

**COMPARATIVE EFFECTIVENESS OF COOPERATIVE
LEARNING CUM INCLUSIVE LEARNING PEDAGOGIES AND
CONVENTIONAL TEACHING METHOD IN BIOLOGY IN
SECONDARY EDUCATION IN AKAMKPA LOCAL GOVERNMENT
AREA OF CROSS RIVER STATE.**

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ABSTRACT

This research study evaluated the comparative effectiveness of cooperative learning cum inclusive learning pedagogies and conventional teaching method in enhancing student learning outcomes in Biology in secondary school students in Akamkpa. The study adopted a quasi-experimental research design, specifically a pretest-posttest control group design. A sample of 219 students was selected using a stratified sampling technique from a population of 2117 senior secondary schools in the research area. A pre-test was conducted to determine the students' initial performance in mathematics. After two weeks of teaching using the prescribed innovative methods (cooperative learning cum inclusive learning pedagogies) and conventional teaching method, a post-test was administered using the Biology Achievement Test (MAT). Data analysis was carried out with independent t-test to compare the difference in the student learning outcomes between the two groups. Two research hypotheses were formulated to guide the study. The findings revealed that Biology students taught using cooperative learning cum inclusive learning pedagogies performed significantly better compared to those taught using conventional teaching method. Based on these findings, it is recommended that Biology teachers in secondary schools should adopt cooperative learning strategies in their instructional delivery to enhance students' performance in biology and secondary school biology teachers should also incorporate inclusive learning approaches in their teaching methods to improve students' academic achievement in biology.

Keywords: Cooperative Learning, Inclusive Learning, Conventional Teaching Method, Biology, Secondary Education, Akamkpa..

Introduction

The primary goals of science education in secondary schools in Nigeria include fostering scientific literacy, enhancing problem-solving skills, and promoting innovation and technology among the populace (Obe & Oladepo, 2023). Additionally, it aims to prepare students for advanced studies in science and related fields, laying a strong foundation for careers in science, technology, engineering, and mathematics (STEM), particularly in Biology (Johnson, 2021).

Biology being a crucial branch of science, focuses on the study of plants and animals, encompassing two main fields: Zoology and Botany (Campbell & Reece, 2018). In biology education, the emphasis is on fostering scientific literacy by cultivating essential attitudes such as curiosity, critical thinking, and objectivity, while imparting practical knowledge of biological concepts and principles that facilitate an understanding of living organisms and ecosystems in their natural state (Karura, Kimosop, & Orora, 2021).

The importance of biology has been recognised in the technological growth of any nation ranging from the field of forensic science to biotechnology. Criminal forensic biologists analyze evidence from crime scenes and work hand-in-hand with law enforcement agencies at the local, state, and federal levels. According to Alketbi (2023), the fundamentals of DNA, fingerprints, and other biological evidence offer assistance in convicting the guilty and exonerating the innocent. Typical biological evidences, including bodily fluids and substances such as blood, semen, and saliva, plays a crucial role in forensic investigations. Forensic serology is the branch of forensic science that specializes in the examination of body fluids and dried stains. Forensic serologists use techniques such as DNA analysis and enzyme testing to analyze biological evidence and help identify suspects, victims, and crime scenes. By studying biological evidence, forensic serologists can provide critical information that helps investigators piece together the events surrounding a crime (De Silva, Dharmasiri, Buddhadasa & Ranaweera, 2021).

Biology as a field plays a vital role in the development of drugs and vaccines, enabling us to prevent and treat a wide range of diseases. Through the study of biological systems and processes, scientists can identify potential targets for drug development and design effective treatments for diseases and ailment. Additionally, knowledge of biology informs the development of vaccines, which have been instrumental in preventing the spread of infectious diseases and saving countless lives. By continuing to advance our understanding of biology, we can accelerate the development of new and innovative treatments for diseases, improving human health and well-being (Crowe, 2018). The relevance of Biology is also seen in the area of biotechnology which utilizes biological systems or living organisms to create, develop, or make products.

Biology plays a pivotal role in addressing some of the world's most pressing issues, including climate change, food security, and conservation. Through the study of ecosystems and biodiversity, biologists can inform strategies for preserving natural habitats and mitigating the impact of human activity on the environment. The knowledge of Biology also underpins the development of sustainable agriculture practices, enabling us to produce food

in a way that is environmentally friendly and resilient to climate change. Furthermore, biology informs our understanding of human health and disease, enabling us to develop new treatments and therapies for a wide range of conditions. By advancing our knowledge of biology, we can unlock new solutions to some of humanity's most pressing challenges. However, it is noteworthy that despite the profound impact of Biology on our daily lives and its pivotal role in driving scientific and technological advancements, students' interest and academic achievement remains poor over the years (Johnson, 2021; Tindan & Chrisantus 2024).

The inadequacies of traditional teaching methods have sparked a surge in research focused on innovative approaches to education, as highlighted by Ihejiamazu, Ukor, and Neji (2018). *The researchers further* emphasized that *activity*-based instructional approaches which purely centre on the learner are advocated for teaching Biology and other science related courses. More so, the National Policy on Education recognizes instructional strategies that are child- centred. Such approaches include cooperative learning and exit ticket among others.

Cooperation is defined as the act of working together with others to achieve a common goal, according to the Oxford Advanced Learner's Dictionary (Hornby, 2019). This definition highlights the importance of collaboration and mutual support in pursuit of a shared objective. Thus, cooperative learning is the deliberate instructional use of small groups of students by a teacher in order to maximize students' learning of a given instructional task. Russel (2023) saw cooperative learning as a successful teaching strategy in which small groups of students with different levels of ability, use a variety of learning activities to improve their understanding of a topic or subject matter. Each group is expected to be heterogeneous in abilities and sociocultural in their background. Within cooperative learning groups, students are given two responsibilities which are to learn the assigned materials and to ensure that every member of the group participate in the learning task. There are dozens of approaches that can be used by the teacher under the umbrella of cooperative learning strategy. Among them include Jigsaw II, Team-Games-Tournaments (TGT), think-pair-share, Numbered Heads Together (NHT) and Student Team Achievement Division (STAD). The essence of these is that in each case, the students are divided in heterogeneous groups based on their learning capabilities, and they support each other for learning (Russel, 2023). Russels study utilized the "Numbered Heads Together" (NHT) approach, a cooperative learning strategy that promotes teamwork and problem-solving. In NHT, students are divided into small groups and each member is assigned a number. The groups work together to complete a task or assignment, and then each numbered member shares their group's findings with the class.

On the other hand, Inclusive education is an educational paradigm that strives to

accommodate the varied and diverse needs of all learners, with particular emphasis on those who are often marginalized or who have special educational requirements. This concept underscores the importance of ensuring that every student, irrespective of their physical, mental, or social challenges, has equal access to quality education (Obizue, 2020). Inclusive education champions the principle of equitable access to education for all children, irrespective of their physical, cognitive, or social limitations. The United Nations (UN) advocates for inclusive education as a core component of its Sustainable Development Goal (SDG) 4, which strives to ensure equitable and high-quality education for all and promote lifelong learning opportunities by 2030. However, in the context of Nigeria, inclusive education faces an array of formidable obstacles, including inadequate infrastructure, entrenched cultural prejudices, and institutional challenges. Despite these barriers, inclusive education is increasingly recognized as a crucial instrument for fostering sustainable development in Nigeria, particularly by addressing pressing issues such as inequality, poverty, and social marginalization;

According to UNESCO (2009), inclusive education is not merely about the inclusion of students with disabilities or those from disadvantaged backgrounds into the educational system; rather, it is an all encompassing approach that aims to create equitable learning opportunities for every student. This system ensures that learners with differing abilities and backgrounds are provided with the necessary resources, support, and tools to succeed within the same educational environment, fostering an environment where no one is left behind. Inclusive education has a dual function: it seeks to address the specific educational needs of individuals while also playing a key role in promoting social integration, cohesion, and respect for diversity. By placing a strong emphasis on inclusion, it moves beyond the physical integration of students into mainstream schools to encompass pedagogical strategies that acknowledge and celebrate differences, while simultaneously seeking to diminish inequality. This approach nurtures an understanding of diversity, tolerance, and mutual respect among students, thus providing them with the skills necessary for positive social interaction and fostering a more inclusive society at large (Ibe, 2021). Moreover, inclusive education ensures that all learners, irrespective of their background or challenges, have the opportunity to develop their full potential within a supportive and nurturing learning environment. Inclusive education also reinforces the broader concept of social justice, as it works toward the elimination of discriminatory practices and the dismantling of barriers that prevent marginalized groups, including those with disabilities, from accessing quality education. It recognizes that traditional educational systems often perpetuate inequalities, and as such, seeks to implement reforms that provide equitable opportunities for all learners. The importance of inclusive education cannot be overstated, as it is not only essential for the individual development of marginalized learners but also for the creation of an equitable and just society, where diversity is celebrated and every individual is empowered to contribute meaningfully to the community

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Moreover, inclusive education ensures that all learners, irrespective of their background or challenges, have the opportunity to develop their full potential within a supportive and nurturing learning environment. Inclusive education also reinforces the broader concept of social justice, as it works toward the elimination of discriminatory practices and the dismantling of barriers that prevent marginalized groups, including those with disabilities, from accessing quality education. It recognizes that traditional educational systems often perpetuate inequalities, and as such, seeks to implement reforms that provide equitable opportunities for all learners. The importance of inclusive education cannot be overstated, as it is not only essential for the individual development of marginalized learners but also for

the creation of an equitable and just society, where diversity is celebrated and every individual is empowered to contribute meaningfully to the community.

Based on this background, this research this research study was evaluated the comparative effectiveness of cooperative learning cum inclusive learning pedagogies and conventional teaching method in enhancing student learning outcomes in in Biology in secondary school students in Akamkpa.

Concept of co-operative learning strategy

Buchs and Maradan (2021) asserts that Cooperative Learning is an approach to organizing classroom activities into academic and social learning experiences, in which the teacher's role changes from giving information to facilitating student learning. Students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, students learning cooperatively capitalize on one another's resources and skills asking one another for information, evaluating one another's ideas in order to achieve general goals, rather than individual benefits. Cooperative instructional strategy begins with the formation of groups or teams of learners in the same grade and age bracket. The cooperative learning technique enables learners to learn from each other and gain important interpersonal skills (Ajaja & Eravwoke 2018).

Research evidences have generally indicated that effective implementation of cooperative learning benefits students in academic, social and psychological domains of development ((Johnson & Johnson,2019; Yizengaw, 2024). Academic Benefit include stimulation of students' critical thinking, problem solving and higher level of reasoning and promotes innovation and creativity. It also aids learners to have deeper understanding of the material, and in turn produces higher academic achievement and greater productivity. Students who are taught through cooperative learning scored significantly higher on achievement and knowledge retention than those who were taught in lecture-based teaching.

The concept of Inclusive Education

Inclusion is an educational concept denoting that all children should be involved in the same classrooms irrespective of their health peculiarities. It denies the idea of organizing separate education for children with special needs. This approach can generate positive outcomes if essential elements are preserved. According to Grove et al. (2019), they include promoting diversity in the classrooms, developing strength-based curriculums, engaging students in active and productive cooperation, and others. Abidance by these requirements will ensure that inclusive practices lead to positive results.

Inclusive education offers both advantages and disadvantages for children with special needs and teachers. Benefits refer to the fact that the children witness a better development of their knowledge and skills through cooperation with their peers, while educators master various pedagogical techniques to work with diverse students. This approach is also advantageous for society because it makes individuals learn to be tolerant to others from

early ages. Simultaneously, challenges arise because not all educational establishments have sufficient resources and materials. Finally, mental unpreparedness and a prejudiced attitude toward children with special needs are additional drawbacks of the phenomenon under analysis. As for my opinion, I believe that including children with special needs in the general education classrooms is a productive practice. The rationale behind this claim is that it is unethical to segregate these individuals. To my mind, inclusive education helps such children adapt to society through cooperation with peers who do not have special needs. That is why it is reasonable to implement inclusive education principles.

Teachers who are key players in the teaching learning process experience several challenges regarding inclusive education. Lack of professional training in dealing with students with disability is one of the obstacles to success in education (Materechera, 2020). Teachers may encounter difficulties in establishing inclusive learning environments and delivering appropriate support if they have limited fundamental understanding and capacity required to accommodate the different requirements of learners with disabilities. This phenomenon may lead to the pupils' inability to fully realize their potential both academically and personally

Research has shown that students learning together in the classroom improves academic excellence (Nwokoro 2020). Students set higher expectations for themselves due to the presence of others with diverse abilities. Students with disabilities challenge themselves to perform optimally like their classmates, while other students also spontaneously set a high standard for themselves. As educators, we won't know what gifts are hidden in our students until we unwrap them. Most successful teachers of [inclusion classes](#) have found that when they teach basic skills within the context of meaningful lessons, all students can achieve higher-level learning. Such lessons stimulate critical thinking and motivate students to make personal connections with the material.

Research Hypotheses

1. There is no significant difference in the biology students' performance taught using cooperative learning compared to those taught using conventional teaching method
2. There is no significant difference in the biology students' performance taught using inclusive learning approach compared to those taught using conventional teaching method

Methodology

The study adopted a quasi-experimental research design, specifically a pretest-posttest control group design. A sample of 219 students was selected using a stratified sampling technique from a population of 2117 senior secondary schools in the research area. A pre-test was conducted to determine the students' initial performance in mathematics. After two weeks of teaching using the prescribed innovative methods (cooperative learning cum inclusive learning pedagogies) and conventional teaching method, a post-test was administered using the Biology Achievement Test (MAT). Data analysis was carried out with independent t-test to compare the difference in the student learning outcomes

between the two groups. Two research hypotheses were formulated to guide the study. In analyzing the data, independent t-test was used. The hypotheses were analyzed at .05 level of significance.

Results

Hypothesis 1

There is no significant difference in the biology students' performance taught using cooperative learning compared to those taught using conventional teaching method

TABLE 1: Independent t-test analysis of difference in the biology students' performance taught using cooperative learning compared to those taught using conventional teaching method (219)

Grouping variables	N	$\bar{x}$	S.D	Df	t-cal	p-val
Conventional method	104	23,54	3.44	217	2.18	.002
Cooperative learning	115	45.40	3.21			

*Significant at .05 level, t-crit. =1.96, t-cal. =2,18

To test hypothesis independent t-test was used. As shown in table 1, the calculated t-ratio of -2.18 (t-cal= 2.18, $p < .05$), is greater than critical t-ratio of 1.96 tested at .05 level of significance and 217 degree of freedom. Since $p(.002)$ is less than $p(.05)$, it implies that there is a significant difference in the biology students' performance taught using cooperative learning compared to those taught using conventional teaching method therefore the null hypothesis was rejected

Hypothesis 2: There is no significant difference in the biology students' performance taught using inclusive learning approach compared to those taught using conventional teaching method

TABLE 2: Independent t-test analysis of difference in the biology students' performance taught using inclusive learning approach compared to those taught using conventional teaching method (219)

Grouping variables	N	$\bar{x}$	S.D	Df	t-cal	p-val
Conventional method	104	23,54	3.44	217	3.10	.001
Inclusive education	115	47.21	3,18			

*Significant at .05 level, t-crit. =1.96, t-cal. =2,18

To test hypothesis independent t-test was used. As shown in table 2, the calculated t-ratio of -3.10 ($t_{\text{cal}} = 3.10$, $p < .05$), is greater than critical t-ratio of 1.96 tested at .05 level of significance and 217 degree of freedom. Since $p(.001)$ is less than $p(.05)$, it implies that there is a significant difference in the biology students' performance taught using inclusive learning compared to those taught using conventional teaching method therefore the null hypothesis was rejected

Discussion of findings

The result of analysis of hypothesis one showed that there is a significant difference in the biology students' performance taught using cooperative learning compared to those taught using conventional teaching method. Meaning from the table that effective use of cooperative learning approach can enhance biology learning outcome compared to the usual conventional teaching method.

The finding is in line with that of Buchs and Maradan (2021) that asserts that Cooperative Learning is an approach to organizing classroom activities into academic and social learning experiences, in which the teacher's role changes from giving information to facilitating student learning. Students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, students learning cooperatively capitalize on one another's resources and skills asking one another for information, evaluating one another's ideas in order to achieve general goals, rather than individual benefits. Cooperative instructional strategy begins with the formation of groups or teams of learners in the same grade and age bracket. The cooperative learning technique enables learners to learn from each other and gain important interpersonal skills (Ajaja & Eravwoke 2018).

Data in table 2 indicated that there is significant difference in the biology students' performance taught using inclusive learning approach compared to those taught using conventional teaching method implying that inclusive learning approach can enhance students performance in biology. The result finding is in line with the study of Grove et al. (2019) that stated that inclusive learning include promoting diversity in the classrooms, developing strength-based curriculums, engaging students in active and productive cooperation, and others. Abidance by these requirements will ensure that inclusive practices lead to positive results.

Inclusive education offers both advantages and disadvantages for children with special needs and teachers. Benefits refer to the fact that the children witness a better development of their knowledge and skills through cooperation with their peers, while educators master various pedagogical techniques to work with diverse students. This approach is also advantageous for society because it makes individuals learn to be tolerant to others from early ages. Simultaneously, challenges arise because not all educational establishments have sufficient resources and materials. Finally, mental unpreparedness and a prejudiced attitude toward

children with special needs are additional drawbacks of the phenomenon under analysis. As for my opinion, I believe that including children with special needs in the general education classrooms is a productive practice.

Conclusion

The study concludes that the use of cooperative learning and inclusive learning pedagogies in biology instruction yields significantly better student performance compared to conventional teaching methods. Therefore, it is imperative for biology teachers in senior secondary schools in Akamkpa to adopt these innovative pedagogies to enhance student learning outcomes in biology.

Recommendation

The researcher made the following recommendations

1. Biology teachers in secondary schools should adopt cooperative learning strategies in their instructional delivery to enhance students' performance in biology.
2. Secondary school biology teachers should also incorporate inclusive learning approaches in their teaching methods to improve students' academic achievement in biology.

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