

Relationship between CA and Examination Scores for First Year Biology Students at Mukuba University

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Abstract: Assessment of student learning at Mukuba University is achieved through both continuous assessment (CA) and final examination. These assessments are conducted during and at the end of the academic year, respectively. One of the most widely debated issues in biology education is the relationship between students' CA scores and their corresponding final examination scores. Against this background, this study aimed to determine whether a relationship exists between CA and final examination scores of first-year biology students at Mukuba University. The study employed a correlational research design. The sample comprised 309 participants for the original study and 360 students for the replication study. Pearson's product-moment correlation was used to analyze the data for both the original and replication studies. The analysis revealed a positive and significant correlation between CA and final examination scores at the 0.01 level of significance for both studies. Furthermore, the effect size of the relationship between the variables was large—averaging 0.83—indicating that integrating CA into lecturers' daily teaching has the potential to improve students' performance in the biology final examination. Notably, both the original and replication studies produced consistent results, confirming the reliability of the findings. Based on these results, it is recommended that lecturers incorporate biology CA as outlined in the course outlines.

Keywords: Correlation, Scores, Continuous Assessment, Final Examination.

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I. INTRODUCTION

One of the most widely debated issues in Biology Education is the relationship between students' Continuous Assessment (CA) scores and their corresponding Final Examination scores. Understanding the statistical relationship between CA and final examination of students helps lecturers, policy makers and students themselves enabling them locate areas in the teaching and learning that need critical improvement (Jason, 2024). That is to say, understanding how the said variables are related to each other provides insights that can guide policy formulation on assessment of students' academic work and consequently providing practical interventions in the teaching process of the university introductory biology course. In order to determine the potential statistical relationship between CA and final examination, a correlation method is usually used to provide valuable insights into the above mentioned variables (Bhandari, 2020).

According to Lubisi (1997), CA is a form of assessment which continuously appraises students' learning throughout their academic year. By assessing on many occasions throughout a course a lecturer is likely to cover reasonable content of a course. In general, the more frequently assessments are made the more reliable the sum of them will be. Turning attention to the final examination, a final examination is a summative form of assessment which is administered once at the end of a course. This form of assessment covers a relatively wider range of content, many different specific outcomes and a variety of techniques than tasks meant for CA. The purpose of each of the above mentioned assessment is to measure, in the most reliable way, how far specific outcomes of a first year biology course have been achieved by students. Against this background, CA coupled with quick feedback correlates with final examination thereby helping students to prepare themselves for their final examination in biology.

The assessment policy of the university states that CA of students' academic achievement should be practiced in every academic programme of the university over the duration of the academic calendar. The final examination is always administered towards the end of the same academic year. A student total score in each course comprises the overall CA score and end-of-course examination score. With respect to the weighting of the above mentioned components of assessment as stipulated in the university policy, CA carries 50 percent of the final score and the final examination has 50 percent weighting.

To sit for the final examination, a student should have at least 50 percent pass of CA. In order for one to clear a course, a student who has cleared CA, needs to score at least 50 percent in the final examination. As a consequence, to clear a course, a student needs to pass both the CA and the end-of-course examination.

A student builds their overall CA by being assessed using the following tasks: progress tests, assignments, laboratory practical reports, field trips reports, quizzes, The weighting of varies components of CA is as follows:

- Tests constitute 20 percent of CA.
- Practical work carries a 20 percent weighting.
- Assignments carry an overall core 10 percent weighting.

According to Myombe and Mushi (2022), when these two forms of assessments are applied in an integrated cycle, the continuous assessment informs the complete learning process while satisfactory results in the final examination indicate successful completion of the course. It therefore follows that continuous assessment should predict students' academic achievement in the final examination (Ajaja, 2020). Because of this aforementioned critical role of continuous assessment in students' learning of biology, the CA practice should be reinforced in the first year biology course as it helps to improve student learning, provide feedback and enhance evidence-based counselling of students as they prepare for the final examinations. Against this backdrop, this study investigated the correlation between students CA scores and their corresponding examination scores.

II. LITERATURE REVIEW

The bulk of studies regarding the relationship between CA and final examination revealed that there was a correlation between CA and the final examination scores while other studies indicated students were either failing CA but passing the final examinations or do well in CA but failing the final examination.

Studies whose findings revealed that there was a correlation between CA and the final examination scores include those conducted by Kumur and Siya (2015); Fan *et al* (2014, 2020); Olufemi (2014); Bich and Musa (2015); Aina and Adedo (2013); Hayford (2015), and Myombe and Mushi (2022)

Other studies illustrated that there was no direct relationship between students CA and their corresponding final examination scores. A study conducted by De Sande *et al* (2008) revealed that students were failing CA but passing their final examination and vice versa. Al-Maskari (2015) obtained similar results.

To sum up, literature surveyed shows that there is limited published study regarding correlation between CA and final examination scores in Zambia. No similar study has been conducted at Mukuba University. Most of the studies available were conducted in Nigeria and a few others in Ghana, Tanzania, Omar and Russia. That is, there was paucity of knowledge regarding the relationship between CA and final examination scores of first year biology students at Mukuba University. As a consequence, there was information gap which this study exploited.

➤ Problem statement

According to Nwakpa *et al* (2023), CA should predict the students' academic achievement in biology exam. Since both the CA and exams are based on the same course outlines. It has, however, been observed that students' performance in CA is usually higher than performance in their exams. That is, higher performance in CA as against low performance in exams. Majority of students do not maintain consistency in the CA and the exams. As noted by Nwakpa *et al* (2023) some students may perform poorly in the CA but perform well in the exams and vice versa while others may perform poorly on this subject, presents strong points that pull in opposing direction is more accurate. As a result of this, it is still uncertain as to which viewpoint is more accurate. Therefore, this study aims to investigate the relationship between students' CA scores and the exam score in biology at Mukuba University.

➤ Purpose of the study

The purpose of the study was to establish whether the relationship between CA scores and the final examination results of first year biology students at Mukuba University exist.

➤ Objectives of the study

The study sought to:

- Determine the correlation between first year students' CA scores and their corresponding final examination scores in biology at Mukuba University.
- Establish the relationship between first year students' CA scores and the final examination scores of male and female in biology at Mukuba University.

➤ Research hypotheses

The following hypotheses guided the study and were tested at 0.01 confident level of significance.

- HO1: There is no significant correlation between first year students' CA scores and their corresponding final examination scores in biology at Mukuba University.
- HO2: There is no significant relationship between first year students' CA scores and final examination scores of male and female in biology at Mukuba University.

➤ *Theoretical Framework*

The study was informed by the constructivist theories which assume learning as an active and continuous process. Constructivism emphasises the active role of learners in their learning process: constructing their own knowledge and understanding by relating new concepts to knowledge previously learnt. Further, this theory allows consistent and regular appraisal of students’ academic achievement throughout the course. Consequently, it allows students to continually know their weaknesses and strengths in the course as frequently as structured in the course outlines. Therefore, as students construct their own knowledge, they conduct self-assessment, a technique rooted in metacognition. To sum up, CA provides students with more opportunities to learn biology before they sit for the final examination.

III. METHODOLOGY

➤ *Research Design*

This study employed a quantitative correlational research design. According to Nwongu(2015), this design seeks to establish the relationship that exists between two or more variables: This study investigated two variables, namely, CA and final examination scores. This design was used because the study sought to explore the potential statistical relationship between two variables, namely, the CA and the final examination scores.

➤ *Population and sample*

The population of the study comprised 3 650 first year biology students for the academic year 2023/24. Two separate study samples participated in the study, namely, the sample for the original study which comprised 309 participants and the sample for the ‘replication study’ which, composed of 360 students. The sample size for each study was determined using Yamane’s formula for finite population (Justine & Stephen, 2022).

➤ *Sampling procedure*

Simple random sampling was adopted to select the aforementioned sample. This technique was employed in order to give each student an equal chance of being selected for a study sample. Furthermore, random sampling process enabled the study sample to be representative of the total first

year biology student population. This technique was achieved using random numbers.

➤ *Research instrument*

The study used official university mark schedule that carried composite CA and final examination scores for the academic year 2023/24.

➤ *Procedure*

The author obtained a composite mark schedule of CA and final examination for first year biology students from the University Registrar- Examinations. Considering this, the CA and final examination results were not submitted for validation as was the case with Nwakpa *et al* (2023). The said mark schedule was a complete and recent list of all first year biology student population from which a random selection of a study sample was chosen. Prior to running correlation analysis, the data were cleaned. This led to removing students from the schedule that missed either their CA or final examination mark. Upon cleaning the data, the correlation analysis was run. As part of the scientific process, a replication study was thereafter conducted. Replication study was included in this study for the purpose of increasing the credibility and validity of the study. This study was conducted from 10th April 2025 to 14th May, 2025.

IV. DATA ANALYSIS

The study employed inferential statistics that used Pearson’s correlation (r) via SPSS version 20 to analyse the findings of the study. The null hypotheses were tested at 0.01 alpha level of significance.

V. RESULTS

A Pearson correlation coefficient was computed to determine the relationship between CA and final examination scores for first year biology students. The results were presented according to research questions: The results of the original study are presented first, and then end with the results of a replication study. The results presented below, are all for two-tailed hypothesis tests.

➤ *Results of the original study*

The Pearson correlation between CA and final examination scores for mixed sex is as presented in Table 1.

Table 1 Correlations between CA and final examination scores for mixed sex

		Continuous Assessment	Final Examination
Continuous Assessments	Pearson Correlation	1	.866**
	Sig. (2-tailed)		.000
	N	308	308
Final Examination	Pearson Correlation	.866**	1
	Sig. (2-tailed)	.000	
	N	308	308
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 1 shows that there was a strong, significant positive correlation between CA scores and final examination scores, $r(307)=.866$, $p < .01$ in which case the null

hypothesis was rejected because the p -value was less than the significance level of the study. Furthermore, the table reveals that the effect size of the correlation was 0.75. The

results of Pearson correlation analysis of students' CA and final examination scores regarding female students is as

presented in the table.

Table 2 Correlations between CA and final Examination scores regarding female students

		CA V3	Exam V4
CA V3	Pearson Correlation	1	.805**
	Sig. (2-tailed)		.000
	N	140	140
Exam V4	Pearson Correlation	.805**	1
	Sig. (2-tailed)	.000	
	N	140	140

** . Correlation is significant at the 0.01 level (2-tailed).

The results in Table 2 indicate that there was a strong, positive significant relationship between female students' CA and final examination scores, $r(139) = .738, p < 0.01$. Since the calculated p -value was less than the significance level of the study the null hypothesis rejected. The table further indicates that the effect size of the correlation was 0.65.

Turning attention to the relationship between CA and final examination scores for male students, Table 3 shown

below indicates the results of Pearson correlation analysis of the two variables stated above.

Table 3 Correlations between CA and final Examination scores regarding male students

		Continuous Assessment	Final Examination
Continuous Assessment	Pearson Correlation	1	.909**
	Sig. (2-tailed)		.000
	N	168	168
Final Examination	Pearson Correlation	.909**	1
	Sig. (2-tailed)	.000	
	N	168	168

** . Correlation is significant at the 0.01 level (2-tailed).

Table 3 indicates that there was a strong, positive and significant correlation between CA and final examination scores for male students, $r(167) = .909, p < 0.01$. As can be seen in the table, the p -value is less than the significance level of the study. As a consequence, the null hypothesis was rejected. The table further reveals the effect size of the study as 0.83.

➤ *Results of the replication study*

The results of the Pearson correlation between CA and final examination scores for mixed sex of the replication study are as presented in Table 4.

Table 4 Correlation between CA and final examination scores for mixed sex

		Continuous Assessment	Final Examination
Continuous Assessment	Pearson Correlation	1	.883**
	Sig. (2-tailed)		.000
	N	359	359
Final Examination	Pearson Correlation	.883**	1
	Sig. (2-tailed)	.000	
	N	359	359

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows that there was a strong, positive and significant association between CA and final examination scores for mixed sex students, $r(358) = .883, p < 0.01$. From the table, it can be seen that the p -value was less than the significant level of the study. This provides sufficient

evidence to reject the null hypothesis. The table further reveals that the effect size of the correlation was 0.78. Results of the Pearson correlation of CA and final examination scores for female students were as presented in Table 5 shown below.

Table 5 Correlations between CA and final Examination scores regarding female students

		Continuous Assessment	Final Examination
Continuous Assessment	Pearson Correlation	1	.889**
	Sig. (2-tailed)		.000
	N	181	181
Final Examination	Pearson Correlation	.889**	1
	Sig. (2-tailed)	.000	
	N	181	181

** . Correlation is significant at the 0.01 level (2-tailed).

Table 5 indicates that there was a strong, positive and significant link between female students’ CA and final examination scores, $r(180) = .889, p < 0.01$. Consequently, the sample data provided sufficient evidence to reject the null hypothesis. The table further indicates the effect size of the correlation as 0.79.

Results of the Pearson correlation of CA and final examination scores for male students were as presented in Table 6 shown below.

Table 6 Correlations between CA and final Examination scores regarding male students

		Continuous Assessment	Final Examination
Continuous Assessment	Pearson Correlation	1	.909**
	Sig. (2-tailed)		.000
	N	168	168
Final Examination	Pearson Correlation	.909**	1
	Sig. (2-tailed)	.000	
	N	168	168

** . Correlation is significant at the 0.01 level (2-tailed).

There was a strong, positive and significant correlation between male students’ CA and final examination scores, $r(167) = .909, p < 0.01$. The table therefore, suggests that there was enough evidence to reject the null hypothesis the study sought to explore. Additionally, the table indicates 0.83 as the effect size of the relationship.

author was 99 percent sure about the results of the study or a one percent chance that the results were incorrect.

To sum up, the correction analysis yielded a positive and significant relationship between CA and final examination scores in both the original and replication studies. Therefore, the first null hypothesis of the study, which stated that there was no significant correlation between first year students’ CA scores and their corresponding final examination scores in biology at Mukuba University, was rejected. Similarly, the study yield enough evidence to reject the second hypothesis of the study which claimed that there was no significant relationship between first year students’ CA and final examination scores of male and female in biology at Mukuba University.

The results of this study yielded a positive and significant correlation between CA and examination scores. This is due to the point that the statistical significance arising from the correlation analysis of the study was less than the pre-specified alpha of 0.01. As a result of this, the author rejected the null hypotheses the study posed to investigate. This study, therefore, shows that statistical significance existed for the finding: There was a strong relationship between CA and final examination scores for first biology students of 2023/24 academic year.

VI. DISCUSSION

A Pearson product moment correlation was used to determine the relationship between CA and final examination scores of first year students in biology. As a reminder, the test yielded a statistically significant p -value result for both the original and replication studies. That is, the p -value obtained regarding each hypothesis of the study was less than the pre-selected significance level of $\alpha = 0.01$ for the study. This implies that the level of uncertainty acceptable in the study was 0.01 or a one percent chance the author was incorrect about the outcome of the study. In this regard, the

This result is similar to that obtained by Kumur and Siya (2015); Fan et al (2014, 2020); Olufemi (2014); Bich and Musa (2015); Aina and Adedo (2013); Hayford (2015), and Myombe and Mushi (2022) whose studies revealed a significant correlation between candidates’ CA scores and their corresponding scores in examination. The results of this study provide valuable insights with regard to the role of CA in students’ learning of biology. This study suggests that overall students’ achievement in CA affected their achievement in their examination. By implication, one could argue that effective implementation of CA during the academic year can help students prepare themselves for their examination. This is due to the point that continuous assessment and quick feedback of students’ results enable learners to identify their weaknesses and strengths regarding their conceptual understanding of what they have learnt. Practical implication of this study is that effective integration of CA into the teaching and learning process of biology is likely to improve students’ learning of the subject.

This result is, however, at variance with results obtained by DeSande *et al* (2008) and Al-Maskari (2015) which revealed that despite students failing CA, they cleared their final examination and similarly, those who passed their CA, did not clear their examination. This result implies that there was a ‘lack of consistency or uniformity’ in the results obtained. These results also seem to suggest that the correlation between CA scores and Examination scores was significant for some but not for all comparisons. Possible explanations why these results were contradictory to the results of this study include the following: First, quality of test items for CA was probably not of the same standard as those contained in examination question papers. Secondly, guidelines for invigilation regarding CA were probably not as strict as those used in examination administration. Other background factors that might have influenced contradictory results for this study and other studies noted above include students’ characteristics such as their health status. Students usually have different health challenges during the course of the year as a result some students could not build enough CA as those doing well health-wise. Similarly, some students could have been doing well during the course of the year but got sick at examination time consequently, failing the final examination despite having passed their CA.

Generally, there were background factors that might have affected the implementation and pupils’ performance in both CA and final examination. To mitigate the effects of confounding variables noted above on the research outcome, the following were done: the author adopted a suitable study design, namely, correlational research design and for a focused inquiry, the author constructed clear and specific questions that helped in excluding external factors creeping into the study.

Turning to the practical significance of the findings of the study which, is represented by the effect size (r^2), the study generally had a large effect size of about 0.80. A large effect size as this ($r^2 = 0.80$), suggests that this finding had practical significance or is meaningful on students academic performance. That is, there is a strong link between students’ CA and their final examination scores. The effect size of this result suggests that if biology lecturers integrated CA into their teaching of biology, majority of their students would perform quite well in final examinations. This is due to the fact that the study explicitly revealed that there was a strong link between first year biology students’ CA and final examination.

➤ *This Study makes a Contribution to Literature Regarding this Subject in the Following ways:*

While most studies in correlation in Science Education reported on the existence of ‘statistical significance’ denoted by p -value of a relationship, they ignored to report on the ‘practical significance’ denoted by correlation coefficient, r^2 . It’s important to note that a significant p -value only suggests that an intervention can improve students’ performance in biology without telling us how much intervention of that kind is needed. This study moved a step further by reporting the effect size of the intervention other than reporting on the statistical significance of the finding only. Furthermore, the

study employed a ‘replication study’ in order to increase its validity and generalisability. Studies the author had access to did not repeat the same study.

VII. CONCLUSION

It was concluded that there is a positive and significant relationship between students’ CA scores and their final examination scores. These findings indicate that practical intervention concerning the use of CA by both lecturers and students, in relation to the final examination, is necessary. Given the large effect size observed, the impact of CA on final exam scores is substantial and may significantly influence overall student performance in biology.

RECOMMENDATIONS

The following were the recommendations:

- A study to assess implementation of continuous assessment in the university
- Since this study revealed that the two variables studied had a strong positive correlation, it is recommended that biology lecturer should implement CA as specified in the biology course outline.

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