	31.09	2.59				
Total	742						

Table 5 shows the statistical analysis of students' correlation between CA and FER (Final Examination Results) based on the institution ownership. Table 5 revealed from that t (740) = -7.26, p = 0.00 (p<0.05). This implies that the stated null hypothesis was not accepted due to the fact that t-value of -7.26 resulting in 0.00 significance value was less than 0.05 alpha value. The sig. (2-tailed) of the t-test for equality shows that there was significant difference in the mean scores (since sig. (2-tailed) is less than 0.05). By implication, there was significant difference between federal and state students' performance in CA and their exam aggregate scores in mathematics based on institution ownership in favour of the students in the state colleges of education. Thus, students' in the state owned Colleges of Education (31.09) has higher positive relationship between continuous assessment and the final examination grade scores in mathematics than their counterparts in the federal government owned Colleges of Education. By implication, there was high correlation between students' performance in CA and FER.

Table 6

Statistical Analysis of Students' Results for Continuous Assessment (CA) and Final Examination Results (FER)

Institution Ownership	Coefficients	R	r^2	$r^2\%$	P	Decision
Federal	CA versus FER	0.9364	0.876	87.6	0.0001	Significant
State	CA versus FER	0.96553	0.93224	87.60	0.0162	Significant

Table 6 revealed that the statistical analysis of students' results for CA and FER in both state and federal colleges have high level of correlation. However, it was higher with the federal Colleges ($P = 0.0001$).

Table 7

Stepwise Regression Analysis of Student's Results for Continuous Assessment (CA) and Final Examination Results (FER)

Institution Ownership	Unstandardized Coefficients	Standardized Coefficients	P	Decision
Federal	CA	0.56	0.0001	Significant
	FER	0.51	0.0001	Significant
State	CA	0.53	0.0001	Significant
	FER	0.50	0.0001	Significant

Table 7 showed the stepwise regression analysis of students' results for CA and final examination results in mathematics. By applying stepwise regression analysis, CA (0.56) has more influence on the FER (0.51) based on the Federal Colleges of Education. However, CA (0.53) also has influence on the FER (0.50) as shown in Table 7. By inference, there was a significant difference between performance of students in CA and final exam aggregate scores in mathematics based on institution ownership.

Discussion of Results

This study is not actually intended to advise the uses of CA or determining its priority among the other methods of assessment. This is because the assessment method or tool is not the target but its impact on the students and the learning process is the goal. Students modify learning according to the method of assessment that used by the assessor. Through the CA system of assessment, the students are continuously under assessment and on an ongoing process of learning. Continuous assessment has influence on both students' FER and on overall students' assessment. The implication is that students' academic achievement especially in mathematics was influenced by considerable level of knowledge and expertise employed for assessing students' performance on continuous assessments according to.Van der Vleuten and Schuwirth (2005) that CA is an effective tool that is used to evaluate what it was intended or presupposed to measure. Trottera (2006) averred also that CA facilitates high level of inspirations to students to learn continuously on a daily basis. Thereby providing the needed response and feedback to

students about their learning and alternative way of improving performances (Nitko, 2004). Continuous use of CA will tremendously assists teachers to identify each learner's areas of strength and weakness (Hernandez, 2012) and how such could be helped where necessary. Anaf and Yamin(2014) describe CA to include all strategies implemented by teachers to ascertain the knowledge, the understanding and the skills gained by students and frequent interactions between teachers and students. Proper utilization of CA enables teachers to have better comprehension of strength and weakness of the learners (Hernandez, 2012).

Study carried out by Carrillo and Pérez (2012) agreed with this study that CA shows higher level of correlation and this demonstrates considerable improvement in students' academic achievement. However, studies on the moderating influence on gender showed inconsistent results. The analysed data based on the gender difference disagreed with Bichi, Suleiman and Ali (2019) that the female students had higher mean score than their male counterparts in academic achievement in mathematics.

Studies conducted by Emmanuel and Clement (2012) and Adeniyi, Ogli, Ojabo and Musa (2013) concurred with this study that CA had a good deal of influence on the FER of students. The demonstration of high correlation between CA and FER exemplified the relatedness of connectivity that frequent conduction of CA is pointer for students' improved performance in FER in mathematics.

Conclusion

As this study suggest the existence of correlation between continuous assessment and examination scores in mathematics in South-west colleges of education, the findings exemplified high correlation between CA and FER irrespective of students' gender and college ownership. The study revealed that continuous assessment has influence on student's results and methodologies of learning. Hence, serious attention should be directed towards the tools that are used in conducting the CA. and training of teachers in setting of CA and exam is very paramount to students' improved performance.

Recommendations

The following recommendations were suggested by the researchers based on the findings of the study:

i.   Government should sponsor lecturers to attend seminars and in-service training in other to update their knowledge and skills on the conduct of continuous assessment.

ii.   More guidance and counselors should be employed into Nigerian Colleges of Education irrespective of college ownership to help in ensuring that continuous assessment practices of the lecturers are properly monitored.

iii.   Lecturers in Nigerian Colleges of Education should endeavour to pay special attention to the practice of continuous assessment based on the principles and concept of the policy in order to reduce the problems of comparability of standards and records.

iv.   Lecturers in Nigerian Colleges of Education should be committed to the use of continuous assessment on a regular basis in order to promptly assess each student's academic and achievement progress as expected for proper and accurate decision making.

Acknowledgement

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