International Journal of Current Research in Education

Exploring How Classroom Interaction Patterns Influence Academic Achievement among Secondary School Science Students

[1]S. C. **NWAFOR**, [2]C. A. **EZENWOBODO**, [1]D. O. **EKOYO**, [3]R. F. **AMEH**

[1]Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria
[2]Department of Biology, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria
[3]Department of Science Education, University of Nigeria, Nsukka, Enugu State, Nigeria

Corresponding Author: S. C Nwafor: Department of Science Education at Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. Email: sc.nwafor@unizik.edu.ng

ABSTRACT

The study determined how classroom interaction patterns influence secondary school science students' academic achievement. The study was carried out in Orumba North Local Government Area of Anambra State. One research question with its corresponding hypothesis guided the study. The population of the study consisted of all the 1,482 SS2 science students in the 15 public secondary schools that made up the LGA of the study. A sample size of 178 science students who were randomly selected from six secondary schools was used for the study. An ex-post-facto (Causal-comparative) research design was used for the study. The instruments for data collections which were validated by three experts were an adapted Previous Science Classroom Interaction Categorization Test (PSCICT) and a researchers' Science Achievement Test (SAT). Data collected were analysed using mean and standard deviation to answer the research question and Analysis of Variance (ANOVA) to test the null hypothesis at 0.05 level of significance. The finding of the study revealed that classroom interaction patterns (CIP) have significant influence on the mean academic achievement scores of students in science. Moreover, teacher active, students equally active classroom interaction pattern showed more influence on students' academic achievement in science than other CIP. Based on the findings, the researchers recommended the utilization of effective classroom interaction patterns as it influence students' academic achievement. Also, conferences and workshops and seminars should be organized for science teachers and student to deepen their skills on how to enhance teacher-student classroom interaction.

Keywords: Classroom interaction patterns, academic achievement, science and secondary school students.

INTRODUCTION

For every societal development, science must be a core aspect of its agenda. According to Comunale (2023), science is the study of the universe around us and within us, natural phenomena, and solutions to problems. It helps us to understand by using a methodology based on empirical evidence the mechanisms that cause these natural phenomena and explain how or why those natural events occur. Nwafor, Ekoyo & Ezenwobodo (2024) define science as a collection of knowledge concerning the nature of the universe and how organisms interact with their surroundings acquired through investigation and experimentation. Therefore, science is a systematic body of knowledge (product) acquired through experimentation and investigation (process) of events in nature through which knowledge, attitude and skills natural phenomena are acquired. This is often facilitated through the manipulation of objects, models, materials and events. Science is a way of thinking in pursuit of understanding nature, a way of investigating and a body of established knowledge (Aniodoh, 2012).

The major goal of science is to understand the natural world in terms of scientific theories-that is, concepts based on what we learn from experimentation (Lexis, 2022). In science, our understanding is constantly increasing and, as a result, our theories develop and change through scientific inquiry. Through systematic scientific inquiry approaches such as observing, collecting information, identifying significant variables, formulating and testing hypotheses, and taking precise, accurate, and reliable measurements, students' interaction with the environment is enhanced. Science therefore is very crucial in shaping the way we think, explore, generate and apply knowledge about our environment. According to Abuh (2021) science and technology provides basic infrastructures that enable man to live comfortably, among which are shelters, good medicare, communication, drinking

water and nourishing food. Abuh maintained that for man to live comfortably in the society or age of science and technology, man therefore has to acquire the knowledge of science to live productively and skillfully, so that he can have dominant social and economic forces. In Nigeria, Achor (2015) acknowledged the influence of science on national policy, on the economic and political problems, and on the citizen's life. From the foregoing, it can deduce that the knowledge of science is an important for the growth and development of a nation. Therefore, students need some basic knowledge of science and technology in order to function productively in this science and technology era and improve their achievement in schools.

Academic achievement is the scholastic standing of a student at a given moment which states individual's intellectual abilities which can be measured by grades obtained from examinations or continuous assessments through tests or quiz (Adeyemi, 2017). It indicates the extent to which a person has accomplished specific educational goals or learning outcome. Kathryn (2020) refers to academic achievement as excellence in all academic disciplines, in class as well as extracurricular activities. It includes excellence in sporting, behavior, confidence, communication, skills and the likes. Students' academic achievement reveals what pupils know, understand, and can do at one point in time; it can be useful for identifying gaps between what students are expected to know and what they actually do know. It reveals the strengths and weaknesses of the students. In this case, solutions to remedy the problems are provided. Students' academic achievement in science subjects has been irregular based on empirical studies. For instance, a look at the WAEC Chief examiner's reports (2016-2020) shows a fluctuating academic achievement in Biology, Chemistry and Physic. Moreover, Ezeudu et al (2019) and Nwafor, Odukwe & Achugbu (2024) reported that poor achievement of students exist in both

external and internal examinations in recent time. Sibomana et al (2021) assereted that factors affecting academic achievement are level of teachers' education, family's economic background, availability of teaching and learning materials, distance covered by learners from home to school, learner's prior knowledge, level of parents' education and absenteeism of learners. According to Suleiman (2023) the factors that affect students' academic achievement include the student factors, such as students' learning skills, parental background, environmental causes, and peer influence. Similarly, teacher-related factors, school factors, socio-cultural factors, and others. Chapagai (2024) reported that home-related factors, campus facilities, the teaching-learning environment and resources, habits of students, teacher-student relations, and institutional factors significantly affect students' academic achievement. Therefore, students' interaction in the classroom, with themselves, their teachers and instructional/learning materials could contribute to students' achievement in science subjects.

Classroom interaction pattern is the sum total of activities taking place in the classroom between the teacher, the learner and the learning materials during the teaching process (Mackey, 2013). Classroom interaction in science classrooms helps to improve the students' communication skills, strengthens their social life, improve students' interest and boost their self-esteem. According to Zhao (2016) classroom interaction (CI) is the interaction between teacher and students and among students. Nnorom & Erhabor (2019) maintained that classroom interaction pattern when applied properly is mainly student-centered, with students consistently very active and the teacher a facilitator. Classroom interaction can be used through the process of repetition and rewarding to improve students' attention which will aid to form meaning relationship between the teachers and students (Mackey, 2013). An interaction between the teacher and student during teaching – learning process modifies behaviour,

helps students to socialize, develop desirable attitude and interest, create an atmosphere to develop problem – solving skills (Nnorom & Erhabor, 2019). Students' participation and involvement in teaching learning process can be enhanced by using the right classroom interactions pattern. Consequently, the researchers conceptualized classroom interaction pattern as all the activities done during science lessons, ranging from the activities between the teacher and student; the students themselves; teacher and learning material and student and learning material. Copper & Robinson (2000) classified classroom interaction pattern into four dimensions namely teacher and student interaction pattern, student- student interaction pattern, teacher-material interaction pattern and student-material interaction pattern. Copper and Robinson expressed that the teacher-student interaction pattern involves that in which the teacher initiates, guides and direct classroom talk with students; in student-student interaction pattern students work with each other to solve a common problem while in student-material interaction pattern, students work with science equipment, machines, specimens and other instructional materials while in teacher-material interaction pattern the teacher illustrates or manipulates the instructional materials in the classroom to explain certain concepts or concerns to the students. Zhao (2016) found that proficiency level, personal traits and cultural factors are the factors that interact and together affect student participation which shapes the quality and quantity of interaction in the classroom.

Some studies have been done to determine different classroom interaction pattern used in teaching and learning and its effect on students' academic achievement. Ingram et al., (2018) in his study on teacher-pupil classroom interaction in Nigerian Primary and Secondary Schools found that the direct teaching (lecturing, giving directions etc) took 69% of the time resulting in a ratio of 2:1 for direct to indirect

teaching. Setianingsih, (2018) in a study to determine the patterns of interactions at grade 5 classroom in learning the topic of statistics viewed from cognitive load theory, found that teacher-talk to pupil-talk took about 87%: 13% of time allocated for the lesson. This gives a ratio of 7:1. Edeh (2024) found that Biology teachers used more of direct mode of teaching than the indirect, teacher-talk is thrice that of pupil-talk, and student-talk-response to student-talk-initiation is of the ration 2:1. A Study on Interaction Patterns in Language Learning Online Classes – Adaptation and Efficiency by Thanh & Duyen (2021) showed that the most dominant interaction adopted in the two classes was teacher-student, especially instructor to the whole class, instructor to each member in the classroom, and learners to instructor. Using Indonesian secondary vocational school, Rido, Ibrahim & Nambiar (2014) conducted a study to investigate EFL master Teacher's classroom interaction strategies. The result showed that the master teacher used four types of interaction strategies such as control of interaction or interaction management, elicitation or questioning, speech modification or feedback, and repairing or error treatment strategies. Abuh (2021) revealed that physics teachers do not interact actively with their students and most of the physics teachers lack the qualities of a good teacher. Teachers adopt only one method of teaching which was mainly for the lecture method. The opportunity to interact more among themselves and quality of classroom interaction was very poor. Also, questions that elicit answer and repetition purpose were mostly answered chorally in both single and mixed schools and that the feedback of the teacher affects the pattern and extent of classroom interaction in physics lesson. In view of this situation, effective classroom interaction patterns in a science class may be useful in teaching students in order to improve their persistent poor performance in science subjects. The problem of this study posed as a question therefore is: What is the influence of classroom

interaction patterns on secondary schools students' academic achievement in science in Orumba North Local Government Area of Anambra State?

Objectives of the study

The objective of the study was to investigate the influence of classroom interaction patterns on secondary school students' academic achievement in science. Specifically, the study sought:

1. To determine the influence of classroom interaction patterns on secondary school students' academic achievement in science.

Research Question

The research question below was formulated to guide the study:

1. What is the influence of class room interaction patterns on secondary school students' academic achievement in science?

Hypothesis

The null hypothesis below was formulated to guide the study and was tested at 0.05 level of significance

1. Classroom interaction patterns have no significant influence on the mean academic achievement scores of students in science.

MATERIALS AND METHODS

The study adopted an ex-post-facto (Causal-comparative) research design. According to Nworgu (2018), ex-post-facto (Causal-comparative) research design is used in a situation where it is impossible to manipulate the independent variable(s); hence it is suitable for this research. The study was carried out in Orumba North Local Government Area of Anambra State. The population of the study comprise of all 1,482 (479 males and 1003 females) SS2 science students in the 15 public secondary schools of the LGA. The sample size for the study consisted of 178 science students who are offering Biology, Chemistry and Physics. The researchers randomly selected six secondary schools and also using simple random sampling technique draw up the sample that was used for the study.

The study made use of two instruments for data collections. They include: Previous Science Classroom Interaction Categorization Test (PSCICT) and Science Achievement Test (SAT). Previous Science Classroom Interaction Categorization Test (PSCICT) was adapted from (Penny, 1996; Flanders, 1966 & Abdullah & Larnone, 2010). The PSCICT is made up of a scale range and was designed to assess interaction processes of the learners in the previous science classroom activities. PCICT comprise of three categories namely: Teacher Active, Student Mainly Receptive ranging from 1 to 1.49; Teacher Active, Student Equally Active ranging from 1.50 to 2.49 and Students Active, Teacher Partly Receptive ranging from 2.49 to 3.00.

The PSCICT consisted of 20 items with three response options available for each item. The SAT was developed by the researchers and consisted of 50 multiple-choice objective items from three science subjects namely Biology, Chemistry and Physic. Each item has 4 options, lettered A to D. A table of specification was used in constructing the SAT, hence, the items measured the six objectives in the cognitive domain of Bloom's taxonomy of educational objectives. The instruments were validated three experts from Nnamdi Azikiwe University, Awka, Anambra State; two from the Department of Science Education (Chemistry Unit) and one from the Department of Educational Foundation (Measurement & Evaluation Unit). The reliability index of 0.88 was obtained for SAT which was determined using Kuder-Richardson 20 (K-R20) while that of PSCICT was done using Pearson Product Moment Correlation Coefficient which gave a reliability index of 0.82. The instruments were administered with the help of trained research assistants from each of the sampled schools. The scores were collected from the students and used for data analysis.

Data collected were analyzed by using mean and standard deviation to answer the research question whereas the null hypothesis was tested at 0.05 level of significance using Analysis of Variance (ANOVA). The analysis was done using Statistical Package for the Social Sciences 25 (SPSS, Version 25).

RESULTS

The result of this study is hereby presented in line with the research question and null hypothesis that guided the study.

Research Question

What is the influence of classroom interaction patterns on secondary school students' academic achievement in science?

Table 1: Mean achievement scores and standard deviation of students in science in previous science classroom interaction categorization test (PSCIC)

Groups	Previous science classroom interaction category	N	Mean	SD
PSCIC 1	Teacher Active, Students Mainly Receptive	110	30.74	12.83
PSCIC 2	Teacher Active, Students Equally Active	38	37.55	12.55
PSCIC 3	Students Active, Teacher's Partly Receptive	30	29.00	14.63
	Total	178	34.65	13.43

The result in table 1 reveals that students of group 1 in teachers active, students mainly receptive in previous science classroom interaction category test had a mean academic achievement scores of 30.74 and standard deviation of 12.83 while students of group 2 in teacher active, students equally active in previous science classroom interaction test had the highest mean academic achievement scores of 37.55 and standard deviation of 12.55 and students of group 3 in students active, teacher's partly receptive in previous science classroom interaction category test had a mean academic achievement of 29.00 and standard deviation of 14.63.

This implies that the mean academic achievement score of students in group 2 was higher than their counterparts in group 1 and 3 respectively. Also, students of group 1 have slight higher score than

students of group 3 in science achievement test. To determine if this influence is significant the hypothesis below was tested.

Hypothesis

Classroom interaction patterns have no significant influence on the mean academic achievement scores of students in science.

Table 3: One-way Analysis of Variance (ANOVA) of students' mean science achievement scores in previous science classroom interaction categorization test (PSCIC).

Source	Sum of squares	df	Mean squares	F	Sig	Decision
Between Groups	2461.763	2	1230.882	7.311	.001	S
Within Groups	29462.641	175	168.358			
Total	31924.404	177				

The data on table 2 shows that the calculated F-value of 7.311 was obtained with a probability value of .001 which is less than the benchmark of 0.05 level of significance. Therefore, the null hypothesis is rejected. This indicates that classroom interaction patterns have significant influence on the mean academic achievement scores of students in science.

DISCUSSION

The findings of the study showed that students in group 2 performed better than their counterparts in groups 1 and 3. As the mean academic achievement of the previous science classroom interaction category test of students in group 2 (teacher active, students equally active) was highest followed by

group 1 (teachers active, students mainly receptive) and then group 3 (students active, teacher's partly receptive). Further analysis also revealed that classroom interaction patterns have significant influence on the mean academic achievement scores of students in science. This could be due to the distinctive features of teacher and student interactive pattern of group 2 were teacher are active and the students equally active which encourages students' engagement and active participation in science learning process. However, the researchers observed that teacher active, students mainly receptive was mostly used and common in science classrooms. This in line with Edeh (2024), Odionye & Onyegegbu (2022) and Abuh (2021) who revealed that students and teacher interaction significantly influence students achievement and encourages cooperative and active learning in addition to feedback and clear communication; however, the authors noted that teachers dominated the science classroom with the use of lecture method and do not interact effectively with the students. The findings of the study is in line with Okoye & Onwuachu (2018) and Owodunni (2015) who revealed that classroom interaction patterns significantly influenced students' achievements in Biology and Basic Electricity respectively.

However, the finding of the study disagrees with that of Thanh & Duyen (2021) that showed no obvious distinctions of interactions used in the class by the two teachers but the teacher's preference in utilizing certain interaction forms based on the characteristics of every single class. Against the findings of this study is that of Nambiar, Ibrahim, & Rido (2014) which revealed that the teacher in Indonesian secondary vocational school used the four types of interaction strategies such as control of interaction or interaction management, elicitation or questioning, speech modification or feedback, and repairing or error treatment strategies.

CONCLUSION/ RECOMMENDATIONS

The researchers concluded that there is a positive influence of classroom interaction pattern on students' achievement in science. Also, the level of the science students' classroom interaction patterns is fairly poor as the teachers are mostly active and the students mainly receptive. Based on the findings of the study, the researchers recommended the adoption of effective classroom interaction as it influences science students' achievement. Also, conferences, workshops and seminars should be organized for science teachers and student on how to develop the necessary skills in order to effectively enhance teacher-student classroom interaction. In addition, students should endeavour to interact with themselves and their teachers to boost their academic achievement in science.

REFERENCES

Abuh,Y. P. (2021). Analysis of classroom interaction patterns and students' learning outcomes in physics in Kogi State, Nigeria. *United International Journal for Research & Technology*, *02*(08), 192-201.

Achor, E.E. (2015). Teaching waves and radioactivity using innovative approaches. In R.M.O. Samba & J.O. Eriba (Eds.), *innovative approaches to teaching difficult concepts* (128 –148). Makurdi: Destiny Venture.

Adeyemi, B.A. (2017). Effects of cooperative learning and problem solving strategies on junior secondary school students' achievement in social studies. *Elect Journal Research Educational Psychology, 18*(3), 691-708.

Aniodoh, H.C.O (2012). *History and philosophy of science.* Enugu: Hacofam Educational Books.

Chapagai, S. D. (2024). Factors affecting the academic achievement of the students in community campuses. *KMC Journal 6*(1), 241-259. Doi: 10.3126/kmcj.v6i1.62344

Comunale, J. (2023). *Science: Definition, topics & philosophy.* https://study.com/academy/lesson/what-is-science-definition-topics-branches.html

Cooper, J. & Robinson, P. (2000). Informal small strategies in large classes. In Macgregor, T. J., Copper, K.T., Smith & Robison, P. (Eds.) *Strategies for energizing large classes: From small groups to learning communities: New Directions for reaching and learning*. New York: McGraw Hill.

Edeh, O. M. (2024). Influence of classroom interaction patterns on achievement in biology among senior secondary school students in Awka. *Global Journal of Applied, Management and Social Sciences (GOJAMSS), 28,* 108 – 116

Ezeudu, F. O., Nwafor, S. C., Abaeme, O. D., Alabi, A. O., Chukwuka, C. U., Ikuelogbon, E. O. (2019). Effect of scaffolding and hand-on instructional approaches on senior secondary school students' achievement and interest in Chemistry. *Research Journal of Applied Sciences, 14*(5), 170-178. Doi: 10.36478/rjasci.2019.170.178

Ingram, J., Andrews, N., & Pitt, A. (2018). Revisiting the roles of interactional patterns in mathematics classroom interaction. In *Proceedings of CERME10* (pp. 1300-1307).

Kathryn, L. (2020). *The effects of positive lifestyles on the academic performance of high school students. International Journal of Sport and Exercise Psychology, 3(2), 1–12.*

Lexis, L. (2022) *Science and the scientific method* https://usq.pressbooks.pub/howtodoscience/chapter/chapter-1/

Mackey, A. (2013). *The conventional interaction in second language acquisition.* Oxford: Oxford university press.

Nnorom, N. R. & Erhabor, P. O. (2019). Effect of classroom interaction patterns on secondary school students cognitive achievement in Biology. *International Journal for Cross-Disciplinary Subjects in Education, 10*(1), 3981-3985.

Nwafor, S. C., Ekoyo, D. O. & Ezenwobodo, C. A. (2024). Undergraduate science students' attitude towards practical work in Anambra State, Nigeria. *Academic International Journal of Social Sciences and Humanities, 2*(1), 19-28. https://doi.org/10.59675/S212

Nwafor, S. C., Odukwe, O. C. & Achugbu, C. N. J. (2024). Self-esteem as a correlate of students' achievement in Chemistry in Anambra State, Nigeria. *Indian Journal of Modern Research and Reviews, 2*(5), 20-24. https://doi.org/10.5281/zenodo.11215591

Odionye, N. & Onyegegbu, N. (2022). Interaction styles in senior secondary practical biology classroom in Nigeria. *European Journal of Science, Innovation and Technology, 2*(1), 1-7.

Okoye, P. & Onwuachu, W. C. (2018). Influence of classroom interaction patterns on achievement in Biology among senior secondary school students. *International Journal of Science and Technology, 7*(1), 72-80. http://dx.doi.org/10.4314/stech.v7i1.6

Rido, A., Ibrahim, N. & Nambiar, R. M. K. (2014). Investigating EFL master teacher's classroom interaction strategies: A case study in Indonesian secondary vocational school. *Procedia-Social and Behavioral Sciences, 118,* 420-424. Doi: 10.1016/j.sbspro.2014.02.057

Setianingsih, R. (2018). Patterns of interactions at grade 5 classroom in learning the topic of statistics viewed from cognitive load theory patterns of interactions at grade 5 classroom in learning the topic of statistics viewed from cognitive load theory. *Journal of Physics: Conference Series, 953*, 012212.

Sibomana, A., Nicol, C. B., Nzabalirwa, W., Nsanganwimana, F., Karegeya, C. & Sentongo, J. (2021). Factors affecting the achievement of twelve-year basic students in mathematics and science in Rwanda. *International Journal of Learning, Teaching and Educational Research, 20*(7), 61-84. https://doi.org/10.26803/ijlter.20.7.4

Suleiman, A. (2023) Factors that affect students' academic achievement in the Faculty of Social Science at the University of Bosaso, Garowe, Somalia. *Open Journal of Social Sciences, 11*, 446-461. doi: 10.4236/jss.2023.112029.

Thanh, V. T. & Duyen, D. T. (2021). A study on interaction patterns in language learning online classes – adaptation and efficiency. *Advances in Social Science, Education and Humanities Research, 533*, 54-63

Zhao, C. M. (2016). Factors influencing student participation in classroom interaction. Higher *Education of Social Science, 11*(3), 20-23. http://dx.doi.org/10.3968/8804

AUTHORS BIOGRAPHIES

S. C Nwafor: Department of Science Education at Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

Dr Stephen Chinedu Nwafor is a lecturer in the Department of Science Education at Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. He specializes in Science Education (Chemistry). He obtained his B.Sc(Ed), M.Sc(Ed) and Ph.D in Science Education (Chemistry) from the prestigious University of Nigeria Nsukka. His is a member of Science Teachers Association of Nigeria (STAN) and Teacher Registration Council of Nigeria (TRCN). He is a recipient of an award of excellence and humanitarian service presented by the National Association of Chemistry Students (NACS), Nwafor Orizu College of Education Nsugbe in affiliation with University of Nigeria, Nsukka; in recognition of his selfless contribution and passion for education towards the department and humanity. He is a reviewer in so many Journals namely Cogent Education, Asian Journal of Education and Social Studies, Journal of Education, Society and Behavioural Science, Asian Journal of Advanced Research and Reports, Asian Research Journal of Arts and Social Sciences among others. His research interest include understanding the psychological aspects of learning among science students, Gender issues in STEM, the use of ICT in STEM, entrepreneurship in STEM, pedagogy and the use of AI in STEM including its ethical consideration. He has published several articles in reputable journals (both national and international) and has a significant number of citations. https://orcid.org/0000-0003-2220-9748

Ezenwobodo C. A: Department of Biology, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria

Ezenwobodo Chidimma Adaeze is an accomplished educator with a Bachelor of Science in Education (BSc, Ed) and a Master of Science in Education (MSC Ed). She is a registered member of the Teachers Registration Council of Nigeria (TRCN), reflecting her commitment to professional Standards in teaching. Chidimma has made significant Contributions to the field of Education through her research, having published papers in reputable national and international journals. Her work addresses various aspects of educational practice and policy, showcasing her expertise and dedication to advancing the teaching profession. Known for her resourcefulness, Chidimma excels in teaching and problem - Solving by employing innovative pedagogical methods. She believes in the transformative power of education and actively seeks to enhance learning experiences for her students. Through her innovative approaches, she fosters an engaging and effective learning environment, equipping her students with skills necessary for success. Chidimma's dedication to education and her continuous pursuit of knowledge make her a valuable asset in the academic community.

Ekoyo, D. O: Department of Science Education, Faculty of Education, Nnamdi Azikiwe University, Awka

Ekoyo, Destiny Onyebuchi is a Ph.D student at the Department of Science Education, Faculty of Education, Ebonyi State University, Abakaliki. He is a lecturer at the Department of Science Education in the Faculty of Education, Nnamdi Azikiwe University, Awka. He specializes in Computer Science Education. He has published papers in different national and international journals. He is a member of Science Teachers' Association of Nigeria (STAN) and Teachers Registration

Council of Nigeria (TRCN). He is very resourceful especially in teaching and problem solving using innovative pedagogies. Orcid number: 0009-0004-9123-620X, (do.ekoyo@unizik.edu.ng)

Dr. Ameh, Rachael Folake is a Doctor of Philosophy of Science Education, University of Nigeria, Nsukka. She is a lecturer at the Department of Science Education, Faculty of Education, Federal University Lokoja. She specializes in Chemistry. She has published papers in some international and national journals. She is a member of Chemical Society of Nigeria (CSN) and Teachers Registration Council of Nigeria (TRCN). She is practically and analytically resourceful especially in teaching and problem solving using innovative pedagogies.