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# INVESTIGATING THE IMPACT OF TVET CURRICULUM ON THE WELL-BEING OF HIGHER EDUCATION INSTITUTION STUDENTS: A FOCUS ON AGRICULTURAL EDUCATION STUDENTS

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## Abstract

*The study investigated the effect of peer instruction (PI) strategy on students' academic performance and retention of Basic Science concepts in Tarauni Local Government Area, Kano. Four research questions and four null hypotheses guided the study which employed quasi experimental pre-test, post-test control group design. The population comprised the entire JSS2 students in Tarauni Education Zone. 82 JSS 2 students selected randomly constituted the sample and were randomly assigned into experimental and control groups. The instrument used for data collection was the Basic Science Performance Test (BSPT). The reliability coefficient of the instrument is 0.78. It was established though test re-test method. Students in the experimental group were taught using PI strategy while those in the control group were taught using the lecture method. The data obtained from the study were analyzed using t-test statistics to test the hypotheses at 0.05 level of significance. Finding reveals that PI strategy was effective in enhancing students' academic performance and retention of basic science concepts. It also revealed that the strategy was gender friendly as no significant difference was observed in the mean retention scores of the male and female students in the experimental group. The study recommends that peer instruction (PI) strategy should be used to teach other subjects in both primary and secondary schools in Nigeria. This is necessary because most of the studies carried out in other countries on PI strategy were at higher education level.*

**Keywords**: Peer instruction, Basic science, Retention, Gender, Performance

## Introduction

Science education has been recognized, all over the world, as a pre-requisite for scientific and technological development. It provides opportunities for students to acquire relevant and functional knowledge and skills that are associated with scientific processes needed for advancement in science and technology driven world (David, 2018). In science education, students are encouraged to acquire and practice scientific skills. This will help in developing their conceptual understanding of analytical abilities. To achieve this, prospective scientist, most learn by doing to encourage them explore their personal abilities and compare them with those of their colleagues. To achieve this, teachers need

to be innovative in their teaching routine. This they can be done through the use of innovative teaching techniques.

There are different teaching methods employed in science education in Nigerian schools. For any method to be able to bring good result in the present age, it should be a method that promotes maximum social interaction. Social interaction between students and teacher and students plays a crucial role in learning (Nguyen, Williams & Nguyen, 2021). However, the teaching method commonly used in basic science classes is lecture method. Lecture method is often used to deliver a large amount of information to the students in a short period (Berry, 2008). This method is known to be effective in dealing with a large class. However, it has been associated with large poor performance among learners (Wudil, 2013).

Research shows that student's retention in a lecture- based science course is weak. According to Bok (2006), an average student only retains 42% of what he or she learned after the end of the lecture and 20% one week later. Berry (2008) argued that lecture method lacks the effectiveness of an active learning approach. In the opinion of Fegen and Mazur (2003) lecture method causes the bad reading habit among students. Franklin, Sayre and Clark (2014) pointed out that students taught in lecture-based classes learn less than those taught with activity-based reformed methods.

To improve the status quo, teachers are often advised to employ strategies that promote social interaction among learners. Several teaching approaches that are based upon social constructivists' theory have been proposed. Among which is the peer instructional (PI) strategy. Several studies have been conducted on the impact of this innovative strategy. However, the studies are mostly in areas other than Basic science. This study therefore assesses it effect on basic science students' performance in, and retention of learnt concepts in Kano state. To attain this, the following research questions are put forward.

**Peers Instruction Strategies: Its Process and Implementation**

Peer Instruction (PI) is an instruction strategy that engages students during class through a structured questioning process (Crouch, Watkins, Fagen & Mazur, 2007). PI provides a structured environment for students to voice their idea and resolve misunderstanding by talking with their peer (Gok, 2012). It requires each student to apply the core concepts beings presented, and then to explain them to their fellow students. Unlike the common practice of asking informal questions during a traditional lecture, this typically engages only a few highly motivated students. PI incorporates a more structured questioning process that involves every student in the class.

Turpen and Finkelstem (2010), describes the process of PI to involve:

1. The question posed;
2. Students are given time to think;
3. Students record or report individual answers;
4. Neighboring students discussed their answers;
5. Students record or report revised answers;
6. Feedback to teacher: Tally of answers;
7. Explanation of the corrected answerer.

**Implementation of PI**

Using PI, the instructor starts with a brief presentation or summary of the materials to be covered. After this, the instructor poses a Concept Test and asks students to think about the question and related concepts. The instructor then allows 1-2 minutes for students to think and come up with an individual answer. This may be through clickers, flashcards, a simple raising of hands, or writing down the answer on a piece of paper. The instructor may revisit the concepts using other strategy or try a different Concepts Test if too few students' responses to the answer are not correct. If a majority of students' responses is correct, the instructor will then give a brief explanation and moves on to the next topic or concept test. In a situation where 30-70% of the students answer the concepts correctly, the instructor asks students to turn to their neighbors and discuss their answers. Students talk in pairs or small group are encouraged to find someone with a different answer. The teacher moves around the room to encourage productive discussions and guide students thinking. After several minutes, students re-examine the same concepts and the instructor then explains the correct answer. The instructor can pose other related concepts or proceed to a different topic or Concept Test depending on the students' answers.

**Research Questions**

The study seeks to answer the following research questions:

I. What is the difference between the academic performance of students in the experimental group taught 'changes in living things' using PI method and those in control group taught using lecture method?

II. What is the difference between the academic performance of male and female students in the experimental group.

III. What is the difference between retention scores of students in the experimental group taught 'changes in the living things' using PI method and those in control group taught using lecture method?

IV. What is the difference between the retention scores of male and female students in the experimental group?

**Null Hypotheses**

The following null hypotheses were formulated at 0.05 level of significance:

I. H01: There is no significant difference between the academic performance of students in the experimental group and those in the control group.

II. H02: There is no significant difference between the academic performance of male and female students in the experimental group.

III. H03: There is no significant difference between retention scores of students in the experimental group and those in the control group.

IV. H04: There is no significant difference between the retention scores of the male and female students in the experimental group.

## Methodology

The design for the study was a pre-test, post-test control group quasi experimental design. Two groups of students participated in the study and were randomly assigned to the experimental (EG) and the control (CG) group. A pre-test was administered to the two groups in order to determine the equivalence in the ability of the groups. The experimental group was taught using the PI strategy while the control group was taught using the conventional lecture method. The population of the study comprised the entire JSS 2 students from two single sex schools in experimental group had 42 (24 male, 18 female) students and control group had 40 (20 male and 20 female) students totaling 82. The Basic Science Performance Test (BSPT) developed by the researchers was used for data collection. The instrument was on the themes 'changes in living things' (growth and development); it was made up of 30 multiple choice items and each has four options (A – D) with only one correct option. The items were validated by Chief and Principal Lecturers in the Integrated Science Department, FCE Bichi. The coefficient of reliability of the instrument was found to be 0.78, using a test re-test method at two weeks' interval.The two groups were taught the same topics for a period of four weeks of 90 minutes per week after which the students in the two groups were post-tested using the BSPT instrument.

## Results

The data obtained were analyzed based on the research hypotheses as follows:

**Hypothesis 1:** There is no significant difference between the academic performance of students in the experimental group and those in the control group.

**Table 1:** t-test analysis of difference between the academic performance of students in the experimental group and those in the control group

| Groups | N | Mean | S.D | SE | df | t | p-value | Decision |
|---|---|---|---|---|---|---|---|---|
| Experimental Groups (PI) | 42 | 59.55 | 11.94 | 1.8 | 80 | 4.158 | 0.001 | Rejected |
| Control Groups (LM) | 40 | 44.90 | 19.28 | 3.05 | | | | |

t = 4.158, df = 80, (p = 0.001 < 0.05)

From Table 1, the mean value of 59.55 of the experimental groups is greater than the mean value of 44.90 of the control group, indicating that the experimental group (PI) enhances students' academic performance better. Also, the calculated $t_{cal} = 4.158 > t_{tab} = 1.984$; ($p < 0.05$); revealed that there is significant differences in the academic performance of students in the experimental group and those in the control groups. Thus, the null hypothesis is rejected in favor of the experimental group that were exposed to the PI strategy. This shows that PI enhances students' academic performance.

**Hypothesis 2:** There is no significant difference between the academic performance of male and female students in the experimental group.

**Table 2:** t-test analysis of difference between the academic performance of male and female students in the experimental group

| Gender | N | Mean | S.D | SE | df | t | p-value | Decision |
|---|---|---|---|---|---|---|---|---|
| Male | 24 | 60.29 | 7.63 | 1.56 | 40 | 0.462 | 0.647 | Accepted |

| | | | | |
|---|---|---|---|---|
| Female | 18 | 58.56 | 16.22 | 3.82 |

t = 0.462, df = 40, (p = 0.647 > 0.05)

Having found significant differences in the performance of experimental and control group, the study went further to examine if any differences exist between the male and female students in the experimental group. From Table 2, the mean value of 60.29 of the male groups is greater than the mean value of 58.56 of the female indicating that the male slightly perform better academically than the female. Besides, the calculated, $t_{cal} = 0.462 < t_{tab} = 2.021$; ($p > 0.05$) revealed that there is no significant difference in the academic performance of male and female of students in the experimental. Hence, the null hypothesis is retained. This confirms that PI is gender friendly.

**Hypothesis 3:** There is no significant difference between retention scores of students in the experimental group and those in the control group.

**Table 3:** t-test analysis of difference between retention scores of students in the experimental group and those in the control group

| **Groups** | **N** | **Mean** | **S.D** | **SE** | **df** | **t** | **p-value** | **Decision** |
|---|---|---|---|---|---|---|---|---|
| Experimental Group (PI) | 42 | 56.19 | 11.28 | 1.74 | 80 | 4.582 | 0.001 | Rejected |
| Control Group (LM) | 40 | 39.73 | 20.22 | 3.20 | | | | |

t = 4.158, df = 80, (p = 0.001 < 0.05)

This study assessed the ability of the students to remember what they were taught after some time. Hence, Table 3 compared the result of the post-post-test. The mean value of 56.19 of the experimental groups is greater than the mean value of 39.73 of the control group, indicating that the experimental group (PI) enhances students' retention better. Again, the calculated, $t_{cal} = 4.582 > t_{tab} = 1.984$; ($p < 0.05$) revealed that there is significant differences in the retention of concepts by students in the experimental and control groups. Thus, the null hypothesis is rejected in favor of the experimental group that was exposed to the PI strategy. This shows that PI enhances retentions of learnt concepts.

**Hypothesis 4:** There is no significant difference between the retention scores of the male and female students in the experimental group.

**Table 4:** t-test analysis of difference between the retention scores of the male and female students in the experimental group

| **Gender** | **N** | **Mean** | **S.D** | **SE** | **df** | **t** | **p-value** | **Decision** |
|---|---|---|---|---|---|---|---|---|
| Male | 24 | 57.25 | 8.12 | 1.66 | 40 | 0.699 | 0.484 | Rejected |
| Female | 18 | 57.78 | 14.63 | 3.45 | | | | |

t = 0.462, df = 40, (p = 0.647 > 0.05)

Table 4 compared gender related differences in the retention of the learnt concepts. The mean value of 57.25 of the male groups is lesser than the mean value of 57.78 of the female indicating that the retention in female is slightly higher than that of their male counterparts. In addition, the calculated, $t_{cal} = 0.699 > t_{tab} = 2.021$; ($p > 0.05$) revealed that there is significant difference in the retention of male and female students in the

experimental group. Thus, the null hypothesis is rejected. Hence, there is slight difference in retention of the concept.

## Discussion

The result in table 1 provide answer to research question one. It reveals that there is significant difference in the academic performance of students in the experimental and those in the control groups. This shows that PI enhances students' performance. The result obtained is in line with the findings of Aina, Jacob and Keith (2015), whose findings reveals that students taught science education using PI instruction performed significantly better than those taught with lecture method. Peer instruction is an interactive approach that was designed to improve the learning process (Rosenberg, Lorenzo & Mazur, 2006). It has the advantage of engaging the student and making the lecture more interesting to the student. It also has the tremendous importance of giving the lecturers significant feedback about where the class is and what it knows. With this potential of inclusiveness, it provides the female the chance to "catch up" with their male counterparts and sometimes even outperform them. This premised the finding of the no significant difference in the academic performance of male and female students in the experimental group. This confirms that PI is gender friendly. This finding is in agreement with findings of Adegbija and Folade (2014), who reported no significant difference between the academic achievement score of male and female students' taught physics using animation based cam studio physics instructional package.

Another important variable of interest to this study is the ability of the students to remember what they were taught after some time. This is referred to as retention. The results of the post-posttest of the two groups revealed that there is significant difference in the retention of concepts of students in the experimental and control groups. This shows that PI enhanced students' performance retention of learnt concepts. This findings is supported by Aina, Jacob, and Keith (2015), who opted that PI has positive impact on students has it helps them to understand the concepts more easily and memorable. It also supports the view of Ogbonna (2007) who stated that the use of new practical approaches enhances students' retention.

The assessment of gender related difference in the retention of the leant concept revealed that there is significant difference in the retention of male comparable to female. The difference mean was however small. The difference could be due to the limited period to which the learners were exposed to the teaching approach (PI) and the fact that female appeal to more verbal instructions. However, PI is more effective at developing students' conceptual understanding than traditional lecture-based instruction (Lasry, Mazur & Watkins, 2008; Crouch, Watkins Fagens & Mazur, 2007). PI is not a rejection of the lecture format, but a supplement that can help engage students who have a range of learning styles (Rosenberg, Lorenzo & Mazur, 2006).

## Conclusion

Based on the findings of this study, it was concluded that the use of PI instructional strategy enhances students' academic performance in Basic Science in the study area and that PI is gender friendly. Also, PI strategy also proved superior in promoting students' retention in science subjects especially Basic Science.

**Recommendations**

The following recommendations were drawn that:

1. Science teachers should utilize innovative practices such as peer instruction (PI) in their lesson delivery so as to enhance students' active participation in the lesson for enhanced academic performance

2. Intensive in-service programs should be organized to get the science teachers acquainted with and trained on how to effectively utilize innovative practices in science education.

3. Science teachers should visit schools that are utilizing innovative practices to observe new methods and materials in action.

4. It is also important to carry out studies using peer instruction to teach other subject in both primary and secondary schools in Nigeria. This is necessary because almost all the studies carried out in other countries on PI was in higher education level.

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