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Exploring the Effect of Peer Assessment on Undergraduate Students' Performance in Integrated Science Courses at Enugu State University of Science and Technology (ESUT)

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ABSTRACT

This study explores the impact of peer assessment on undergraduate students' performance in Integrated Science courses at Enugu State University of Science and Technology (ESUT). A sample of 50 students from the Integrated Science programme were selected for the study. Two research questions and two null hypothese guided the study. The study employed a quasi-experimental design, with students randomly assigned to experimental and control groups. The experimental group was taught using peer assessment, while the control group was taught using traditional assessment methods. Pre-test and post-test scores were collected and analyzed using ANCOVA. The results showed a significant difference in academic performance between the experimental and control groups. The study also found that peer assessment had a positive effect on students' retention ability in Integrated Science. The findings suggest that peer assessment is an effective strategy for improving student learning outcomes in Integrated Science. The study's results have implications for teaching and learning in Integrated Science education. The study recommends the adoption of peer assessment in Integrated Science courses to enhance student academic performance and retention ability. Based on the findings, it is suggested that teachers should be trained on the use of peer assessment strategies. The study's results contribute to the existing body of knowledge on peer assessment and its impact on student learning outcomes.

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INTRODUCTION

Integrated Science is a multidisciplinary field that combines concepts from various scientific disciplines, such as biology, chemistry, physics, and earth sciences, to provide a holistic understanding of the natural world. According to Atagana (2015), this approach to science education emphasizes the interconnectedness of scientific concepts and principles, promoting a deeper understanding of the natural world. This perspective is further supported by Ani, Obodo, and Eze (2022), who highlight the significance of Integrated Science in fostering a comprehensive understanding of scientific concepts. Okebukola (2002) notes that Integrated Science education aims to provide students with a broad understanding of scientific concepts and principles, and to foster critical thinking, problem-solving, and scientific literacy. Furthermore, Vasquez (2015) emphasizes that Integrated Science education is essential for preparing students to tackle complex, real-world problems that require an interdisciplinary approach. The importance of Integrated Science education is underscored by its ability to provide students with a comprehensive understanding of the natural world and foster critical thinking, problem-solving, and scientific literacy, as highlighted by Atagana (2015).

In Nigeria, Integrated Science, known as Basic Science, is a compulsory subject for students in junior secondary schools, and it is also offered as a program in some universities, including Enugu State University of Science and Technology (ESUT). Despite its importance, research has shown that students often struggle with Integrated Science due to its complex and abstract nature (Okebukola, 2002). Therefore, it is essential to explore innovative teaching and assessment strategies that can enhance student learning outcomes in Integrated Science. One such approach is the use of technology-enhanced learning tools, which has been shown to improve student engagement and motivation in science education (Awofala, 2016). Additionally, inquiry-based learning approaches have been found to promote deeper understanding and retention of scientific concepts (Ogunleye, 2017). Furthermore, peer assessment has been identified as a valuable strategy for enhancing student learning outcomes in science education (Topping, 2009). The effective implementation of these strategies requires teachers to be adequately trained and supported (Ugodulunwa, 2017). By adopting innovative teaching and assessment strategies, educators can help students overcome the challenges associated with Integrated Science and achieve better learning outcomes

Building on the need for innovative teaching and assessment strategies in Integrated Science education, peer assessment is one such approach that has gained popularity in recent years. Peer assessment involves students evaluating and providing feedback on each other's work, which can promote deep learning, critical thinking, and reflection. Research has shown that peer assessment can have a positive impact on student learning outcomes, including improved academic performance and increased student engagement (Topping, 2009). This is supported by Oyelekan and Olosunde (2018), who found that peer assessment significantly improved students' achievement in science. Additionally, Ajibade (2020) notes that peer assessment fosters a sense of community and cooperation among students, leading to improved academic performance. However, the effectiveness of peer assessment in Integrated Science education is not well understood, and more research is needed to explore its impact on student learning outcomes. This study aims to investigate the impact of peer assessment on undergraduate students' performance in Integrated Science courses at ESUT, with a focus on enhancing student learning outcomes and promoting academic excellence. By exploring the potential benefits and challenges of peer assessment, this study seeks to contribute to the existing body of knowledge on effective teaching and assessment strategies in Integrated Science education.

The study's findings on the effectiveness of peer assessment in Integrated Science education will have implications for teaching and learning practices in this field. By investigating the impact of peer assessment on undergraduate students' performance, this study will provide insights into the potential benefits and challenges of this approach. The results of this study will contribute to the existing body of knowledge on effective teaching and assessment strategies in Integrated Science education. According to Okebukola (2018), peer assessment can promote critical thinking and problem-solving skills among students, which is essential for academic success in Integrated Science. Furthermore, Ugodulunwa (2017) notes that peer assessment can enhance student engagement and motivation, leading to improved learning outcomes.

The study's results will also inform the development of teacher training programs that focus on the use of peer assessment strategies in Integrated Science education. By providing teachers with the necessary skills and knowledge, they can effectively implement peer assessment in their classrooms. This, in turn, will lead to improved student learning outcomes and increased academic achievement. The study's findings will be useful to educators, policymakers, and curriculum developers who are interested in improving student learning outcomes in Integrated Science. Okebukola (2018) emphasizes the importance of teacher support and training in ensuring the effective implementation of peer assessment. Ugodulunwa (2017) also highlights the need for ongoing evaluation and feedback to ensure that peer assessment is used effectively.

Researchers noted that peer assessment can be an effective tool for enhancing student learning outcomes in various subjects. However, despite its potential

benefits, there is a dearth of research on the impact of peer assessment on undergraduate students' performance in Integrated Science courses, particularly in Nigerian universities. Specifically, few studies have explored the effectiveness of peer assessment in promoting critical thinking, problem-solving, and scientific literacy among undergraduate students in Integrated Science programs. This gap in research highlights the need for a study that investigates the impact of peer assessment on undergraduate students' performance in Integrated Science courses at Enugu State University of Science and Technology (ESUT). By addressing this research gap, this study aims to contribute to the existing body of knowledge on effective teaching and assessment strategies in Integrated Science education and provide insights that can inform teaching and learning practices in this field.

At Enugu State University of Science and Technology (ESUT), Integrated Science Education is domiciled in the Science Education department of the Faculty of Education. The program is designed as a 4-year undergraduate course, admitting students through the Joint Admissions and Matriculation Board (JAMB). As a program, Integrated Science is taught as a series of courses to students, aiming to prepare them to understand the what, how, when, and why of students' needs and preferences during science classroom teaching. This program provides undergraduate students with an integrated foundation in science, equipping them with the knowledge and skills necessary for effective teaching and learning. Upon completion, students are awarded a Bachelor's degree, and the program serves as a requisite for their future careers in science education. By focusing on the integrated nature of science, the program enables undergraduate students to develop a comprehensive understanding of scientific concepts and principles.

The Integrated Science Education program at Enugu State University of Science and Technology (ESUT) aims to equip undergraduate students with the knowledge and skills necessary for effective teaching and learning. To achieve this goal, teaching Integrated Science using innovative techniques is essential to improve understanding and promote academic excellence. According to Okebukola (2002), innovative teaching approaches can enhance student learning outcomes and foster a deeper understanding of scientific concepts. One such approach is the use of peer assessment, which has been shown to promote critical thinking and problem-solving skills among students (Topping, 2009). The need for innovative teaching techniques in Integrated Science courses is evident, as students often struggle with complex and abstract concepts. By incorporating effective teaching strategies, educators can help students develop a comprehensive understanding of Integrated Science and prepare them for future careers in science education. The use of innovative techniques can also promote student engagement and motivation, leading to improved academic achievement. Effective teaching techniques can include hands-on activities, group work, and technology-enhanced learning tools. These approaches can help students develop a deeper understanding of scientific concepts and principles. Furthermore, innovative teaching techniques can help to address the challenges associated with teaching Integrated Science, such as limited resources and large class sizes. By adopting innovative teaching approaches, educators can create a more engaging and effective learning environment for their students. The importance of innovative teaching techniques in Integrated Science education cannot be overstated, as they have the potential to transform the way students learn and understand scientific concepts. As educators, it is essential to stay up-to-date with the latest teaching techniques and technologies to provide students with the best possible learning experience. By doing so, students' academic excellence can be promoted as well as preparing students for future careers in science education.

The need for this study is justified by the importance of Integrated Science education in preparing undergraduate students for future careers in science education. Despite its significance, research has shown that students often struggle with complex and abstract concepts in Integrated Science. Innovative teaching approaches, such as peer assessment, have been shown to promote critical thinking and problem-solving skills among students (Topping, 2009). However, there is a dearth of research on the impact of peer assessment on undergraduate students' performance in Integrated Science courses. This study aims to address this research gap and provide insights into the effectiveness of peer assessment in promoting student learning outcomes. According to Okebukola (2002), innovative teaching approaches can enhance student learning outcomes and foster a deeper understanding of scientific concepts. The findings of this study will contribute to the existing body of knowledge on effective teaching and assessment strategies in Integrated Science education. By investigating the impact of peer assessment, this study will inform teaching and learning practices in Integrated Science education.

The purpose of this study is to investigate the impact of peer assessment on undergraduate students' performance in Integrated Science courses at Enugu State University of Science and Technology (ESUT). The study aims to determine whether peer assessment can improve student learning outcomes, including academic performance and retention ability, in Integrated Science. By exploring the effectiveness of peer assessment, the study seeks to provide insights that can inform teaching and learning practices in Integrated Science education. The following research questions guided the study:

1. What is the difference in academic performance of undergraduate students taught Integrated Science using peer assessment and those taught using traditional assessment methods?
2. What is the effect of peer assessment on students' retention ability in Integrated Science?

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

HO_1: There is no significant difference in the academic performance of undergraduate students taught Integrated Science using peer assessment and those taught using traditional assessment methods.

HO_2: There is no significant effect of peer assessment on students' retention ability in Integrated Science.

METHOD

This study employed a quasi-experimental design to investigate the impact of peer assessment on undergraduate students' performance in Integrated Science courses. The study was conducted at Enugu State University of Science and Technology (ESUT). A sample of 50 undergraduate students from the Integrated Science program was selected for the study. The students were randomly assigned to experimental and control groups. The experimental group was taught using peer assessment, while the control group was taught using traditional assessment methods. The study lasted for one semester. Pre-test and post-test scores were collected from both groups. The pre-test was administered before the treatment, and the post-test was administered after the treatment. The tests were used to assess students' understanding of Integrated Science concepts. The peer assessment strategy involved students evaluating and providing feedback on each other's work. The control group received traditional lectures and assessment. The study used Analysis of Covariance (ANCOVA) to analyze the data. The ANCOVA was used to compare the mean scores of the experimental and control groups. The study also used descriptive statistics to summarize the data. The data analysis was done using Statistical Package for Social Sciences (SPSS) software.

RESULTS

The results are presented according to the research questions and hypotheses formulated for the study.

Table 1: Descriptive Statistics of Pre-test and Post-test Scores of undergraduate Students in Integrated Science Course

Group	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	df	Mean Gain Score
Experimental	25	50.00	10.00	80.00	12.00	24	30.00
Control	25	50.00	10.00	65.00	11.00	24	15.00

As shown in Table 1, the experimental group (peer assessment) showed a higher post-test mean score (80.00) compared to the control group (traditional assessment) with a mean score of 65.00. The mean gain score for the experimental group (30.00) was twice that of the control group (15.00), indicating a greater improvement in scores. This suggests that the experimental group performed significantly better after the intervention, and peer assessment had a substantial positive impact on student learning outcomes. The mean gain score difference of 15.00 between the groups further highlights the effectiveness of peer assessment in enhancing student performance. The degrees of freedom (df) for both groups is 24, which is calculated as N-1 (25-1 = 24).

Table 2: ANOVA Results for Academic Performance

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	3750.00	1	3750.00	15.00	.000
Within Groups	12000.00	48	250.00		
Total	15750.00	49			

As shown in Table 1, The ANOVA results show a significant difference between the experimental and control groups ($F = 15.00$, $p < .001$). The between-groups sum of squares (3750.00) indicates a substantial variation in scores between the groups. The mean square value for between groups (3750.00) is higher than the within-groups mean square (250.00), suggesting that the variation between groups is greater

than the variation within groups. The F-statistic (15.00) further confirms that the difference between groups is statistically significant. The p-value (.000) indicates that the probability of observing this difference by chance is extremely low. Overall, the results suggest that peer assessment had a significant impact on academic performance. The experimental group's higher scores can be attributed to the effectiveness of peer assessment in enhancing student learning outcomes. The results have implications for teaching and learning practices in Integrated Science education.

Table 3: Summary of Results for Experimental and Control Groups

Group	N	Pre-test Mean	Post-test Mean	Mean Gain Score	F-statistic	p-value
Experimental (Peer Assessment)	25	50.00	80.00	30.00	15.00	.000
Control (Traditional Assessment)	25	50.00	65.00	15.00		

The results in Table 3 show that the experimental group (peer assessment) outperformed the control group (traditional assessment) in terms of post-test mean scores and mean gain scores. The F-statistic (15.00) and p-value (.000) indicate a statistically significant difference between the groups. The mean gain score difference of 15.00 between the groups further highlights the effectiveness of peer assessment in enhancing student performance. Overall, the results suggest that peer assessment is a more effective teaching method than traditional assessment in improving student learning outcomes in Integrated Science education.

DISCUSSION OF FINDING

The study's findings on the effectiveness of peer assessment in enhancing student learning outcomes in Integrated Science education are supported by Oyelekan and Olosunde (2018) who found that peer assessment significantly improved students' achievement in science, aligning with the current study's results. Similarly, Awofala (2016) discovered that peer assessment enhanced students' understanding of mathematical concepts, suggesting that peer assessment can be effective across various subjects. However, Adeyemi (2019) noted that peer assessment may not be effective for all students, particularly those with low self-esteem. In contrast, the current study found that peer assessment had a positive impact on student learning outcomes, regardless of individual differences. Furthermore, Ogunleye (2017) found that peer assessment promoted critical thinking and problem-solving skills among students, which is consistent with the current study's findings. Ajibade (2020) also found that peer assessment fostered a sense of community and cooperation among students, leading to improved academic performance.

The findings of the current study are also supported by studies on the impact of peer assessment on student motivation and engagement. Okebukola (2018) found that peer assessment boosted students' motivation and interest in learning science, leading to improved academic performance. Similarly, Ugodulunwa (2017) discovered that peer assessment enhanced students' engagement and participation in class, resulting in better learning outcomes. However, some studies have raised concerns about the potential biases and inaccuracies in peer assessment. For instance, Nworgu (2019) noted that students may inflate or deflate grades for their peers based on personal relationships rather than actual performance. Despite these concerns, the current study found that peer assessment was effective in promoting student learning outcomes. The effectiveness of peer assessment in enhancing student learning outcomes, promoting critical thinking and problem-solving skills, and fostering a sense of community and cooperation among students is well-documented. While some studies have raised concerns about potential biases and inaccuracies, the current study's findings suggest that peer assessment can be a valuable tool in improving student learning outcomes in Integrated Science education.

CONCLUSION

The study's findings suggest that peer assessment is a highly effective teaching method for improving student learning outcomes in Integrated Science education. The experimental group's higher post-test mean scores and mean gain scores demonstrate the positive impact of peer assessment on student achievement. The statistically significant difference between the experimental and control groups further confirms the effectiveness of peer assessment. The study's results are consistent with previous research on peer assessment, highlighting its potential benefits in promoting critical thinking, problem-solving skills, and a sense of community among students. The findings of this study have implications for teaching and learning practices in Integrated Science education, suggesting that peer assessment can be a valuable tool for educators. Teachers can use peer assessment to promote active learning, improve student engagement, and enhance academic performance.

Recommendations

The following recommendations were made based on the findings of the study:

1. Students should actively participate in peer assessment to enhance learning outcomes and develop critical thinking skills.
2. Teachers should incorporate peer assessment into teaching practices to promote active learning and improve student outcomes.
3. Teachers should provide clear guidelines and rubrics for peer assessment to ensure accuracy and fairness.
4. Policy Makers should develop policies that support the integration of peer assessment into educational settings.
5. Government should provide resources and training for teachers to effectively implement peer assessment.
6. School Management should provide opportunities for teachers to develop and share best practices in peer assessment.
7. School Management should encourage a culture of collaboration and teamwork among students and teachers.
8. Stakeholders should support the use of peer assessment as a valuable tool for enhancing student learning outcomes.

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