



## Influence of Peer Instruction on Students Achievement in Tertiary Education: Assessing the Implication for Learning Outcomes

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**Abstract:** The study examined the influence of peer instruction on students' achievement in tertiary education. The study was conducted in Ignatius Ajuru University of Education, Rivers State, Nigeria. The researchers adopted a non-randomized pretest-posttest control group design. The population of the study consists of 1,162 final year undergraduates, duly registered in a compulsory course: "Introduction to Special Education". A sample of 486 students (200 males and 286 females) were drawn through proportionate stratified random sampling. Students in intact classes were assigned to the experimental and control groups. Students in the experimental group were exposed to lectures by the researchers and peer instruction, while those in the control group were only exposed to lectures by the researchers. The instrument for data collection was students' examination and continuous assessment scores, obtained after one semester of instruction. Three null hypotheses were drawn from three research questions postulated for the study. An analysis of covariance was used to analyze the data, which revealed a statistically significant difference between the achievement of experimental and control groups of students based on exposure to peer instruction.

**Keywords:** Peer Instruction, Achievement, Tertiary Education, Assessing, Learning outcomes.

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## INTRODUCTION

In recent years, research in the field of sustainability of higher education has investigated learning achievements and competencies that education programmes need to develop in learners to transform them into change agents towards sustainability (Mochizuki & Fedeeva, 2010). The utilization of teaching and learning approaches and processes which enhance the competencies or skills necessary to deal with the skills required to deal with sustainability are in high demand globally. Such skills as critical and creative thinking, problem-solving, action competence, collaboration, and future thinking are consistently considered optimal in the global employment market. Therefore, creating empowered and globally-responsible citizens and

professionals who can become active change agents should be the focus of ideal national educational systems (Wals, 2010).

Research findings from educators and psychologists have revealed that students learn more when they are engaged in the course content by their teachers and regarded as active agents of their learning process (Biggs, 1996). The lecture method which is the most common method of instruction in our tertiary institutions has been adjudged to be ineffective in enhancing students' achievement. The lecture method is often used to transmit a large amount of course content to students within a limited time which also limits students' active contributions to the learning

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process (Berry, 2008). In the same light, Race (2000) further argued that the lecture method of instruction results in surface, rather than deep learning. For Bok (2006), the traditional lecture method of instruction is ineffective because the level of retention of course content at the end of the lecture for an average student is 42% and 20% a weekly time. With these and other limitations of the lecture method, various researchers have advocated for other alternative methods of instruction, with one of these being peer instruction.

Student-centered instructional methods, specifically peer instruction, have been advocated to lead to higher retention of scholarship, deeper comprehension, and a more confident attitude towards learning materials (Bonwell & Eison in Van Dike, et al 2001). Peer instruction is a strategy that can actively engage students in learning. Mazur (1997) refers to peer instruction as “an instructional method in which students study as groups of two or three rather than alone”. Peer instruction is believed to be developed by Eric Mazur, a physicist at Harvard University in 1991 (Mazur, 1997). According to Rao and Dicarolo (2000), peer instruction is a cooperative learning technique that promotes critical thinking, problem-solving, and decision-making skills.

The effectiveness of peer instruction on the academic achievement of students in diverse areas of study has been well documented based on previous research findings from around the world. In a study conducted by Smith, et al (2009) in a biology course in genetics, their findings revealed that based on pre-and post-test scores, students' achievement was exceptionally high on difficult items after interaction via peer instruction.

In a similar study by Porter, et al (2011) which was conducted using students in computer science courses showed a significant gain in the achievement of students who were involved in peer instruction. In a related study, Knight *et al.*, (2013) assessed students' achievement in a course in biology using higher-order questions and their findings revealed that students' discussions were more analytical due to the influence of peer instruction.

From an interactive perspective, Nicol and Boyle (2003) stated that when students interact with each other, it inspires deep thought about viewpoints and enables them to tackle challenges more creatively. In a longitudinal study conducted by Crouch and Mazur (2001) on the effect of peer instruction on students achievement in a general physics course, their findings revealed students exposed to peer instruction performed better in the

course than their counterparts in the control group who received instruction via the traditional lecture method. Contrary to these findings, Zingaro (2014) in a study conducted in computer science found no significant achievement in the final examination of students exposed to peer instruction when compared to those in traditional lecture groups.

Though literature revealed that peer instruction has been widely utilized to improve academic achievement in various areas of study such as science, mathematics, education, etc, Aina and Keith (2005) opined that peer instruction is new to many African schools and lecturers. As such it has become relatively difficult to implement this at the classroom, school, state, or national levels.

The importance of peer instruction cannot be over-emphasized, especially for students in tertiary education contexts. Students need to apply the knowledge acquired in the classroom environment to address real-life issues and provide innovative solutions beyond the classroom context. In order to apply their scholarship, expertise, and competence to solve problems after school, higher education students need a deep understanding of the concepts learned in the classroom and apply the same when the need arises (Novak, 2003).

Beyond the direct impact of peer instruction on students' academic outcomes, peer instruction has been shown to significantly affect other aspects of students' academic trajectories. Reporting on various research that has been conducted on the impact of peer instruction on students, Tullis and Goldstone (2020), showed that peer instruction improves students' conceptual understanding, improves students' attendance, bolsters their engagement in course materials, and their attitude towards course contents and materials.

Various methods of peer instruction have been utilized in the academic literature. These include the ones where instructors show students the answers before the discussion, in which students are graded for participation and for correctness, in which lecturers facilitate the opportunity for answer-seeking or sense-making and the one in which students instruct their peers and also assess them (Tullis & Goldstone, 2020). Irrespective of the methods adopted, the benefits of peer instruction have been well documented in physics, biology, chemistry, physiology, calculus, computer science, and even philosophy.

It is therefore the responsibility of the lecturers and contemporary educational institutions to ensure that appropriate instructional procedures

are utilized to maximize learning outcomes among tertiary education students.

#### Statement of the Problem

In the past few years in Nigeria, the quest for the acquisition of university education has grown exponentially with a corresponding increase in the population of the citizenry without an attendant increase in manpower, infrastructure and facilities in higher institutions. This has negatively impacted the academic achievement of students and frustrated the efforts made by lecturers to impart knowledge in most of these institutions. Many reasons have been put forward for the poor academic achievement of undergraduates in tertiary institutions but large class size would place undue pressure on the lecturers, grant more premium on high ability students and silence the voices of the low ability students.

Lecturing is one of the most widely utilised modes of instruction in transmitting knowledge, especially in higher institutions although considered ineffective in eliciting the greatest potential from the students. Students process and assimilate information differently. Hence, it is imperative to identify and utilize instructional methods that would enhance students' capacity to process information and improve academic achievements. In most cases, students have limited opportunities within the teaching/learning exercise to make up for lapses or shortfalls in the course content.

The lecturers who are pressed for time especially in overcrowded classrooms may not be able to engage students in activities and cognitive processes that would enable them to participate actively in class discussions in order to improve on the areas of their weaknesses. Hence, adequate academic interaction with their peers will give them the opportunity to discuss and acquire a better understanding of the course content. Peer instruction involves active interaction among students and provides learners with a better perspective of course content through reflective reasoning and dispels misconceptions. University education is targeted at not just preparing students for the labour market in real-life situations. It is worthy to note that Students learn more when they are involved in the process.

It is, therefore, necessary to devise practical and effective strategies of teaching that would positively influence the academic achievement of higher education students. Thus it against this background that the problem of the study was to investigate the influence of peer instruction on students' achievement in tertiary education in Rivers State.

#### Research Questions

1. What is the effect of peer instruction on the achievement of students based on their pre-test and post-test scores?
2. What is the effect of the lecture method on the achievement of students based on their pretest and posttest scores?

#### Hypotheses

1. There is no significant effect of peer instruction on the achievement of students based on their pretest and post-test scores.

#### METHOD

A non-randomized pretest-posttest quasi-experimental research design was adopted for this study. This design was adopted because intact classes were used for the study and the pretest was used as a covariate. The population comprised 1,162 final year undergraduates (2015/2016 session) duly registered in a compulsory course: "Introduction to special education" from the Ignatius Ajuru University of Education, Rivers State, Nigeria. The convenience sampling technique was used to draw a sample of 108 students, from the Faculty of Science, Ignatius Ajuru University of Education, Rivers State. From this faculty, two departments were randomly selected to serve as the experimental and control groups.

The experimental group consisted of 35 students while the control group consisted of 42 students. Students in the experimental and control groups were exposed to lectures for one semester based on the course outline. The researchers randomly assigned students in the experimental group to sub-units of five students per unit. Topics from the entire course outline were allocated to the sub-units. Students were given the opportunity to choose their unit coordinators. The responsibility of the coordinators was to ensure that all members of their units participated in the process of peer instruction. The researchers drew schedules for all the units to interact outside the regular lecture periods. As the lecture progressed within the semester, members of each unit in the experimental group, presented their topics on weekly basis to the entire group through discussions, critique, and inputs from the other students who were not part of their groups. The researchers observed and facilitated the process using high-order and follow-up questions to direct the students.

The control group was exposed to the traditional lecture methods. The instrument for data collection was continuous assessment and students' semester examination scores. The continuous assessment score was used as the covariate (pretest)

while the final semester examination score was used as the posttest. The instruments consist of multiple-choice, completion-type items, and essays. The instruments were validated using a table of specifications in assessing the representation, appropriateness, and adequacy of the test items. Inputs were made by a subject specialist (all course lecturers). Mean and standard deviation were used to answer the research questions, while ANCOVA

was used to analyze the data. The analysis was done using SPSS software.

## RESULTS

The findings of the study are presented in the tables below.

The answer to research questions one and two are briefly summarized as shown below in Table 1.

**Table 1: Mean and standard deviation of students' achievement in the experimental and control groups**

Group	n	Mean	SD	Mean Difference
Peer_Inst Pre	35	58.71	6.84	27.78
Peer_Inst Post-test	35	86.49	4.21	
Control Pretest	42	57.40	5.22	4.77
Control Post-test	42	62.17	6.03	

An observation of the result displayed in Table 1 indicates that when the pretest and post-test values of students' achievement in the experimental group where peer instruction was utilized, as well as those in control, were compared, the mean differences obtained were 27.78, and 4.77

respectively. These values indicated that students who were taught using peer instruction had a higher increase in their academic achievement compared to those in the control groups taught using the traditional method.

**Table 2: ANCOVA summary showing the test of between-subjects effects for students mean on peer instruction**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	26938.980 <sup>a</sup>	2	13469.49	4632.595	.000	.993
Intercept	1269.661	1	1269.661	655.017	.000	.868
PrStaAt	2765.195	1	2765.195	1426.561	.000	.934
Group	24967.993	2	24967.993	6440.477	.000	.992
Error	193.837	100	1.938			
Total	689657.976	104				
Corrected Total	27132.816	103				

a. R Squared = .993 (Adjusted R Squared = .993)

From the result of the analysis in table 2 which tests the effect of peer instruction, the result revealed:  $F(2,103) = 644.477$ ,  $P = 0.0005$  the result indicates that the p-value is less than 0.05 alpha level, therefore, it implies that peer instruction had a significant positive effect on students' achievement. Furthermore, this yielded a partial eta squared value of 0.992 indicating a strong effect size.

## DISCUSSION

The findings of the study revealed that students exposed to peer instruction have a higher mean gain than those exposed to lecture methods. This result might be attributed to an increase in students' commitment to studying the materials they were assigned to study. Similarly, the reality that most of them might be standing before their peers to present the materials while also exhibiting their knowledge might have resulted in a deeper level of dedication and insight towards the work. Furthermore, the result could also be attributed to

the fact that students had the materials from the beginning of the semester and may have had ample time to study the materials and the content embedded in them. The findings are in agreement with that of Crouch and Mazur (2001), whose research on the effect of peer instruction on students' achievement, on a general physics course reveals a significant improvement in the achievement of students exposed to peer instruction when compared to their counterparts who received instruction via the traditional lecture method. On the contrary, Zingaro (2014) found no significant achievement in the final examination of students exposed to peer instruction in a computer science course.

## CONCLUSION

Students' learning and achievement are enhanced by the utilization of peer instruction. From the investigation, it implies that students' interaction through discussions, use of high-order questions,

encouraged reflective and analytical thinking. In order to effectively enhance students learning, it is imperative for members of the faculty, to explore instructional strategies that would be engaging and interactive. To this end, lecturers need to adopt peer instruction strategy to enhance students' performance in the courses they teach.

There is a growing work pressure on lecturers in tertiary institutions based on high students' enrolment. It is, therefore, necessary for members of faculty, to utilize peer instruction, which would enable them to act as moderators and facilitators in the learning environment. Learning transmits changes in an individual's thoughts, behaviour, attitude, and development. Peer instruction therefore would boost students' self-confidence, improve their relationship with their peers and enable them to accommodate the perspective of others. This would be reflected in their attitude towards tackling real-life issues.

## RECOMMENDATIONS

1. Members of faculty should employ the peer instruction method of teaching to promote active interaction of students to enhance learning.
2. In-service training of lecturers should be encouraged in the areas of innovative teaching strategies, workshops, and hands-on learning.
3. Training on guidelines on the utilization of the peer instruction model developed by Mazur (1997) should be mandatory for all lecturers in tertiary.
4. Government should allocate more resources to the development of infrastructure and facilities to tertiary institutions in Rivers State.

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