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EFFECT OF ASSESSMENT FOR LEARNING (AFL) ON BIOLOGY ACADEMIC ACHIEVEMENT OF SENIOR SECONDARY STUDENTS IN RIVERS STATE.

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ABSTRACT: *The study investigated Effect of Assessment for Learning (AFL) on Biology Academic Achievement of Senior Secondary Students in Rivers State. The researchers adopted a non-randomized pretest-posttest control group quasi-experimental research design. The population of the study consists of 34,825, Senior Secondary Two (SS2) students duly registered in public secondary schools (2013/2014 Session) in the 23 Local Government Areas of Rivers State, Nigeria. A total of 400 Senior Secondary Two (SS2) students' (200 males and females respectively) were sampled through multistage sampling technique in Ikwerre, Obio/Akpor, Ogu/Bolo, Okrika and Port Harcourt Local Government Areas. Students' in intact classes were assigned to four experimental groups and one control group. Students' in the experimental groups were subjected to the following Assessment For Learning strategies: use of questioning, comment only marking, self/peer assessment and formative use of summative assessment, while students' in the control group were subjected to the traditional assessment method. Two research questions and two hypotheses were postulated for the study. A 40 item instrument titled: "Assessment For Learning Biology Achievement Test" (AFLBAT) developed by the researchers was used for data collection. The instrument was duly validated by three subject specialists and two experts in educational measurement and evaluation. An internal consistency coefficient of 0.71 was obtained using Rulon formula. Data for the study were analyzed using descriptive statistics (mean, and standard deviation), analysis of covariance (ANCOVA) and paired sample t-test. The analysis of data was done using SPSS software. The result of the study revealed that: Assessment For Learning strategies effectively improved biology achievement of students'; biology academic achievement of students was enhanced by the following AFL strategies: use of questioning, comment only marking and self/peer assessment but the most effective is comment only marking; AFL has a significant effect on biology academic achievement of students. Based on the results of the study, the following recommendation among others was made by the researchers: a critical review of classroom assessment methods is advocated, especially in the aspect of comments made by teachers concerning learning outcome of students'.*

KEYWORDS: Assessment for Learning, Formative Assessment, Summative Assessment, Academic Achievement, Biology

INTRODUCTION

Accomplishment of learners in every academic endeavour is measured depending on the results of their learning outcome at the termination of the learning period, term, academic calendar or at the end of a programme. The level of academic achievement of a learner is determined based on assignment, test/examination scores, and marks or grades assigned by the instructor, teacher

or examiner. Achievement is "a result oriented construct aimed at accomplishing a particular task which terminates at the realisation of the attainment of the programme" (Nixom & Topping, 2000). In recent years, students' academic achievement in Senior Secondary Certificate Examination (SSCE) has drawn the consideration of all stake holders in education. The decline in academic accomplishment of students in biology is reflected yearly in students result published by the examination bodies. The 2002 – 2012, West African Examination Council (WAEC) Annual Report highlighted by Akanbi and Kolawole (2014), indicated the percentage of those who passed biology obtaining a credit (A1 - C6) for the past eleven years (2002 -2012) in Nigeria were 31.52%, 44.15%, 24.69%, 35.04%, 48.60%, 33.37%, 33.94%, 33.87%, 33.90%, 38.50%, and 38.82% respectively.

This shows that for the past eleven years the biology achievement of students' has been below fifty percent. Biology is a mandatory subject for any science oriented course, thus it has developed advancement as it concerns the field of forensic science, genetic engineering and medicine. In spite of its importance, however the performance of students has degenerated at higher level of secondary school (Ahmed, 2008). The result of previous findings indicates that there is more work to be done to avert this poor academic achievement among students. Over the years, researchers have attributed this pathetic level of academic achievement of students to various factors such as failure of parents to pay attention to the needs of their children which has culminated into lack of orientation, corruption, less emphasizes on hard work, unregulated television and internet viewing, usage and unnecessary addiction to face-book and mobile phones Ajayi (In Adewusi, 2013). For Adegoke and Umar (2011) in a separate study observed that most classes involve rote learning, in which there is dependence on memorization devoid of the understanding of the subject.

The incessant utilization of this strategy discourages students' participation in classroom learning. The amount and quality of the expected behaviour manifested in form of performance are determined through the process of assessment (Hassan, 2001). The attention on assessment of students' achievement has highlighted assessment as an intrinsic aspect of instruction and learning. In their view Kallaghan and Greaney (2001), observed "that teachers' assessment of their students in the classroom deserves a second consideration in terms of improving the quality of education". Assessment from educational perspective according to Ukwuije (2012:3):

> *"is a process of documenting, usually in measurable terms, knowledge, skills, attitudes, beliefs, practice or generally what behaviour a learner does or does not have, acquire or develop before, during and at the end of instruction, or a course of study".*

Furthermore, assessment has been defined as; "a process of obtaining information used to make educational decisions about students, to give feedback to the students about his or her progress, strengths and weaknesses, to judge instructional effectiveness and curricular adequacy and inform policy" (American Federation of Teachers (AFT), National Council on Measurement in Education (NCME); & National Education Association (NEA), (in Kellaghan & Greaney, 2001:19). During the 1990s, "research findings indicated that giving recognition to assessment as a constituent of teaching improves achievement for learners and also shows connection that classroom practices are relevant to bodies of research, such as: feedback, motivation, attribution and self-regulated learning" (Wiliam, 2011). Thus, for assessment to be an integral part of instruction, it has to be carried out formatively. Stiggins and Chappius (2005:18) identified three approaches to formative assessment. These include:

"More Frequent Testing: this refers to increase in the frequency of summative assessments from once to several times a year. Effective Data Management: This approach involves the accumulation, summarizing, analysing and providing a feedback on effective assessment with diligence.

The third approach is Assessment For Learning: In Assessment For Learning, the emphasis is on transferable learning, here, assessment becomes a much more transparent process, which is based on critical information that is shared with learners, and thus the learners are responsible for their own learning and assessment". Based on research findings and interviews conducted with teachers who had practiced AFL in their classrooms Black, Harrison, Marshall, Lee and Wiliam (2003:2) identified the following AFL strategies:

- "Teachers use of questioning: refers to the use of questions by teachers to diagnose and extend students' ideas and to scaffold students' thinking. The teacher adjust questioning to accommodate students' contributions and thinking in a neutral rather than evaluative manner" (Chin, 2006a).
- Feedback through marking: refers to the use of written comments instead of grades to inform students on their area of strength and weaknesses. This approach guides the students to analyse their strengths and improve on their weakness.
- Peer and Self assessment by Students: Peer assessment according to (Falchikov, 1995) is defined as "the process whereby groups of individuals rate their peers. While self assessment refers to "the involvement of learners in making judgements about their own learning, particularly about their achievements and the outcomes of their learning" (Boud & Falchikov, 1989).
- Formative use of summative assessment: refers to the use of items from past examination and test papers that are relevant to the topics being taught by the teacher to assess on-going learning process".

Assessment For Learning in the context of this study "is defined as the mean difference in scores obtained by students based on exposure to Assessment For Learning strategies such as, "use of questioning, comment only marking, self/peer assessment and formative use of summative assessment".

Black, Harrison, Marshall, Lee and Wiliam (2002), refer to Assessment for Learning "as every exercise embarked on by instructors and learners that serve as information which forms and advances the instruction and study exercise undertaken within the classroom". The currently practiced formative assessment process in Nigeria is mostly the More Frequent Testing and the Effective Data Management Approach. These approaches are traditional formative assessment and have been in use for decades, not only in Nigeria but globally. For Wiliam, (2011:3):

> *"Currently, the existing view on education sees instruction as a reasonable quality which is not adaptive to the needs of learners. A well-design instruction is effective for those students that it was meant, while others are assigned to remedial activities in which the causes of failure to learn lies on the individual in terms of materials which were difficult and as such, learners pursue the less academic avenues"*

According to Black et al (2002) Assessment for Learning is mainly non-formal and embedded in instruction and learning. It takes place frequently in each unit of instruction. Their study revealed that comments made by teachers were more effective and productive than the award of marks or simultaneous use of comments and marks. Stiggins and Chappius (2005) asserted that Assessment for Learning does not only monitor the students' learning but turns the classroom assessment process which result to the instructional intervention. Findings on a study on formative assessment by Black and Wiliam (1998) showed that, it is descriptive feedback that produces the highest improvement in performance and not letter grades or scores.

Similarly, Elawar and Corno (1985) in their study stated that teachers' written feedback, in terms of students' homework amounted to twenty-four percent difference in terminal accomplishment. The attainment of learners subjected to comments was better than that of their counterparts who were assigned grades; hence grades hinder accomplishment. Butler (1988), revealed that where comments are personalized to students they obtained predominantly higher scores up to thirty percent on specific assignment. There was visible reduction in accomplishment of learners' assigned grades only, as well as those exposed to both comments and grade. Harrison and Harlan (2006) in their study on the effect of self/peer assessment strategy on academic achievement of students revealed that this strategy is effective, in facilitating learners' deliberation on a specific exercise or assignment, their learning methods and enhances thorough rather than superficial learning process.

However, regardless of the growing agitation especially in developed countries on enhancing learning and classroom assessment through AFL interventions, Nigerian educators, teachers and stakeholders seem not to be aware of the continuous changes and innovation in formative assessment especially in the area of students achievement gain. Our educational system has relied on terminal assessment scores generated by teachers and public examination bodies for decades to inform our decision about accountability on the academic output of students. Which is to say that much emphasis is laid on summative assessment at the detriment of classroom assessment which if adequately used paves way for effective summative assessment and its achievement?

The researchers have observed that in most developing countries, such as Nigeria, assessment practices focus primarily on examinations (summative assessment) in which little or no emphasis on classroom assessment methods are made. Most teachers appear to focus more on the activities, laid- out for teaching in order to end scheme of work than on outcome/mastery. Most teachers administer classroom assessment specifically to generate mandatory terminal continuous assessment scores. The evaluation functions are high-lighted, whereas the guidance and learning processes are not high-lighted. A high priority is accorded the collection of marks for records, rather than enquire into learners activities to detect learning requirements and assessment strategies that would improve and enhance learning.

It is quite unfortunate that Assessment for Learning strategies which have been introduced in most classrooms in developed countries are yet to be applied in our classrooms. The problem of the study therefore is to investigate the effect of Assessment For Learning strategies such as, "use of questioning, comment only marking, self/peer assessment and formative use of summative assessment" on biology academic achievement of Senior Secondary Students.

Research questions

Two research questions were stated to guide the study:

1. What is the effect of Assessment For Learning (AFL) strategies ("use of questioning, comment only marking, self/peer assessment and formative use of summative assessment") on biology academic achievement of students as measured by their pretest and post test scores?

2. What is the difference in biology academic achievement of students among the five groups ("use of questioning, comment-only marking, self/peer assessment, formative use of summative assessment" and control group) as measured by their post test scores?

Hypotheses

The following null hypotheses were postulated to direct the study:

1. There is no significant effect of AFL strategies ('use of questioning, comment only marking, self/peer assessment and formative use of summative assessment") on biology academic achievement of students as measured by their pretest and post test scores.

2. There is no significant difference in biology academic achievement of students among the five groups ("use of questioning, comment only marking, self/peer assessment, formative use of summative assessment" and control groups) as measured by their post test scores.

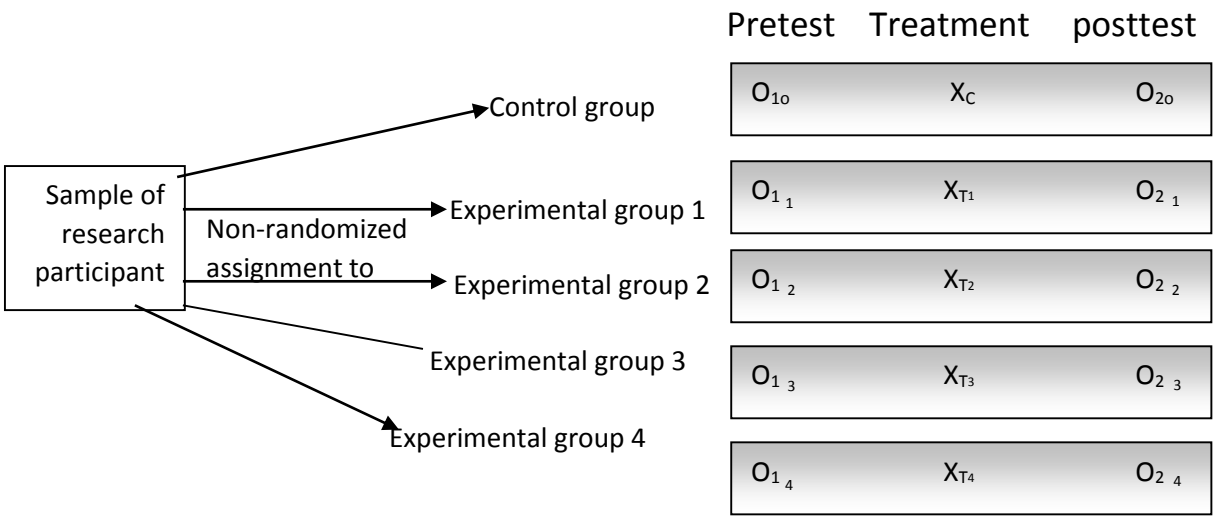
METHODOLOGY

The researchers adopted a non-randomized pretest-posttest control group quasi-experimental design. The population of the study consist of 34,825, Senior Secondary Two (SS2) students duly registered in public secondary schools (2013/2014 Session: Rivers State Ministry of Education, 2012) in the 23 Local Government Areas of Rivers State, Nigeria. Multistage Sampling technique was adopted to draw a sample of 400 students. The first stage of sampling was carried out using proportional stratified random sampling technique where the area of study (Rivers State) was divided into two regions; upland and riverine.

The upland region consist 15 Local Government Areas while the riverine region consist of 8 Local Government Areas. The researchers selected three Local government areas (Port Harcourt, Obio/Akpor and Ikwerre) from the upland region and two Local Government Areas (Ogu/Bolo and Okrika) from the riverine region.

In the second stage non-proportional stratified random sampling technique was adopted to select one secondary school from each Local Government Area, giving a total of five secondary schools. The five schools represented the four treatment groups and a control group respectively. These schools are co-educational secondary schools. The design of the study is shown in the figure below.

Figure 1: Pretest-postest control group design with more than one experimental group in which O_1 and O_2 represent the pretest and posttest assessments, X_C is the control or standard condition, and X_{T1} - X_{T4}represent four experimental treatment conditions.



Adapted from Johnson and Christensen (2012:304)

Key: O_{1o} and O_{2o} - represent the pretest and posttest assessment of the "control group": Xc
$O1_1$ and O_2 - represent the pretest and posttest assessment administrated to experimental group 1 (those exposed to "use of questioning": $XT_{1)}$
O_{1_2} and $O_{2\,2}$ - represent the pretest and posttest assessment administrated to experimental group 2 (those exposed to "comment-only marking" XT_2)
O_{1_3} and O_{2_3} - represent the pretest and posttest assessment administrated to experimental group 3 (those exposed to "self/peer assessment" XT_3)
O_{1_4} and $O_{2\,4}$ - represent the pretest and posttest assessment administrated to experimental group 3 (those exposed to "formative use of summative assessment" XT_4)

Students in the experimental groups where subjected to Assessment for Learning strategies ("use of questioning, comment only marking, peer/self assessment and formative use of summative assessment") adopted from the research by Black and Wiliam (1998).

Experimental Procedure

Experimental group 1: Students' (N=70) in this group were exposed to: "use of questioning": "students were engaged in classroom discussions, using incorrect answers drawn from classroom exercises and take-home assignment; encouraging students to interface with their classmates by allotting more time to their discussions and views on issues under consideration; guiding students, encouraging them to learn from the errors on responses to questions and collaborate with their classmates to reach a resolution; and discouraging the use of hand signals to volunteer answers to questions but asking open questions to ensure that the students were able to contribute to the discussion. This was done to enable the researchers (teacher) change from closed questions that emphasize recall of facts to hierarchical question types such as: high-order, low-order and follower-up. Promoting reflection and discussion".

Experimental group 2: students' (N=90) in this group were exposed to; feedback through; "comment only marking". This involved: "entering marks into record book kept by the researchers, but not writing the mark or grade in the student's book; using incorrect responses for discussion and making only verbal and written comments to guide the students to find a

solution to the questions raised in the class work or assignment; engaging students in scrutinizing their responses to straight forward exercises; using written and descriptive comments instead of marks to guide and direct students work, not commenting on their personality or character; and monitor the students' responses to the comments made by sharing their class work and assignment notebook into two, using the left side for class work and the right side for responses to comments made by the researcher".

Experimental group 3: students' (N=75) in this group were exposed to: "self / peer assessment". It involved: "Asking students to mark their peers work (assignment, class work), based on the topics taught, using mark scheme and guidelines criteria developed by the researchers; students are encouraged to indicate if they have any difficulty with on-going instruction by lifting a piece of paper with appropriate colour; "green, amber or red", which indicates the level of comprehension; good, partial or little understanding of the work done. The piece of paper with the different colours were provided by the researchers and distributed to the students before the lesson for the day began. Green colour indicates good understanding, amber – partial understanding and red: little or no understanding; students who indicated good and partial understanding of the instruction were paired to interact and facilitate learning while the researchers engaged students who indicated little or no understanding of the instruction and monitored the progress of the amber and green light bearing students; and at the end of the pairing/learning exercise the researchers gave the students mark scheme/criteria for grading their peers and their own work".

Experimental group 4: students' (N=85) in this group were exposed to: "formative use of summative assessment". It involved: "The use of relevant questions from the Senior Secondary Certificate Examination (SSCE) past question papers to assess students learning based on the topics or units taught; using relevant questions from SSCE past questions papers (administered by WAEC & NECO) for revision of topics taught".

Control group: Students' (N=80)

The control group was assessed during the teaching learning process, based on the traditional method of continuous testing and homework.

The instrument for data collection for pretest and posttest was a 40 item "Assessment for Learning Biology achievement Test" (AFLBAT). The items used in the instrument where generated from lessons taught on aquatic habitat, based on SS2 scheme of work by the researchers. The items consist of completion type and multiple choice. Each correct item was scored one mark with a maximum score of 40. To determine the content validity of the instrument, a test blueprint was used to ensure even distribution of the content and objective of the lesson. Copies of the instrument where validated by three subject specialists (biology) and two experts in educational measurement and evaluation. A copy of the SS2 biology scheme on aquatic habitat was made available to these experts to facilitate the suitability of the items. The instrument was administered to 40 SS2 students who were not involved in the study. Rulon formula was used to establish an internal consistency coefficient of 0.71. Data generated was analysed using paired sample t-test statistics and ANCOVA with the pretest as covariate to test the tenability of the null hypotheses, while mean and standard deviation was used to respond to the research questions.

RESULT

The results of the data analysis are shown below:

Table 1: Paired t-test analysis of Pre and Posttest scores of effect of AFL strategies on biology academic achievement of students' in the different groups

Pairing	Group	N	$\overline{X}$	SD	MG	T	Df	*P*	Sig
Pair 1	UOQ Pre	70	20.20	3.179	7.143	-23.868*	69	.000	P<0.05
	UOQ Post	70	27.34	4.021					
Total		70	23.77	3.60					
Pair 2	COM Pre	90	20.77	2.772	7.600	-31.190*	89	.000	P<0.05
	COM Post	90	28.37	3.241					
Total		90	24.57	3.007					
Pair 3	SPA Pre	75	20.45	2.830	6.720	-21.403*	74	.000	P<0.05
	SPA Post	75	27.17	4.276					
Total		75	23.81	3.553					
Pair 4	FUSA Pre	85	20.87	2.453	4.671	-17.228*	84	.000	P<0.05
	FUSA Post	85	25.54	3.611					
Total		85	23.21	3.032					
Pair 5	CG Pre	80	16.69	1.356	4.300	21.586*	79	.000	P<0.05
	CG Post	80	20.99	2.034					
Total		80	18.84	1.695					

**Significant at 0.05 level of Significance*

Table 1, reveals that the mean scores for students exposed to use of questioning strategy is 20.20 while their posttest mean score is 27.34. Hence, the mean gain is 7.14. The pretest mean scores for students exposed to comment only marking strategy is 20.77 while their posttest mean score is 28.37 with a mean gain of 7.60. The pretest mean scores for students exposed to self/peer assessment is 20.45 while their posttest mean score is 27.17 with a mean gain of 6.72. The pretest mean scores for students exposed to formative use of summative assessment strategy is 20.87 while their posttest mean scores is 25.54 with a mean gain of 4.67. Furthermore the pretest mean scores of students in the control group is 16.69 while their posttest mean scores is 20.99 with a mean gain 4.30. A critical look at table 1 shows that students subjected to the following AFL strategies: comment only marking (COM), use of questioning (UOQ), self/peer assessment (SPA) and formative use of summative assessment (FUSA) had higher mean gains; 7.60, 7.14, 6.72 and 4.67 respectively based on the difference on their pretest and posttest mean scores. The control group on the other hand had the lowest mean gain of 4.30.

Table 1 also reveals that comment only marking strategy has the highest mean gain 7.60, followed by use of questioning strategy 7.14, self/peer assessment strategy 6.72 and formative use of summative assessment strategy, has a mean gain 4.67, while the control group has the least mean gain, 4.30. The paired t-test analysis in table 1 shows that there is a statistical significant difference between the pretest and posttest mean scores among the four groups exposed to AFL strategies. Students exposed to "use of questioning, comment only marking, self/peer assessment and formative use of summative assessment" strategies obtained: t = -23.868, df 69, p (.001) < 0.05 ; t = -31.190, df 89, p (.001)< 0.05 ; t = -21.403, df 74, p (.001) < 0.05 ; and t =-17.228 , df 84, p(.001) < 0.05 respectively. Therefore, the null hypothesis of

no significant effect of AFL strategies on biology academic achievement of students' is rejected and the alternate hypothesis accepted.

Table 2: AFL strategies posttest mean scores and standard deviation on the difference in biology academic achievement of students' among the five groups

Groups	N	$\overline{X}$	SD
Use of Questioning (UOQ)	70	27.34	4.021
Comment Only Marking (COM)	90	28.37	3.241
Self/Peer Assessment (SPA)	75	27.17	4.276
Formative Use of Summative Assessment (FUSA)	85	25.54	3.611
Control Group (CG)	80	20.99	2.034

Table 2 above revealed that students assessed based on comment only marking strategy had the highest posttest mean value 28.37 and standard deviation 3.241, followed by use of questioning strategy, 27.34 and standard deviation 4.021, self/peer assessment strategy, 27.17 and standard deviation 4.276, formative use of summative assessment strategy, 25.54 and standard deviation 3.611. The control group posttest mean value is 20.99 with standard deviation 2.034. This shows that there is a difference in the biology academic achievement of students among the five groups based on their posttest mean scores. This is also depicted in figure 2.

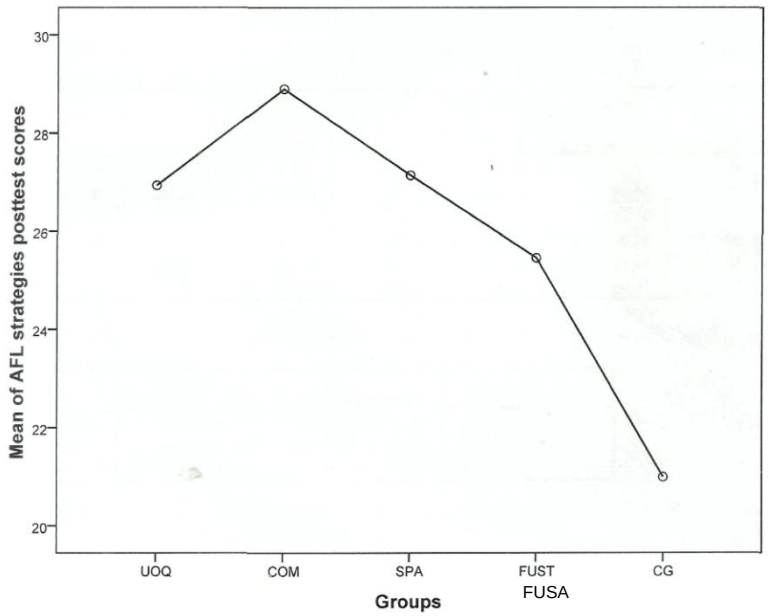


Fig 2: Posttest means plots showing the difference in academic achievement of students in biology among the five groups

The posttest mean difference in biology academic achievement of students among the five groups is aptly revealed in the mean plot in figure 2.

Table 3: One-way ANCOVA summary of AFL strategies posttest mean scores on differences in biology academic achievement of student' among the five groups

SV	SS	Df	MS	F	*P*	Sig
Corrected model	5351.155	5	1070.231	189.028*	.000	P<0.05
Intercept	253.179	1	253.179	44.716*	.000	P<0.05
Pretest	2594.729	1	2594.729	458.280*	.000	P<0.05
Groups	672.955	4	168.239	29.714*	.000	P<0.05
Error	2230.782	394	5.662			
Total	275647.00	400				
Corrected Total	7581.937	399				

**Significant at 0.05 level of Significance*

Table 3 revealed that with the effect of pretest removed, there is a significant difference in the biology academic achievement of students among the five groups as measured by their posttest scores, as F(4, 394) =29.714, p(.001)<0.05. Therefore, the null hypothesis that there is no significant difference in biology academic achievement of students among the five groups ("use of questioning, comment only marking, self /peer assessment, formative use of summative assessment" and control group) as measured by their possttest scores is rejected and the alternate hypothesis accepted. However, since a significant difference was observed among the five groups, there is need to determine the direction of the significant difference. This was done using post hoc comparison via Bonferroni test. The result obtained are as presented in table 4.

Table 4: ANCOVA AFL strategies posttest means scores showing pair wise multiple comparisons of differences in students' biology academic achievement in the five groups via Bonferroni

Pair	**MD**	**Std Error**	***P***	**Sig**
UOQ Versus COM	-.460	.380	1.000	P>0.05
UOQ Versus SPA	.421	.396	1.000	P>0.05
UOQ Versus FUSA	2.468*	.385	.000	P<0.05
UOQ Versus CG	2.863*	.422	.000	P<0.05
COM Versus SPA	.882	.372	1.83	P>0.05
COM Versus FUSA	2.929*	.360	.000	P<0.05
COM Versus CG	3.323*	.412	.000	P<0.05
COM Versus FUSA	2.047*	.377	.000	P<0.05
COM Versus CG	2.442*	.421	.000	P<0.05
FUSA Versus CG	.395	.418	1.000	P>0.05

**Significant at 0.05 level of Significance*

Table 4 on ANCOVA pairwise multiple comparison, revealed specifically where significant difference in the biology academic achievement of students in the five groups lie based on their posttest mean scores. The table revealed that having adjusted for the effect of the pretest, the posttest mean scores of students subjected to use of questioning, comment only marking and self/peer assessment strategies, statistically differed from posttest mean scores of those subjected to formative use of summative assessment strategy and the control group. While the posttest mean scores for students subjected to formative use of summative assessment strategy did not differ statistically from those in the control group as p (1.000) > 0.05 alpha.

Discussion of Findings

The result of research question one shows that AFL strategies are effective in improving students' biology academic achievement. There is a mean gain on the posttest scores of students exposed to all the AFL strategies. This indicates that there is a significant effect of AFL strategies in enhancing students' achievement in biology. The result of the study is in tandem with the research findings of Black, Harrison, Lee, Marshall and Wiliam (2003), which revealed a positive and significant effect on mean gain obtained by students exposed to AFL strategies.

The answer to research question two (Table 2) shows that there is a difference in the biology academic achievement of students among the five groups. Students subjected to comment only marking strategy ($\bar{x}$:28.37) and use of questioning strategy ($\bar{x}$:27.34) performed better than those exposed to self/peer assessment strategy ($\bar{x}$:27.17) and formative use of summative assessment strategy ($\bar{x}$:25.54). Students subjected to AFL strategies in the four groups performed better than those in the control group ($\bar{x}$:20.99). This result shows that students subjected to comment only marking strategy had better academic achievement, followed by use of questioning strategy, self/peer assessment strategy, and formation use of summative assessment strategy. Students in the control group had the least achievement based on their posttest mean score. The result based on pair wise multiple comparison summary (table 4) revealed that students subjected to use of questioning, comment only marking and self/peer assessment strategies, statistically differ from those subjected to formative use of summative assessment strategy and the control group. There is no statistical difference between those subjected to formative use of summative assessment and those in the control group.

It could be inferred that this lack of significant difference between students subjected to the formative use of the summative assessment and control group is due to the assessment procedure in formative use of summative assessment strategy, which requires the teacher or instructor to use relevant items from already developed items from biology textbooks and previous items from WAEC/NECO formatively. That is, as the teaching/learning process is going on based on the subject/topic content taught to assess learning outcomes. Students in the control group were assessed verbally and homework was administered by the researcher at the end of a unit or topic based on items from the content of the topic taught. Scores were assigned to the homework. This assessment strategy is what obtains in traditional classroom based assessment.

The result of the present study is in line with the study of Elawar and Corno (1985) that the accomplishment of students subjected to feedback through comments was better than those who were assigned scores. Similarly, Butler (1988) revealed that where comments are personalized to students, they obtain predominantly higher scores up to 30% on specific assignment. Harrison and Harlan (2006) in their study on the effect of self/peer assessment strategy on biology academic achievement of students revealed that this strategy is effective, in facilitating learners' deliberation on a specific exercise or assignment, their learning methods and enhances thorough rather than superficial learning process.

CONCLUSION

Based on the findings, Assessment for Learning strategies are effective in improving and enhancing biology achievement of students. Specifically students subjected to use of questioning, comment only marking and self/peer assessment strategies performed better than those subjected to formative use of summative assessment strategy and those in the control group. The study revealed that comment only marking strategy is the most effective in enhancing learning outcomes of students.

RECOMMENDATIONS

Critical review of classroom assessment methods is advocated especially in the aspect of comments made by teachers concerning learning outcome of students. More emphasis should be laid on constructive comments based on students' area of weakness. Specific comments should be made by teachers to direct the students on what needs to be done to improve and enhance their learning. Comments should be strictly for eliciting the required changes that would enhance learning outcomes. Classroom assessment should not be conducted just for generating scores and awarding marks to students, but for diagnostic purposes and assessment of learning outcomes. Experts in educational test and measurement should be retrained through workshops, seminars and conferences to acquire appropriate skills, and develop appropriate models of AFL strategies in different subject areas to suit our classroom environment and facilitate the training of teacher trainees.

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