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Community and Peer Learning Approaches for Teaching Chemistry to Out-of-School Children in Zaria Educational Zone

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Abstract
The research examines the effects of teaching chemistry to out of-school children in Zaria educational zone through the use of peer-based and community-based learning strategies. This was done to lower the community's out-of-school children population. The study used a single-group pretest-posttest quasi-experimental research design. 545 community out-of-school children in Zaria Education Zone, ages 14 to 16, make up the study's population. Using the purposive sample approach, 50 children were chosen. Data for this research were gathered using a chemistry performance test with a reliability coefficient value of 0.79. Using an independent one-sample t-test, the research hypothesis, which states that a significant difference does not exist between the performance in chemistry among participants before and after being exposed to community and peer-based learning strategies in teaching chemistry concepts, was tested using an independent t-test. The results showed that when participants were taught chemistry using community and peer-based learning techniques, there was a significant change in their performance. The results led to the following recommendations: knowledgeable individuals in a community should act as mentors to encourage out-of-school children to return to school by giving presentations and participating in community development initiatives.

Keywords: Chemistry, Community and Peer-Based Learning Strategy, Out-of-School Children.

Introduction

Education provides individuals with knowledge and skills which serve as a fundamental tool towards the economy and social progress of a nation. Ezenwa et al. (2024) define education as a process of acquiring Knowledge and skills, developing a positive attitude and fostering morals and intellectual growth for the development of an individual. It is defined as all-round development of an individual, i.e physically, socially, morally, mentally, psychologically and spiritually. Education is the process that prepares individuals for the future. It is expected to reflect in the life of the recipient a kind of behaviour that conforms to the norms and values of his society (UNESCO, 2023). Science and Technology have proven to be basic tools towards industrial and national development. The economic and social advancement of any country hinges on the teaching and learning of science (Muhammad-Lawal & Mari, 2023). Countries are categorised into developed, developing and underdeveloped countries depending on their science and technological advancements. In Nigeria, efforts have been intensified by the Government to direct the country's educational policies towards effective teaching and learning of science subjects such as Agricultural sciences, physics, Biology and Chemistry to enhance its economic development and national growth (Muhammad-Lawal, 2023).

Chemistry as a science subject deals with the study of nature composition properties and the changes it undergoes under different conditions. (Muhammad-Lawal & Atiku, 2024). It probes into the principles governing the changes matter undergoes, the complexity of nature and the changes that take place in the universe. Regarding the application of its knowledge in practical situations, chemistry became a subject of universal interest in human growth., Chemistry is taught in senior secondary schools to assist students in understanding key scientific ideas that will help them contribute to their community. Chemistry is a subject that should be taught in a way that current ideas and innovations are introduced; it should be presented because mere teaching of chemical concepts using a

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traditional classroom setting may not be enough to achieve the desired mastery of the concept but could be achieved using digital techniques of teaching (IRENA, 2023).

Young individuals who fall into the category of out-of-school children are those who are between the ages of attending elementary and secondary schools but are not enrolled in formal education or studying in non-formal education. People with impairments are also included in this group (UNESCO, 2024). According to Anne (2021), Students who have never had the opportunity to register in school or who leave the system due to poor academic performance, lack of sponsors, unemployment, or disenchantment with the educational system are considered out-of-school children. These are children who have left the schooling system without completing their course of study. These children have to be taught chemistry concepts in a way that will arouse their interest and motivate them to further their studies. This could be done through the use of educational technological tools. All children, no matter where they come from or the circumstance, has the right to education, but unfortunately, in Nigeria, about 10.5 million children are out of school (UNESCO, 2022), and this may be due to economic barriers, geographical location, conflicts or socio-cultural norms and practices. Some are out of school due to a lack of sponsorship, poor academic records or fear of a lack of employment after schooling. However, the rapid development of technologies has provided ample solutions to this problem by creating different means, methods and techniques for learning that have gone beyond ordinary classroom teaching (Hussain et al., 2017). This study investigates the use of community and peer-based learning to teach out-of-school children (Secondary School Dropouts) chemistry in Zaria Metropolis.

Technologies are process entities resulting from solving problems, which produce transformations and changes. They are tools, techniques and methods use to solve practical problems through the application of scientific knowledge. Enhancing the quality of education, especially in the teaching and learning of science, requires the use of educational technology as well as the planning and execution of technology-based instruction (Ojo, 2017). Since the 19th century, technology has been incorporated into classroom instruction. At first, gadgets like the overhead projector were seen as important in contrast to more conventional technology like the blackboard, pencil, and ballpoint pen. The use of technology to improve teaching and learning has changed intensely in recent years due to the rapid advancements in computers (Inaltekin, 2020).

Education technology can be defined as an asset of the academic system that effectively designs learning and teaching environments, which leads to quality and permanent learning of a particular concept (Barak, 2020). It could be seen as a process of helping learners in reaching a targeted goal set in the academic system. Technology provides the learner opportunities to participate in the process of teaching and learning, and individuals learn by exploring and effective learning environments are provided. As the learning environment becomes more attractive to the learner, he/s becomes more motivated and his/her ability to construct new knowledge becomes broader. Learners exposed to the use of technological tools have the ability to quickly adapt to changes and are open to innovative practices. (Pricahyo et al., 2018). Information is now more accessible than ever, this is due to the development of the Internet and smart gadgets. For instance, 70% of people use mobile phones, and smartphones account for the bulk of global internet traffic (Boxer, 2018). Since technology has make it easier to get information quickly and allows for the adoption of many strategies for technology-enhanced instruction both inside and outside of class (Pricahyo et al., 2018). Internet technologies are a growing phenomenon and their use is changing modes of communication and forms of sharing content among users cannot be overemphasised. This may include community and peer-based learning strategies (Muhammad-Lawal , Madaki & Ahmad, 2025) .

Community and peer based learning is an educational approach where individuals learn by actively engaging with their surrounding community and peers, often through collaborative projects, discussions and real world experiences, allowing them to gain knowledge and skills while contributing to their community and learning from each other (Araya 2012). In this strategy learning happens through interaction with peers where individuals shares knowledge, provide feedback and work together to solve problems, often in small groups. Learning process is tied to practical experiences within the community, enabling students to use their academic understanding in practical settings. Both the community and the learners gain value from the interaction with students contributing skills and the community receiving support or solution to identified needs (Carvalho & Santos, 2022).

According to Asmamaw (2020), active idea sharing in small groups during peer learning fosters critical thinking and improves the efficacy of peer learning in relation to learning objectives in addition to raising participant

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engagement. Improved student accomplishment will result from student interaction on learning assignments. Students will gain knowledge from one another as a result of cognitive disputes, poor reasoning, and the emergence of higher-quality understanding throughout their debate of the material. Umar and Dalaham (2023) are of the view that students are better able to comprehend, process, and remember information when they are given the chance to elaborate on it through class discussions, teaching peers what they have learnt, and sharing perspectives on how the material relates to the issue they are trying to solve. They are also of the view that peer support—both giving and receiving assistance from one another—seems to boost persistence and task involvement. Individual effort also seems to be encouraged by peer standards. According to Eryilmaz (2017) peer-based learning is a technique that gives pupils many chances to show that they understand the concept being taught. It entails segmenting the material to be learnt into learning units, each with distinct learning goals. It allows pupils to study a subject until they are proficient in it, unit by unit. To reduce performance gaps, mastery learning employs differentiated and individualised teaching, progress tracking, formative assessment, feedback, corrective measures, and instructional alignment. It also focuses on how to enhance, rather than alter, the subject mastery process.

Objective of the study

The study objective is to determine the impact of community and peer-based learning strategy in teaching out-of-school Children chemistry concepts on their performance in chemistry.

Hypothesis

Significant difference does not exist between the performance in chemistry among out-of-school Children before and after being exposed to community and peer-based learning strategies in teaching chemistry concepts.

Methodology.

One group Quasi-experimental research design involving pretest and posttest, was used in this study. Participants were pre-tested using the Chemistry performance test to determine their ability before the administration of treatment. The selected students were taught basic concepts in Senior Secondary I Chemistry using community and peer-based learning strategy for six weeks. At the end of the six weeks Chemistry performance test was re-administered to determine their performance in chemistry after treatment. The population of the study comprises 1,345 communities out of school children within the age of 14-16 in Zaria Education Zone. 50 children were selected using a purposive sampling technique. A chemistry performance test with a reliability coefficient of 0.79, which was done using test-retest and tested using the Pearson Product-Moment Correlation Coefficient statistical tool, was used for data collection for the study

Results

Testing Research Hypotheses

Significant difference does not exist between the performance in chemistry among out of school children before and after being exposed to community and peer-based learning strategies in teaching chemistry concepts.

Table 1: Independent one-group t-test for the performance of participants taught Chemistry using community and peer-based learning strategy

Variable	Study groups	N	Mean	STD	Mean Difference	Df	t computed	t critical	p
Mean scores	Post-test	50	51.3258	15.36508	10.74445	**173**	5.048	**1.96**	**0.000**
	Pre-Test	50	40.5814	12.60295					

p≤0.05

Table 1 shows the p-value tested to be 0.00 at p≤0.05 level of significance. The p-value of 0.00 obtained is significant as it is less than the 0.05 level of significance set for the study. The null hypothesis, which states that a significant difference does not exist between the performance in chemistry among participants before and after being exposed to community and peer-based learning strategies in teaching chemistry concepts, is hereby rejected. This reveals that a significant difference exists in the performance of participants after they were taught chemistry using community and peer-based learning strategy.

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Discussion

Results of findings from the study revealed that there was a change in the performance of out of school children after they were taught chemistry using community and peer-based learning. This also implies that community and peer-based learning enable participants to see the relevance of education in their day-to-day life. This result aligns with the claims made by Umar and Dalaham (2023), which suggest that when students participate in explanation through discussions with their peers, teaching one another what they have learnt, and exchanging perspectives on the use of that knowledge to the problems they are solving, information is more effectively understood, processed, and remembered. Also, Asmamaw (2020) was of the view that in addition to raising participant engagement, active idea sharing in small groups during peer learning promotes critical thinking and improves the effectiveness of peer learning in relation to learning objectives, which will result in improved student accomplishment through interaction and learning.

Conclusion

Considering the findings in this study, it was concluded that out of school children can be taught chemistry using community and peer base learning to improve their performance in learning and this also could increase their willingness to enroll in either formal or non-formal education to give their quota of contribution in societal development.

Recommendations

Based on the findings in this study, the following recommendations were made:

1. Educated Members of a particular Community should serve as mentors to children in their community so as to foster a willingness to study among children.
2. Children should be engaged with activities in their surroundings to enable them acquire knowledge and skills as they contribute to their community.
3. Out of school children should be taught in such a way that they will find the relevance of learning in their day to day life experiences.

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