Rivers State University Journal of Science and Mathematics Education
(RSUJOSME) 1(1), 65-73

Effect of Learner-Centred Instructional Approach on Students' Performance in Secondary School Biology in Opobo/Nkoro Local Government Area in Rivers State

Ahiakwo, M.J. & **Oko-Jaja**, Peace
Department of Science Education, Faculty of Education,
Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

* Corresponding Author: Oko-Jaja, Peace Email: slimfitisgood@gmail.com

ABSTRACT

The study investigated the effect of learner-centred instructional approach on students' Biology performance in secondary schools in Opobo/Nkoro Local Government Area in Rivers State with two specific objectives. Quasi-experimental research design was adopted for the study. The target population was made up 414 students and teachers from the four senior secondary schools in Opobo/Nkoro Local Government Area, Rivers State. The study adopted purposive sampling technique to select 178 SS1 students in intact classes and the entire 38 biology teachers. Two research instruments were used for this study namely Biology Achievement Test and Extent of Use of ASEI-PDSI instructional approach by Biology Teacher Questionnaire. The coefficient of reliability of the instruments were established using test–retest method. Pearson Product Moment Correlation was used to obtain r-values of 0.82 and 0.86 respectively. The findings of the study show that students taught using activity based instructional strategy achieved higher scores than those taught using lecture method and that there is low level use of Activity Based-Learner Centred Instructional Approach in teaching biology in secondary schools in Opobo/Nkoro Local Government Area of Rivers State. In view of the findings, the study recommends training and re-training of biology teachers on more aspects of the activity based-learner centred instructional approach.

Keywords: Learner-Centred, Instructional Approach, Student performance, Secondary School, Biology.

Cite as:
Ahiakwo, M.J. & Oko-Jaja, Peace (2023). Effect of Learner-Centred Instructional Approach on Students' Performance in Secondary School Biology in Opobo/Nkoro Local Government Area in Rivers State. *Rivers State University Journal of Science and Mathematics Education,* 1(1), 65-73.

INTRODUCTION

Science is the key to the desired growth and development of any nation, Nigeria inclusive. Yet there has been consistent low enrolment and poor performance of students in science in internal and external examinations. Among other factors, it is suspected to be attributed to poor method of teaching or instruction (Emmanuel, Hyaceinth & Basil, 2021). Biology is a science subject embodied with the scientific study of life. It is a scientific, logical, objective, quantitative and qualitative study of life. According to Joda (2019) biology is a life science subject concerned with the study of living organisms with regards to their structure, function, evolution, distribution, identification and taxonomy. Biology is one of the science subjects taught in senior secondary schools in Nigeria. Onu, Anyaegbunam and Uzoigwe (2020) defined biology as a natural science which studies the existence (evolution, morphology and physiology) of living things as well as their interactions with non-living components of the earth. Owolabi, Babatunde and Gambari (2019) noted that the study of biology provides an ideal preparation and a prerequisite for pursing a number of careers in science which include; Medicine, Pharmacology, Biochemistry,

Pharmacy, Botany, Nursing, Agriculture, Microbiology, Zoology and other applied sciences.

According to Emeji (2014), although learning depends on the method adopted by the teacher in teaching a particular concept, skill or process of sciences, a better method is a method the teacher uses that promotes learning and retention. The teaching of biology is dominated by lecture method which is teacher-centred instructional approach. According to Jada (2019) lecture method is a common method employed by teachers in teaching biology and in the course of using this method, teachers act as expository of all knowledge, while the students are passive recipients of knowledge transmitted by the teachers in the process of chalk, blackboard and textbook during instructional delivery. Thus, the need to utilize learner-centred teaching strategy becomes imperative, such as Activity focused methods, Student-centred activities, Experimenting and Improvisation (ASEI). Learner-centred approach (LCA) is a learning strategy that puts the learner at the focal point. In this approach, there is a shift from the teacher to the learner. The learner is at the heart of the learning process and the teacher mainly facilitates the process by guiding. In this scenario, the teacher should consider the varying learning ability among pupils. This LCA ensures learners' independence via active participation (LCA gives an intrinsic motivation for learning mainly emphasizing on cooperation rather than competition among learners (Namuyenga, Milded & Joseph, 2019).

One innovation in strategy to salvage the lapses of our traditional classroom practices is the use of activity-based and learner such as the ASEI-PDSI approach. ASEI-PDSI stands for activity student- centred, experiments and improvisation- Plan, Do, See and Improve. The ASEI principle is one of the participatory approaches that call for a paradigm shift from conventional practice of teacher-centred and knowledge- based teaching, through PDSI approach to pupil-centred and activity-based method (SMASE, 2006). ASEI-PDSI approach of teaching is very effective in the teaching and learning of basic science since it deals with learning through actual practice with learning materials or equipment and teaching through previous knowledge of the student's ability and response. The use of ASEI-PDSI approach does not only cater for improvisation and materials but also take care of individual differences there by considering students of high and low abilities, encourages knowledge discovery by the pupils, with these the application of the features of ASEI-PDSI approach in the teaching of basic science in all our primary schools will promote quality teaching and learning thereby making learning more effective than any other methods Consequently, the learners' academic performance will improve and according to the national policy on education (FME 2004) which state that one of the objectives of science education is to lay a sound basis for scientific and critical reflective thinking will be achieved (Emeji, 2014).

Looking at the first part of the above ASEI-PDSI approach, ASEI (activity, student-centered, experiment, improvisation) has been seen as a way of engaging learners in experiments and practical activities even in situations where conventional resources are lacking. This can be through improvisation which also helps to develop creativity and linking school learning with immediate learners' environment from where the improvised resources are sourced. PDSI (plan, do, see, improve) as the second part of the approach is a strategy of teaching in which teachers plan the lesson,

deliver it and improve their specialty and teaching ability through observing and reflecting from daily classes. According to Namuyenga *et al* (2019), PDSI is a process of checking the progress of an activity against its plan and answering the question of how the activity is being carried out in relation to the intended objectives. The teacher should plan his lesson taking into account the objectives which should be Specific; Measurable; Achievable; Realistic and Time bound (SMART), the level of the learner and their prior knowledge, teaching and learning materials and methods of teaching as well as the criteria of evaluation. During the teaching learning process, the teacher should ensure total involvement of the learner in the lesson and make an evaluation of the lesson verses his plan. Evaluation is vital in reflecting on teaching for improvement and should involve comments from both the teacher and the pupils. This helps to enhance performance and improve learning process (Centre for Mathematics, Science and Technology Education in Africa, 2011).

Teaching methods/models can be out of date but lesson study cannot be out of date because it is a learning cycle. Lesson study can be continued as long as there is a cycle system and the place where teachers get together, even if teachers change the teaching methods/models. A class is deemed to change moment to moment based on how each student reacts on what the teacher says. It is important to plan considering children's response such as where children have difficulties and how to deal with the difficulties children have. If children have responded in an unexpected way, teachers need to change their plan promptly so that the class can facilitate children's learning most effectively rather than proceeding class as it was planned by direct teaching presentation (SMASE in CEMASTEA, 2013).

Statement of the Problem

Before the introduction of activity based-learner centred instructional approach (ASEI-PDSI), the teaching of biology was characterized by knowledge based teaching, teacher-centeredness, transmission of facts and concepts as well as learning of science through large scale recipe type experiments described in text books. Also, certain biology concepts are perceived difficult for the teachers to teach and problematic for the learners to comprehend. Agboghoroma and Oyorwi (2015) observed that growth and excretion system are among difficult and problematic concepts in Biology.

Thus, research in Science Education and State Government has continued to seek better ways of teaching Biology through training of teachers on different teaching methods. Despite the fact that the training had result in remarkable improvement on students' academic achievement in biology examination in secondary schools, there is still room for excellent outstanding students' academic achievement of students in Biology through the use of learners centered teaching approach. It has thus become necessary for the present study to investigate the effect of learner centered instructional approach on students' performance in secondary school Biology in Opobo/Nkoro Local Government Area in Rivers State.

Purpose of the Study

The main purpose of this study was to investigate the effect of learner centred instructional approach on students' performance in secondary school Biology in Opobo/Nkoro Local Government Area in Rivers State. Specifically, the study sought to examine the:

1. The effect of using learner centred instructional approach and lecture method on academic performance of students in biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State.
2. The extent of use of learner centered instructional approach by biology teacher in teaching biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State.

Research Questions

The following research questions guided the study;

1. What is the effect of using learner centred instructional approach and lecture method on academic performance of students in biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State?
2. To what extent do Biology teachers use learner centred instructional approach in teaching biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the mean achievement scores of students taught using learner centred instructional approach and those taught using lecture methods in biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State.
2. There is no significant difference in the response of male and female teachers on the extent of use of learner centred instructional approach by biology teacher in teaching biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State.

METHODOLOGY

The research design adopted for this study a quasi-experimental research design. The area of this study covers senior secondary schools in Opobo/Nkoro Local Government Area of Rivers state. The target population was made up 414 students and teachers from the four senior secondary schools in Opobo/Nkoro Local Government Area, Rivers State. The study adopted purposive sampling technique to select 178 SS1 students in intact classes and the entire 38 biology teachers. Two research instruments were adopted for this study namely Biology Achievement Test (BAT) which contains 30 multiple choice questions based on the Senior Secondary School Biology Curriculum and Extent of Use of ASEI-PDSI Approach by Biology Teacher Questionnaire (EUAABTQ). The EUAABTQ instrument is made up of a total of 15 items. Generally, the EUAABTQ questionnaire adapted the four (4) point rating scale of: Very High Extent (VHE) = 4, High Extent (HE) = 3, Moderate Extent (ME) = 2, Low Extent (LE) = 1.

Two lecturers in Science Education Department and one lecturer in Measurement and Evaluation validated the instrument, while the reliability coefficient was determined by test–retest method after administering it to 30 respondents who were not part of the sample and calculated to be of 0.82 and 0.86 respectively using Pearson product moment correlation coefficient. The questionnaire was administered to the respondents on a one-on-one basis by the researcher with the assistance of the class

form masters. A total of 216 questionnaires were administered and 216 retrieved. This gives a return rate of 100% return rate.

Data obtained from the questionnaire was analysed using a Mean and Standard Deviation. Also, z-test was used to test the stated hypotheses, if there is any significant mean difference between stated variables at a significance level of 0.05. The null hypothesis was rejected if the calculated z-value is greater than the tabulated z-value, else the null hypothesis was accepted if the calculated z-value is less than the tabulated z-value. The Statistical Package for Social Sciences (SPSS, v. 20) was used for the analysis. The results were presented using tables. A criterion mean of 2.5 was adopted as decision rule for the research questions.

The following topics were taught: Organization of life, the cell and its environment (Osmosis and Diffusion) and Nutrition for six (6) weeks and the lesson plan was developed by the researcher. Before the treatment, the instrument was administered to the experimental and control group as pre-test and after treatment as post-test. The experimental group were taught using learner centred approach (ASEI-PDSI) while those in the control group were taught using conventional lecture method. Before administering the instrument for post-test, the items were reshuffled to avoid test wiseness. The researcher divided the sample of the students into two groups of 98 and 80 students and assigned to the experimental and control groups respectively.

RESULTS

Research Question 1

What is the effect of using learner centred instructional approach and lecture method on academic performance of students in biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State?

Table 1

Mean Scores and Standard Deviation of Students Taught with Learner-Centred Instructional Approach (ASEI-PDSI) and those Taught with Lecture Method

Group	N	Pre-test		Post-test		Mean Difference
		$\bar{X}$	S.D	$\bar{X}$	S.D	
Learner Centered	98	16.14	5.18	72.13	6.93	55.99
Lecture Method	80	15.96	5.15	38.81	8.47	22.85

Table 1 shows 16.14 pre-test mean score for students taught with ASEI-PDSI and 15.96 obtained for those taught with Lecture Method. Their post-test mean scores were 72.13 and 38.81 respectively. The table also reveals the mean differences of these groups were 55.99 and 22.85 for learner centred instructional approach and Lecture Method respectively. The mean difference (55.99) of the experimental group (learner centred instructional approach) is higher than 22.85 for the control group (Lecture Method). The Table shows that students taught with activity based-learner centred instructional approach obtained higher scores than the lecture method group.

Research Question 2

To what extent do Biology teachers use learner centred instructional approach in teaching biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State?

Table 2

Mean and Standard Deviation of Male and Female Teachers on the Extent of use of Learner Centred Instructional Approach by Biology Teachers

S/N	Items	Male Teachers N=22			Female Teachers N=16		
		$\bar{X}$	S.D	Remark	$\bar{X}$	S.D	Remark
1	Teachers allow us to carry out hands-on activities	1.05	0.21	LE	1.06	0.24	LE
2	Teachers involve us in group discussion	1.14	0.34	LE	1.06	0.24	LE
3	Teachers use examples from our daily life	1.55	0.66	LE	2.06	0.56	LE
4	Teachers allow us to ask questions where we don't understand	2.86	0.69	HE	2.50	0.94	HE
5	Teachers allow us to explain our ideas on the chalk board	1.09	0.29	LE	1.19	0.39	LE
6	Teachers encourage us to carry out experiments and report our observations in class	1.09	0.29	LE	1.06	0.24	LE
7	Teachers allow us to make creative things for use in our science lessons	1.27	0.45	LE	1.31	0.46	LE
8	Teachers bring interesting learning materials in class	1.14	0.34	LE	1.38	0.60	LE
9	Teachers use teaching materials from our local environment.	1.05	0.21	LE	1.13	0.33	LE
10	Teachers take us outside the classroom for nature walk	1.18	0.49	LE	1.25	0.43	LE
11	Teachers guide us on assignments	3.55	0.58	HE	3.06	0.43	HE
12	Teachers goes round in class marking and correcting our work	2.05	0.64	LE	2.38	0.60	LE
13	Teachers test us on what we have been taught to gauge their understanding	3.50	0.72	HE	3.06	0.56	HE
14	Other science teachers come to observe our class lessons	1.00	0.00	LE	1.13	0.33	LE
15	Teachers assist us to correct our assignments	3.50	0.84	HE	3.06	0.43	HE
	Grand Mean	**1.80**		**LE**	**1.78**		**LE**

Table 2 presents the mean rating and standard deviation of Male and Female teachers on the extent of use of ASEI-PDSI Approach by biology teacher in teaching Biology in secondary schools in Opobo/Nkoro LGA in Rivers State. The grand means of 1.80 and 1.78 of male and female teachers respectively as shown in the table 3 indicates that extent of use of activity based-learner centred instructional approach (ASEI-PDSI) by biology teachers in teaching Biology in secondary schools in Opobo/Nkoro LGA in Rivers State, is Low.

Hypothesis 1

There is no significant difference in the mean achievement scores of students taught biology using learner centred instructional approach and those taught using

lecture methods in secondary schools in Opobo/Nkoro Local Government Area in Rivers State.

Table 3

z-test of Difference Between students Taught Biology Using Learner centred Instructional Approach and Those Taught Using Lecture Method

Respondents	Mean	S.D	N	S.E	z-cal.	z-crit.	Remark
ASEI-PDSI	72.13	6.93	98	1.18	28.30	1.96	Reject
Lecture Method	38.81	8.47	80				

The analysis of Table 3 showed that z-calculated value of 28.30 is greater than the z-critical value of 1.96 and as such the null hypothesis which states that there is no significant difference in the mean achievement scores of students taught biology using learner centred instructional approach instructional approach and those taught using lecture methods in secondary schools in Opobo/Nkoro LGA in Rivers State is rejected. This implies that there is significant difference in the mean achievement scores of students taught biology using activity based-learner centred instructional approach (ASEI-PDSI) and those taught using lecture methods in secondary schools in Opobo/Nkoro Local Government Area in Rivers State. Students taught using activity based-learner centred instructional approach (ASEI-PDSI) had higher performance.

Hypothesis 2

There is no significant difference in the response of male and female teachers on the extent of use of learner centred instructional approach by biology teacher in teaching biology in secondary schools in Opobo/Nkoro Local Government Area in Rivers State.

Table 4

z-test of Difference Between Male and Female Teachers on the Extent of Use of Learner Centred Instructional Approach by Biology Teachers

Respondents	Mean	S.D	N	S.E	z-cal.	z-crit.	Remark
Male Teachers	1.80	0.45	22	0.15	0.14	1.96	Accept
Female Teachers	1.78	0.45	16				

Table 5 shows that z-calculated value of 0.14 is less than the z-critical value of 1.96 and as such the null hypothesis which states that there is no significant difference in the response of male and female teachers on the extent of use of learner centred instructional approach by biology teachers in teaching biology in secondary schools in Opobo/Nkoro LGA in Rivers State is accepted. This implies that both male and female Biology teachers agree that the use of activity based-learner centred instructional approach (ASEI-PDSI) in teaching is Low.

DISCUSSION OF FINDINGS

The findings from the study showed that the students taught using ASEI-PDSI instructional approach performed significantly better than the students taught using Lecture Method. This significant difference can be attributed to the involvement of students in learning activities or classwork which is student centred and participatory aspect of ASEI which leads to constructivism, learning and brings about retention in what is learnt. This in line with the findings of Emeji (2015) that activity based-learner centred instructional approach (ASEI-PDSI) helps in the development of inquiry behaviour of the learner; provides an avenue for students to share their ideas; promotes

the spirit of team work and cooperation; helps to develop the students thinking and listening skills; encourages the use of locally made materials; takes care of the needs of pupils' individual differences; simplifies attainment of learning objectives; gives students the opportunity to learn by making new discovering, identifying problems and finding possible solutions. The result of this study also agrees with Otutu (2014) who stated that active learning method has become preferred way to change the traditional teacher centred classroom into newer student centred approach to learning. The findings of this study is in line with the study of Emmanuel, Hyaceinth and Basil (2021) whose study found out that it was found that the students performed better in ASEI-PDSI approach than they do in demonstration method and discussion method. The use of methods that are not activity-based in teaching basic science hinders the students' academic achievement as was observed that the students taught using discussion method performed lower than those taught with demonstration whereas students taught with learner centred instructional approach performed very well.

The findings from this study also showed that there is a Low level use of learner centred instructional approach by biology teachers in teaching Biology in secondary schools in Opobo/Nkoro LGA in Rivers State. The findings of this study agrees with the study of Ndirangu, Nyagah and Gerald (2017) who reported that the majority of the teachers (75%) were partial implementers and only (5%) were full implementers of ASEI-PDSI instructional approach. Also, the findings of this study is similar to those in a survey by CEMASTEA (2011), which revealed that only 40% of the teachers were found to be using ASEI-PDSI practices.

CONCLUSION

From the findings of the study, it can be concluded that biology students who are taught using ASEI-PDSI instructional approach have better mean achievement in biology in secondary schools in Opobo/Nkoro LGA in Rivers State. Also, it can be seen that there is a low level use learner centred instructional approach in teaching biology in secondary schools in Opobo/Nkoro LGA in Rivers State.

RECOMMENDATIONS

The following recommendations are made based on the findings of this study.

1. Training and re-training of biology teachers on more aspects of the activity based-learner centred instructional approach (ASEI-PDSI) for better implementation during lesson delivery
2. Regular and proper supervision of biology teachers will go a long way to make the teachers use activity based-learner centred instructional approach (ASEI-PDSI) during lesson delivery
3. Schools should be properly funded and laboratories should be well equipped to aid the implementation and use of activity based-learner centred instructional approach (ASEI-PDSI) during lesson delivery by biology teacher.

REFERENCES

Association for the Development of Education in Africa, (2014*).* The integration of ICT into education and training systems in Africa; The cases of Argentina, Burkina Faso, Cote de Voire, Paraguay, Senegal, Tunisia. Abidjan*:* ADEA.

Agboghoroma, T.E. & Oyovwi, E.O. (2015). Effect of students' academic

achievement on identified difficult concepts or topics in Senior Secondary School biology in Delta State, *Nigeria Journal of Education and Practice*, 6(30), 117-125.

Centre for Mathematics, Science and Technology Education in Africa, (2011). Current status of Mathematics and Science Education; Findings of the Needs Assessment Survey; Primary Mathematics and Science Education: QASOs' workshop. CEMASTEA Kenya.

Centre for Mathematics, Science and Technology Education in Africa (2013). Effective Implementation of SMASE Primary Activities for sustainable ASEI-PDSI practice; Head teachers' Workshop manual, CEMASTEA, Kenya.

Emmanuel, O. E., Hyaceinth, A. O. & Basil, N. N. (2021). Effects of using ASEI-PDSI approach of teachingon the academic performances of students in basic science in junior secondary schools. *Global Scientific Journals*, 9(2), 1467-1474.

Emeji E.O. (2014). Effective teaching and learning basic science and technology through an ASEI-PDSI approach. *The journal of Emergent Science*. **7**, 16-18.

Federal Ministry of Education. (2004). *National policy on Education*. Abuja, Nigeria. Federal Ministry of Education.

Joda, F.M. (2017). Effects of instructional Scaffolding strategy on students' academic achievemrnt and attitudes towards chemistry in Jalingo education Zone of Taraba State, Nigeria. *Ilorin Journal of Education*, 40(1), 1-15.

Namuyenga, W.S.A., Mildred, A. & Joseph, R. (2019). Extent of use of ASEI-PDSI approach in teaching of science in primary schools in Emuhaya sub-county, Vihiga County, Kenya. *European Journal of Education Studies*, 6(7), 322-344.

Onu, W.O. Anyaegbunam, N.J. & Uzoigwe A.V (2020). Improving biology students interest and achievement trough collaborative instructional strategy, *British Journal of Education Society and Behavioural Science*, 33 (2)9-20.

Owolabi, O. Babatunde, A.T. &Gambari, A.I (2019) Effect of computer animation instructional package on secondary school students' achievement in biology in Niger State. *Nigeria Journal of Science, technology, mathematic and education,* 15(1)240-246.

Ovansa, J. U; (2017). Effect of socio-economic status on the academic performance of senior secondary school students (A case study of public senior secondary schools in Adavi L.G.A of Kogi State*). International Journal of Education and Evaluation*, 3 (8) 2017. www.iiardpub.org

United Nations Educational, Scientific and Cultural Organization, (2016). Education for people and planet: Creating sustainable future for all. Paris: UNESCO