



# Evaluating the Efficacy of Instructional- Reinforcement Techniques on Junior Secondary School Students' Academic Engagement and Performance in Basic Science in Rivers State

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## Abstract

Research has concentrated on ways teachers influence students' achievement and grades in school subjects through their chosen teaching strategies with little or no recourse to the evidence that academic engagement and behaviours of students are equally important to their life-long academic success. This study evaluates the efficacy of using corrective feedback and extra as instructional reinforcement techniques on the academic engagement and performance of Junior Secondary School Students in Rivers State. 121 Basic 8 (JSS II) students randomly selected from three Junior Secondary Schools in Rivers State participated in the study. The selected students were taught in their respective schools after the normal class time and through the administration of academic engagement survey and academic performance test data were obtained and analysed using mean and ANOVA. Results showed significant difference among the groups as students in the group that received corrective feedback followed by extra time to perform the given task had higher mean academic engagement and academic performance than students in the group that only received corrective feedback. While those students in the group that neither received corrective feedback nor extra time showed lower academic engagement and academic performance. These findings lend empirical evidence on the potency of reinforcement strategies in improving students' academic engagement and performance. And so, students should be given immediate corrective feedback couple with extra time to attend to problems and task they perceived to be difficult as these can help them to engage in academic task and improve their academic performance.

**Keywords:** Instructional, Reinforcement, Academic, Engagement, Performance, Basic Science.

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## **INTRODUCTION**

From the beginning of the 20th century, researchers have studied how motivation influences or affects learning and vice versa (Mehring & Colson, 1990), as both concepts are apparently related (Rao, 2003; Crandell & Robinson, 2007). At the commencement of adolescence most students' scholastic motivation starts to decline (Zusho & Pintrich, 2001; Watt, 2004), and so the tendency of most students' learning outcome or performance and academic achievement to decrease (Barber & Olsen, 2004; Vedder-Weiss & Fortus, 2012). This could probably be due to lack of academic engagement. Academic engagement refers to efforts dedicated by students to academic activities with the aim of achieving success.

In teaching and learning it is common for effective teachers to notice that while some students are very much engaged in classroom learning activities and achieve academic success some are less engaged in classroom activities and so lag in academic achievement. Such teacher may therefore see the need to push the students towards success. One way to guarantee this in the classroom is to encourage students' learning through reinforcement. Through reinforcement given to students by a teacher(s), students learn to self-monitor themselves and their activities, plan and manage their time, set goals, and self-evaluate themselves (Otero, 2015).

Reinforcement theory is one of the important theories on learning. The theory is based on the early work of Thorndike (1929) and Skinner (1938). Their theory of operant conditioning theorizes that individuals learn in proportion to the consequence of their actions. For example, if the consequence of a student learning Chemistry at school is an excellent academic achievement and this consequence is reinforced through rewards and incentives such as praise, gift and feedback the student is likely to repeat the behaviour (which is excellent academic achievement). This implies that reinforcement in the form of reward or incentives has direct positive relationship with students' motivation to learn and consequently retention of what is learnt and improvement in academic achievement. In turn, punishment can work to suppress or discourage negative or undesirable behaviour.

### **The Concept of Reinforcement**

Sheffield (2006) defined reinforcement as a process of shaping or influencing behaviour by manipulating the consequences of the behaviour. Nwankwo (2005) construe reinforcement as the addition of pleasant stimulus to a situation (or the withdrawal of an unpleasant stimulus from a situation) with the intention to increase or promote the proceeding response. Reinforcement can be regarded as the application of skills, strategies or activities to positively modify or change an organism's behaviour. It involves the equable use of positive and negative outcomes to encourage or increase the repetition of a required behaviour and/or to discourage or decrease the repetition of undesirable behaviour.

Reinforcement theory (sometimes referred to as operant conditioning or behaviourism) is one of the oldest theories of motivation and learning that is universally taught and learnt in psychology and is still being taught at present. It explains behaviour in relation to environmental stimuli or factors and so focuses on how stimulus is used in behavioural management. Consistent with Management Study Guide (2013) the theory sees an individual's behaviour as a function of its consequences. The theory emerges as a result of the early experimental works of Thorndike (1929) and Skinner (1938).

In 1911, an American psychologist, Edward Lee Thorndike (1874-1949) made known the Law of Effect following his studies on hungry cats placed inside puzzle boxes. On presentation of food, the cat inside the box was able to get to the food only when it was able to use the handle or bar to get out of the box. During the course of trial and error, the cat was able to learn the contingency between its behaviour (response) and the reward (food). Thorndike further observed that in each successive attempt of the cat to get to the food, the time it takes the cats to get to the food decreases following the repeated training the cat received.

The law of effect is one of the principles of learning. This law maintain that any response that leads to a satisfying effect in a given situation is more likely to be repeated in that situation, while responses that emit a displeasing effect is less likely to be repeated in that situation. And so, going by the law it is believed that man repeat behaviours that yield pleasant outcomes and stay away from those behaviours that produce unpleasant outcomes.

The concept of reinforcement was also buttressed by the work of B. F Skinner (1938) who studied the influence of presentation of food (i.e. reinforcement) on the behaviour of a hungry rat. In the study, Skinner constructed a box inside, which has a place for food and a lever that released the food when pressed. He placed a hungry rat into the box and examined what the rat did to get to the food. At first, when the rat was placed into the box, the rat played around without knowing what to do to get the food not until when it accidentally struck the lever and the food was released. As a result of numerous trials, the rat was able to learn to go to the lever and press it to release the food each time it was hungry. The actions (or responses) of the rat were reinforced by making sure that the food was released into the box each time the lever was pressed and the increased activity of the rat was noticed through the speed at which the rat presses the lever.

Psychologists have identified two types of reinforcements as positive reinforcement and negative reinforcement. According to Wood, Wood, and Boyd (2005) positive reinforcement is any pleasant or desirable consequences (or outcomes) that succeeds a response and increases the likelihood of that response to be repeated. It involves giving the individuals what he or she likes when he/she had performed the desired behaviour, thus negative reinforcement involves the removal of an unpleasant consequences or stimuli when a desired response occurs. While positive reinforcement increases the future frequency of behaviour as a result of the addition of a stimulus (reinforcer) following a response, negative reinforcement increases the future frequency of a behaviour when the consequences is removed of an aversive stimuli. These consequences could be pleasurable to the organism and thus strengthen or encourage the repetition of such behaviour, and could be aversive or unpleasant to the organism and thus reducing the occurrence of the proceeding behaviour. Cotton (2008) maintained that pleasurable consequences are generally called reinforcers, while unpleasant ones are called punishers.

Reinforcement whether positive or negative, is actually targeted at producing or effecting changes in the behaviour of an organism. It utilizes the reward system i.e. a collection of policies, mechanisms, monetary, non-monetary (events or objects), and psychological payments that an organization provides for its employees in exchange for the work they perform well (Schultz, 2006; Bratton & Gold, 2007). The essence is to regulate and control the employees' behaviour by inducing pleasurable effects and removing unpleasant ones so as to attract, motivate, and retain the employee.

Going by the concept of reward, once a reward is given after the occurrence of a behaviour, there is an increase in the possibility of such behaviour to occur again (Pavlov,

1927; skinner, 1953). In like manner, punishment administered immediately on an individual for exhibiting intolerable behaviours tends to decrease the reoccurrence of such behaviours.

### **Instructional Reinforcement and Students' Academic Achievement**

In the field of education, reinforcement can be seen as what the teacher do to promote and buttress positive behaviour and/or dissuade negative behaviour of the learner. And so, instructional reinforcement can be defined as the steady provision or application of skills, strategies or activities in the classroom to increase the incidence of desirable academic engagement and performance or decrease the manifestation of undesired academic outcome of a leaner. It encompasses all the techniques and activities used by the teacher that result in positive change(s) of learners' behaviour and academic achievement. In reinforcement, rewards or punishments or a combination of rewards and punishments are used to promote or encourage desired behaviour.

In educational settings the rewards can include giving the learner food to eat, a pat or palm on the back, verbal praise, clapping hands, thumb up, or a preferred item (such as a toy, pencil, book, or a break on a swing), scholarships, free tuition fees and others, while punishment can take the form of denial of break time, suspension, expulsion, scolding among others. Reward and punishment when adequately applied serve as means of motivation, though they may produce different results, depending on the recipient and conditions under which they were given and/or received. For example, some children and adolescents are often very well motivated when they are rewarded with material reinforcers such as toy, food, pencil, book, cash, snacks irrespective of the fact that young ones generally differ significantly in the kind of material reinforcers that is of interest to them.

### **Academic Engagement and Academic achievement**

Academic engagement is the quality of effort and time put in by a student in academically purposeful activities. Active engagement in academic activities has a strong capability of predicting academic outcome or performance. It has been recognized that academic engagement is interconnected with enhanced study habits, improved study skills, academic outcome and productivity as well as improved behaviour necessary for an effective classroom (Otero, 2015). Lack of academic engagement can lead to unfavorable learning outcomes such as low academic achievement, increased risk of failure, behaviour disorder such as rudeness, drug addiction, and dropout (Noohi, Abaszadeh & Maddah, 2013).

### **A REVIEW OF RELATED LITERATURE ON REINFORCEMENT**

Green and Todd (2015) examined the relationship between different forms of reinforcement and mathematical performance of sixth grade students at a Midwest suburban STEM (science, technology, engineering, and mathematics) school. The researchers used a sample of Thirty (30) sixth-grade students divided into three groups (positive reinforcement group, negative reinforcement group and the control group). The groups were asked to mentally solve provide oral answers to a twenty-question fraction problems, while holding a Vernier heart-rate monitor, after receiving different forms of reinforcement. While the students in the positive-reinforcement group were promised of receiving candy as reward for their performance if they

earned an “A” on the test, students in the negative-reinforcement group were promised of coming back during recess and after school to study fractions again if they did not earn good grade as expected by their teacher.

Students in the control group were informed that their results will bear no name and as such it would have no effect on their academic performance. Results revealed that the positive reinforcement group displayed the highest average score (71.5%), followed by the negative reinforcement group with average score, 61.5% while the control had the least average score (56.5%). However, the results did not show any statistically significant difference among the groups ( $F = 0.89, p = 0.422$ ). The result also indicate a significant difference in the heart rates of students in the groups as the heart rates of students in the positive reinforcement group were significantly lower than those of the students in the negative reinforcement and control groups.

Adibsereshki, Abkenar, Mohammad and Mirzamani (2014) performed an experimental study to compare the usefulness of tangible reinforcements and social reinforcement to the academic achievement of intellectually disable female science students using 45 eighth-grade female students having intellectual disabilities in the science subject as participants. The participants were chosen from three middle schools in in Tehran using the multistage cluster approach. The participants’ progress in science was determined using Wechsler intelligence test for matching the participants with regards to intelligent quotient and the teacher-used tests. The results indicated that the treatment, there was a significant difference in the post academic achievement score among the groups, with the tangible reinforcement group having the highest achievement followed by the social reinforcement group and then the control group.

In Kenya, Dillion and Wanjiru, (2013) investigated the reinforcement strategies for teachers and learners of English in an urban primary school in Kenya. The results indicated that positive reinforcement was more influential and mostly used by the teachers as classroom management technique. In addition, the findings showed that rewards and appraisal are good in reinforcing learners.

Also, Wafula, Malimbe and Kafu, (2011) in their study on the state of positive reinforcement in secondary schools assumed that reinforcement in the secondary school classroom in Kenya home in on promoting student’s academic achievement, teacher efficacy, and effective teaching and learning. And they found that positive reinforcement was more often used by the teachers in the classroom management and hence concluded that positive reinforcements are essential techniques in classroom learning behaviour management. However, they caution in their findings that despite the fact that certain forms of incentives are good to encourage students repeat a desired behaviour or perform a desired task, material incentives or rewards should be occasionally used to avoid students engaging in doing a task mainly for the reward.

Amuma and Idoli (2013) undertook a study on the effects of material reinforcers as well as non-material reinforcers on the academic performance of Senior Secondary School female students on health Science in Abia State using 240 randomly selected SS II girls divided into three groups viz: material reinforcer, non-material reinforcer and the control groups each consisting of 80 students. Data from pre-test and post-test were analyzed based on ANOVA, and z-test and findings revealed that the mean performance scores of students in the three groups differ significantly and is in the order, material reinforcer group > non-material reinforcer > control group.

In another research carried out in Ontario Canada on the pro-active approach to

behaviour in class with students as respondents, Maini, (2011) found out that majority of students benefited in academic achievement after receiving from their teachers reinforcement in the form of rewards and antecedent strategies.

Mandah and Douglas (2010) executed a study on two groups of first year French students of Rivers State University of Education, Port Harcourt, Nigeria to investigate the effect of the application of Planned Repetition skill as a way of resolving poor understanding due to forgetting in learning French among the first year students. In the study one group, A was taught with the application of the Planned Repetition skill and another group, B taught without the application of Repetition skill on a conventional teaching process. The result indicated that more students in group A that were treated with the Planned Repetition skill showed increased performance than majority of those in group B who were not treated with the Planned Repetition skill.

Maori, (2008) study on classroom management strategies among 50 selected teachers in a New York school showed that majority of the teachers accepted using social reinforcement strategies including verbal praise, positive feedback, use of tokens, and use of privileges such as extra computer time, positive touching and positive note home to parents as means of reinforcing students.

### **Feedback and Extra Time as Reinforcement Instructional Strategies**

Feedback is a critical component of all teaching and learning process, and assessment. Feedback could be defined as any action or information or a means of communication given to (or received by) an individual or group to guide their future actions so as to achieve a desired success. It is a corrective reaction or information that proceed an action or behaviour undertaken by a performers (or learner) that informs him of what he did well, what he did not do well and what next steps he needs take to improve and attain a higher level of success. To Nicol and Macfarlane-Dick (2006) a good quality feedback is information that helps students to increase their performance, self-correct and take actions to decrease any identified discrepancies between their intentions (input) and the resulting effects (output).

Effective feedback serves several purposes such as evaluation of students' achievements, development of students' competencies and understanding, and evaluation of students' motivation and confidence. According to Nicol (2010), feedback enables students to know how their grades are obtained; helps students understand the necessary steps to take to improve; motivate students to act on their assessment; and develop in students the ability to self-monitor, evaluate and regulate their own learning.

Baker (2009) aver that there is a connectivity between formative assessment and feedback, and that through feedback teachers assess and take decisions on the readiness, diagnosis and remediation measures. Also, through feedback, students monitor the strengths and weaknesses of their performances; and reinforced themselves on areas leading to success and modify or improved in those areas considered unsatisfactory.

Results of the study conducted by Cutumisu and Shwartz (2018) indicated that critical feedback and revision are positively connected with performance as students who engage with higher levels of critical feedback significantly outperformed the other students when they choose their feedback. According to Bhutan Council for School Examinations and Assessment (BCSEA), (2013) report, students who received frequent feedback on their homework had improved performance compared to those students who received no feedback.

Burnet (2006) investigated the students' perceptions of the frequency of teacher feedback and praise as reinforcement strategies in New South Wales and found that, effort feedback impacted directly on students' relationships with their teachers. The age analysis of the teacher feedback as a reinforcement strategy indicated that ten year old students reported to have valued praise more frequently than the younger students and the older student.

In a study Paul Burnett and Valerie Mandel (2010) examined types of praise and feedback from both teachers' and students' perspectives in primary classrooms. In the study there were four types of feedback- non targeted praise, negative feedback, 'effort' feedback, and 'ability' feedback. The study revealed that younger students preferred to receive 'ability' feedback, while older students desired 'effort' feedback. It was also found that students who received ability feedback followed by a failure experience did not perform well after the failure, while those who received effort feedback had better performance following a failure experience (Burnett & Mandel, 2010).

Extra learning time here is conceptualized as the time additional time allotted by a teacher or utilized by a learner to solve a problem or accomplish a task. In this study, the extra learning time is the time used by students to do take homework. The study conducted by Nunez et al. (2015) disclosed that effective management of homework time have positive and significant effect on the quality and number of successfully done homework and as such produce positive effects on academic performance. In another study Jez and Wassmer (2015) found a significant positive relationship between time of learning and academic achievement and concluded that increasing time for students to learn is sine qua non to higher academic success particularly for the less advantage students.

The reviewed literature have shown the positive effects of several reinforcement strategies including feedback on students' behaviour modification, students' learning and academic achievement but none reported the effect on students' engagement. In addition, none of the literature included extra time as a reinforcement strategy. More so, personal observation revealed that despite the importance of feedback some students spend little time to go through teachers' feedback, probably they feel that feedback does not make sense to them. Some consider the time that feedback is given and the opportunity to use the feedback. A delayed feedback as well as lack of opportunity to improve following a feedback cannot make a feedback to be effective. If a given feedback is to help improve learning, then there is the need for adequate opportunities in terms of enough or extra time to be provided to students to work on the feedback, because this study examined the effects of immediate corrective feedback combined extra time as instructional reinforcement techniques on the academic engagement and academic achievement of basic science students in Junior Secondary Schools.

## **Research Questions**

The study is guided by two research questions and two hypotheses.

- Are there differences in the mean academic performance score among the three instructional classes with respect to post Basic Science performance test (BSPT)?
- Are there differences in the mean academic engagement score among the three instructional classes?

## **Hypotheses**

- The mean academic performance scores in post BSPT among the three classes do not differ significantly.
- There is no significant difference in the mean academic engagement of students in the three instructional classes.

## **METHODOLOGY**

### **Design**

This research is a quasi-experimental study comprising three instructional classes. Two of the classes fall under selected instructional reinforcement strategies while the other group served as the control group. The Skinner's theory of positive reinforcement was used for the two experimental groups to encourage the students to engage in learning a given classroom learning task.

### **Participants**

The participants are 81 Junior Secondary II students randomly selected from three Junior Secondary Schools in Rivers State. The participants are within the age range of 12-14 years. In each of the schools the participants were randomly split into three different classes: Two experimental classes-EC<sub>1</sub> and EC<sub>2</sub> and one control class (CC). Each of the experimental groups received different instructional reinforcement techniques.

### **Treatment of instructional classes**

Prior to teaching the different classes, the participants were given a pre-Basic Science performance test (BSPT) to ascertain the level of academic homogeneity or variability among the groups. Subsequently students were taught the topic "Work, Energy and Power" for two periods per week for four weeks. Each period lasted for 80 minutes

The students in these classes were taught by the same teachers. At the end of each lesson the students were given quizzes and problems to solve in their workbook. Students in the EC<sub>1</sub> who performed the expected academic task were rewarded while those who were unable to perform the task received both corrective feedback on the task and extra time (in the form of take home assignment) to perform the task. On the other hand, in the EC<sub>2</sub> students that performed well were rewarded while those who could not achieve success in the task were given corrective feedback on the task but without extra time to perform the task. In the control class, neither students who achieve success in the academic task nor those who could not achieve success were rewarded or punished respectively; rather they only received corrective feedback on the academic task. To provide corrective feedback to the students, the work book of students in the EC<sub>1</sub> and EC<sub>2</sub> were marked and returned to the students. This was followed with a detailed answer (corrections) to the problems given to them. At the end of the four week treatment a post Basic Science performance test (BSPT) and student academic engagement survey (SAES) were administered to the three groups

## Data Collection and Analysis

Data collection was done through the use of validated and reliable instruments- pre-Basic Science performance test (pre-BSPT), post-Basic Science performance test (pre-BSPT) and students' academic engagement survey (SAES) with reliability index ,  $r=0.72$ ,  $r = 0.82$  and  $\alpha = 0.69$  respectively. They were administered to the students and the scores obtained used as data for the study, and data was analysed by using mean and one-way analysis of variance (ANOVA).

## RESULTS

Table 1: Test of Homogeneity of Variances

Levene Statistic, F	df1	df2	Sig.
1.186	2	118	.309

Table 1 showed the Levene test of homogeneity of variances among the three classes. The table revealed that the variances are homogeneous ( $F_{2, 118} = 1.186$ ,  $P = 0.309$ ). Meaning that there was no significant difference in the mean pretest scores among the three classes

Research question 1: Are there differences in the mean academic performance score among the three instructional classes with respect to post Basic Science performance test (BSPT)

Table 2: Mean performance score in post BSPT among the three classes

Classes	Mean	N	Std. Deviation
Exp. Class 1 (EC <sub>1</sub> )	68.6000	35	8.4478
Exp. Class 2 (EC <sub>1</sub> )	64.3500	40	4.6880
Control Class (CC)	57.3478	46	5.8622

Table 2 revealed the mean and standard deviation (SD) of the academic performance of the three instructional classes. It showed that the experimental class 1 (mean = 68.60, SD = 8.4478), experimental class 2 (mean = 64.350, SD = 4.6880) and control class (mean = 57.3478, SD =5.8622).

Research Question 2: Are there differences in the mean academic engagement score among the three instructional classes

Table 3: Mean academic engagement score among the three instructional classes

Classes	Mean	N	Std. Deviation
Exp. Class 1 (EC <sub>1</sub> )	70.1714	35	7.8945
Exp. Class 2 (EC <sub>2</sub> )	65.2750	40	5.8703
Control Class (CC)	62.9783	46	4.9418

Table 3 showed the mean and standard deviation (SD) of the academic engagement of the three instructional classes. The table indicated that the experimental class 1 (mean = 70.1714, SD = 7.8945), experimental class 2 (mean = 65.2750, SD = 5.8703) and control class (mean = 62.9783, SD =49418).

HO1: The mean academic performance scores in post BSPT among the three classes do not differ significantly

Table 4: ANOVA of mean difference in academic performance score in post BSPT among the three classes

Classes	Sum of Squares	df	Mean Square	F	Sig.
Between Classes	2639.239	2	1319.619	32.240	.000
Within Classes	4829.935	118	40.932		
Total	7469.174	120			

Table 4 revealed that a significant difference exist in the mean academic performance among the three groups ( $F_{2, 118} = 32.240$ ,  $P = 0.000$ ). This showed that students in the three instructional groups differ significantly in their academic performance with respect to the posttest.

Table 5: Multiple comparisons of mean difference in academic performance score in post BSPT among the three classes using Scheffe's post hoc test

(I) Class	(J) Class	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Exp. Class 1	Exp. Class 2	4.25000*	1.48080	.019	.5789	7.9211
	Ctrl. Class	11.25217*	1.43502	.000	7.6945	14.8098
Exp. Class 2	Exp. Class 1	-4.25000*	1.48080	.019	-7.9211	-.5789
	Ctrl. Class	7.00217*	1.38315	.000	3.5731	10.4312

\*. The mean difference is significant at the 0.05 level.

Table 5 showed multiple comparisons of mean difference in academic performance of students in the post test using Scheffe's post hoc test. From the table the mean academic performance between Exp Class 1 and Exp Class 2 differ significantly to the benefit of the Exp Class 1 (mean difference = 4.2500,  $p = 0.019$ ). The table also revealed that the mean difference between Exp Class 1 and Ctrl Class was significant also to the benefit of the Exp Class 1 (Mean difference = 11.25217,  $P = 0.000$ ). Again, the table showed that Exp Class 2 and Ctrl had a significant difference in mean academic performance in favour of the Exp Class 2 ( Mean difference = 7.00217,  $P = 0.000$ ).

HO2: There is no significant difference in the mean academic engagement of students in the three instructional classes

Table 6: ANOVA of differences in mean academic engagement of students in the three classes

Classes	Sum of Squares	Df	Mean Square	F	Sig.
Between Classes	1046.075	2	523.038	13.529	.000
Within Classes	4561.925	118	38.660		
Total	5608.000	120			

Table 6 indicated that there is a significant difference in the mean academic engagement of students in the three instructional groups ( $F_{2, 118} = 13.529$ ,  $P = 0.000$ ). And so, the null hypothesis two ( $H_{O2}$ ) was rejected.

Table 7: Multiple comparisons of differences in mean academic engagement among the three classes using scheffe post hoc test

(I) Classes	(J) Classes	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Exp.Class1	Exp.Class 2	4.89643*	1.43913	.004	1.3286	8.4642
	Ctrl. Class	7.19317*	1.39464	.000	3.7356	10.6507
Exp. Class 2	Exp. Class1	-4.89643*	1.43913	.004	-8.4642	-1.3286
	Ctrl. Class	2.29674	1.34423	.236	-1.0358	5.6293

\*. The mean difference is significant at the 0.05 level.

Table 7 showed Scheffe's post hoc test of mean differences in academic engagement score among the classes. It indicated that the difference in mean academic engagement between Exp Class 1 and Exp. Class 2 was significantly higher in favour of the Exp Class 1 (mean difference = 4.89643,  $p = 0.004$ ). The table also indicated that the mean difference between Exp Class 1 and Ctrl Class was significant in favour of the Exp Class 1 (Mean difference = 7.19317,  $P = 0.000$ ), while Exp Class 2 and Ctrl showed no significant difference in mean academic engagement (Mean difference = 2.29674,  $P = 0.236$ ).

## DISCUSSION

This study sought to evaluate the efficacy of using feedback as instructional reinforcement technique on students' academic engagement and performance. Findings from this study showed that the academic performance score of the classes that received feedback were higher than that of the control class. This result is in agreement with the results of some studies (Nahadi, Firman & Farina, 2015; Gunlock, 2014) on the use of feedback to improve students' learning and achievement. The study by Nahadi, Firman and Farina (2015) pointed out that verbal and written feedback given to students on their performance in quizzes and homework enhances students' learning process activity. Gunlock (2014) found out that providing feedback from the use of weekly rubrics and target statements, students' discussion, students' observation and teacher's reflection which are incorporated into teaching helps students to engage in self-evaluation and peer assessments, which in turn increases motivation and engagement in the learning task leading to improvement in their learning outcome. Maini (2011) also found out that, that reinforcement strategies can be incorporated by the teachers into their daily repertoire of classroom behaviour management skills as well as to increase students' learning.

The study found that the experimental group students effectively utilized the feedback to achieve success. Feedback is more valuable when the recipients (a learner) understands and use it. The manner a student understands analyses, discusses and utilizes the feedback is as important as the worth of the feedback itself (Nicol, 2010).

Another finding of this study is that students in the experimental class 1 had higher academic engagement and performance than their cohorts in the experimental class 2. The observed differences are likely due to the treatments given to the two classes. While the experimental class 1 was given extra learning time (through take home assignments) to solve

given problems, the experimental class 2 was not given such opportunity. Accomplishment of homework is of great advantage to students, however, the fact is not doing the homework rather the extent of engagement on the homework (Nunez et al, 2015) as well as the extent of relationship between students' engagement on homework and motivation. This present study corroborate the finding of Nunez et al (2015 that found effective management of homework time affects significantly the quality and quantity of accomplished homework and as a consequence affects academic performance. Students in the experimental classes tend to put in more effort and time to learn and persist longer in doing their homework.

Time of learning has been found to have a significant positive relationship with academic achievement (Jez & Wassmer, 2015). They stressed that additional time given for teaching leads to higher academic success particularly for the less advantage students. The extra time utilized in attending to academic issues like homework increases students' academic engagement and hence academic performance. Extant research findings on issue of academic engagement and achievement is that students who actively engage and participate in all class and academic activities learn better and achieve academic success than those who are not academically engage. Therefore, the students need a variety of academic assistance like additional learning time and feedback from their teachers to enable them become aware of their current academic status, the errors they make and what they can do to achieve success in future

### **Implications of the Study**

The lesson from this study vividly shows that instructional reinforcement improves the academic performance of students and also enhances the students' engagement in academic activities. And so, teachers' knowledge of the power of instructional reinforcement and its application can help them improve student's learning behaviour and engagement in learning by way of making the classroom environment suitable for positive change in the behaviour of students and hence their behaviour towards learning by positively reinforcing desired behaviour in the classroom during teaching learning process. Again, operant or reinforcement learning is one of the processes that influence students' academic motivation or motivation to learn. And so, having knowledge about it could help teachers, parents, students and other stakeholders in education to understand why and how some students tend to depend on reinforcing aspects of learning. Teachers' ability to recognize only correct responses is vital because it will prevent students from associating the reward with inappropriate responses since the teacher should make students aware of the particular aspect of their behaviours that is desirable. It is therefore very crucial for teachers to recognize that effective knowledge and usage of instructional reinforcement skill is a vital tool in the teaching-learning process and that corrective feedback and extra time should be valued and used , frequent and fairly immediate.

### **CONCLUSION**

The study found that reinforcing students with corrective feedback couple with extra learning time positively impact students' academic engagement and performance as it was helpful in providing students with the opportunity to self-monitor, self-regulate themselves, do self-revision and become independent learner which is one of the most effective lifelong learning process.

## Recommendations

- Teachers should be able to recognize within the classroom setting, desirable responses and reinforce them immediately following such response(s).
- Teachers should as a matter of necessity give students immediate feedback and correction on any problem or task given to them as this will significantly contribute towards helping students to clearly identify the problem areas and ameliorate them.
- Encourage students to put in extra time to solving problems. Students should be given extra time to attend to problems and task they perceived to be difficult as the extra time coupled with corrective feedback can help the students to engage on the academic task and improve their academic performance.
- Students on their part must also revise their academic work as soon as they receive feedback as this can enrich them with an opportunity to independently engage in learning.

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