

Using Field Trip Method to Enhance Scientific Literacy Acquisition Among Basic Science Students in Rivers State

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Abstract

The study investigated the effects of field-trip instructional method as against conventional method on the enhancement of scientific literacy acquisition among Basic science students in selected secondary schools in Etche Local Government Area of Rivers State. As to elicit information on the usability strategy for enhancement of scientific literacy acquisition. The study employed quasi-experimental, non equivalent control group, pre-test posttest design. The population for the study were 237 students which comprised of junior secondary school students from JSS I-III from the selected public schools in Etche Local Government Area of Rivers State. The study sample consisted of 130 Junior secondary JSS (JSS II) students in two intact classes from the study area using a-simple random sampling technique. The instruments used for data collection were Basic science Process Skill Achievement Test on Photosynthesis (BSPSATP), and the Basic science Rating Scale on Process Skills Development (BSRSPSD). Data collected were analysed using mean, standard deviation to answer the research questions, while Analysis of Covariance (ANCOVA) were used to test null hypotheses at 0.05 level of significance. The results of the study showed that there is significant difference on the effect of field-trip and conventional methods on the acquisition of skills, ($F_{(1-128)}=248.42, pP= 0.00 < 0.05$), observation skills, ($F_{(1-128)} = 354.20, pP = 0.00$), and predictive skills, ($F_{(1-128)} = 315.81, pP=0.00$) by Basic science students. Based on the findings of the study, it was concluded that the field-trip instructional method is effective and innovative method that teachers could use in improving students skills' acquisition.

Keywords: Fieldtrip method, scientific literacy acquisition, Basic science students

Introduction

Science is a universal subject that spans the branch of knowledge that examines the structure and behaviour of the physical and natural world through observation and experimentation Science education is most commonly broken down into the following components: Biology, Chemistry, physics and Basic science in JSS class with the application of educational principles (Nwala, 2018). However, due to the importance attached to science education all over the world, it has been postulated that a nation lacking in science skills will forever depend on those who claim to be the custodians of scientific knowledge, even if such a country has crude oil (Olajide & Aladejana, 2019) and they will be a stodge to scientific communities all over the world. Scientific literacy is a sin-quo-non to human and societal development therefore the yielding of every nation is to join in this academic parade.

Suffice to say, scientific literacy is one of the few issues that the leaders around the world accept without reservation and beneficial to all societies. Scientific literacy has received attention over the years, but there is virtually no consensus on its definition (Salamon, 2017). However, in the context of this study, the acquisition of scientific literacy is measured in terms of students' skills acquisition.

Based on this background, it is obvious that science subjects are necessary for development of science and technology. Thus, science is one of the most important subjects in school due to its relevance to students' lives and the universally applicable problem-solving and critical thinking skills it uses and develops. These skills are lifelong skills that allow students to generate ideas, weigh decisions intelligently and even understand the evidence behind public policy-making. Engaging young learners with exciting experiences, motivates them to learn and pursue the sciences throughout school. Teaching technological literacy, critical thinking and problem-solving through science education gives learners the skills and knowledge they need to succeed in school and beyond (Olajide, 2017).

The need to enhance scientific literacy acquisition among students is the very essence why students strive to possess mastery of the necessary science process skills so that they can succeed in science inquiry and hands-on science activities. These skills form the foundation and method of actual scientific inquiry that are often used in science classes. Without a mastery of the science skills it becomes very difficult for students to acquire any form of scientific literacy. However, the skills encompass the 12 basic skills which can be group under basic science process skills and integrated science

process skills. The basic science process skills include observing, classifying, communicating, measuring and using numbers, predicting, making inferences, and using space-time relationship. On the other hand, the integrated science process skills include identifying and controlling variables, making hypotheses, interpreting data, defining operationally, and experimenting.

The ability to make good observations is also essential to the development of the other science process skills; identification, communication, observation, classifying, measuring, inferring and predicting Olalide, (2017).

Students are more likely to retain information, being immersed in information and being involved in visual and practical experiences will help students remember, learn and understand subjects taught better. Going on field trips offers students a unique cultural learning experience, since it allows them to be involved in new environments, which is a key to encouraging curiosity about a given subject. It is also valuable as an exercise in broadening students' understanding of the world and their place, since educational trips encourage the development of social, civic, personal and study skills (Aladejana, 2019)..

Statement of the Problem

One common problem usually encountered by science students in Nigeria's system of education has over the years been the issue of lack of exposure to hand-on-learning and exposure to a real-time learning experience. The lack of these innovative approaches to learning may be the reason why the country has remained backward in the development of science and technology as compared to other neighboring African countries.

The quest to be scientifically literate which in the real sense is needed to enhance economic growth at all levels of human existence; both in the school and the society is habitually impeded by the approach utilized to teach by the science teachers. For instance, in a situation where students were not given the chance to develop their thinking skills because they are not allowed to think fully by themselves.

It has been observed from experience that the well-known approach teachers utilize in instructing students, especially in science classes is such that students are first lectured by the teachers with the necessary concepts and information before proceeding to experiments or hands-on-learning- in few cases, which unfortunately, impedes the development of scientific literacy acquisition among learners, and this type of educational setting

is exactly the opposite of what the science education framework aims to develop among the learners quite unfortunate and laughable.

Some other identified factors that are responsible for this malady faced by science students include; learning difficulty, teachers' factor, students' factors, anxiety, and fear for the subject among others, (Aladejana, 2019). As such over the years stakeholders have expressed their concern over the lacked concern from the government to improve science education, as well as the lack of innovation by teachers in driving science education to an enviable height, such that the country can compete with European countries side-by-side in terms of innovation in science and technology. In response to these aspirations by stakeholders, researchers and educators have experimented on the extent to which instructional strategies could enhance students' scientific literacy acquisition through the acquisition of science process skills (observation, classification, communication, measurement, inference and prediction) as well as to improve their performance.

Therefore there is an urgent need to improve the teaching and learning of science in Nigeria schools to pave way for the ease in the acquisition of scientific literacy if the Nigerian system of education is to compete successfully in the technology-intensive global markets as the world is rapidly moving to the age where without investing in science there will be no development. Therefore, it is based on the foregoing backdrop that this study was conceived to investigate the effect of field-trip method on the enhancement of scientific literacy acquisition among Basic Science students in selected secondary schools in Etche Local Government Area of Rivers State.

Purpose of the Study

The purpose of this study was to investigate the effect of field-trip method on the enhancement of scientific literacy acquisition among Basic science students in selected secondary schools in Etche Local Government Area of Rivers State. The specific objectives of the study were to:

1. Determine the effect of the use of field-trips method and conventional method on the acquisition of identification skills by Basic science students.
2. Investigate the effect of the use of field-trips method and conventional method on the acquisition of observational skills by Basic science students.
3. Find out the effect of the use of field-trips method and conventional method on the

acquisition of predictive skills by Basic science students.

Research Questions

The study was guided by the following research questions:

1. What is the effect of field-trips method and conventional method on the acquisition of identification skills by Basic science students?
2. What is the effect of field-trips method and conventional method on the acquisition of observational skills by Basic science students?
3. What is the effect of the use of field-trips method and conventional method on the acquisition of predictive skills by Basic science students?

Hypotheses

The following null hypotheses were formulated to be tested at the 0.05 level of significance;

1. There is no significant effect of field-trips method and conventional method on the acquisition of identification skills by Basic science students.
2. There is no significant effect of field-trips method and conventional method on the acquisition of observational skills by Basic science students.
3. There is no significant effect of field-trips method and conventional method on the acquisition of predictive skills by Basic science students.

Methodology

The study adopted a quasi-experimental non equivalent control group pre-test post-test design. This design is represented, illustrated thus:

E ₁	O ₁	X ₁	O ₂
C ₂	O ₃	X ₂	O ₄

Where: E₂ = Experimental group.

C₁ = Control group

O₁ = Pre-test for score for experimental group

O₂ = Post-test score for control group

X₁ = Treatment on experimental group

X₂ = Treatment on control group.

Population

The population of students in the selected schools was 237 students from JSS 1-3. This population comprised of III students from Government Secondary School Ozuzu, and 126 students from

Community Secondary School Igbo Etche (Source: Planning Research and Statistics, UBE Schools Board, Port Harcourt, 2020/2021 Academic Session).

Sample and Sampling Technique

The study utilized a sample of 130 students from JSS classes. This comprised of 54 students from GSS Ozuzu (26 males & 28 females), and 76 JSS students from CSS Igbo Etche (42 males & 34 females). However, the simple random sampling technique was used in selecting the schools used while the purposive sampling technique was utilized in selecting the class of students; this was due to the fact that the JSS students have been exposed to a vast aspect of science education as compared to the JSS I students, while the JSS III students are at the verge of rounding off their programme. However, an intact class was used for the study; hence no sampling was carried out in selecting the students used for the study.

Instruments

Two (2) researcher's constructed instruments tagged Basic science Process Skill Achievement Test on Photosynthesis (BSPSATP) and Basic science Rating Scale on Process Skills Development (BSRSPSD) were used for data collection. The BSPSATP consisted of 15 essay questions drawn from the content area of the study while the BSRSPSD comprised of 15 items, of which five (5) items each assessed the level of identification, observation, and predictive process skills developed by the students. The 4-point scoring grade scale in order to assess the students' identification, observation, and prediction skills using: Very Good (4) Good (3), Fairly Good (2) and Poor (1). Each student was assessed using the BSPSATP and the BSRSPSD as the instrument of the study.

Validity of the Instruments

The research instruments were vetted by two experts in the field of Science education including; two of the researcher colleagues who have taught Basic science in JSS II for more than five (5) years. These people ensured that the face, content coverage, language were clear.

Reliability of the Instrument

A reliable instrument is that which is consistent in measuring a particular variable it is designed for, therefore the reliability of the instrument was done using a t-test-retest method. That is, twenty (20) students were administered the instruments without

any form of treatment and after two weeks, the instrument was re-administered. The data collected was analyzed using, Pearson Product Moment Correlation Statistics and a reliability coefficient value of 0.81 was obtained.

Method of Data Collection

Permission was sought from the principals and heads of Basic science departments of the two schools that were used for the research study through an official letter that was written by the researcher. The consent and cooperation of the Basic science teachers in the two schools used; for which one of the schools was used for the experimental group while the other was used for the conventional group. As such their assistance was solicited to support the researcher for the period of the study.

The teacher for the experimental group was guided on how to carry out the field-trip method of instruction which was concerned with hands-on-learning and concrete experiences approach which focused on; the concept of photosynthesis. On the other hand, the teacher for the conventional group was provided with a validated lesson plans package that was prepared by the researcher on photosynthesis.

On the first visit to the selected schools; the pre-test was administered just, on a subsequent scheduled meeting the researcher assistants started teaching

the topic of the study. The teaching of the concept of photosynthesis in the conventional class setting lasted for three weeks, while the students of the experimental group had three field-trip outings as well; where the concept of photosynthesis was taught using natural sites, and experimental lessons on each of the field-trips embarked upon. The overall aim of the treatment especially in the experimental group was to enhance the acquisition of scientific literacy through exposure to the acquisition of science process skills.

The Basic Science Process Skills Achievement Test on Photosynthesis (BSPSATP) was re-administered as a post-test on both experimental groups and control group at the end of the three weeks and the students were scored or graded using the marking guard and the Basic Science Rating Scale on Process Skill Development (BSRSPSD); this was done by the researcher with the help of the research assistants in the selected schools.

Method of Data Analysis

The data collected were analyzed using descriptive and inferential statistics. The research questions were answered using mean and standard deviation, while the null hypotheses were tested using Analysis of Covariance (ANCOVA) at the 0.05 level of significance.

Result

Table 1: Mean and Standard deviation of pre-test and post-test of the effect of the use of field-trips method and conventional method on the acquisition identification skills by Basic Science students

Teaching Method	n	Pretest		Posttest		Mean Gain
		\bar{x}	SD	\bar{x}	SD	
Fieldtrip Method	54	46.94	6.40	95.65	7.34	48.71
Conventional Method	76	47.11	6.39	61.05	14.88	13.94

Source: SPSS Computation

Table I shows the effect of the use of field-trips method and conventional method on the acquisition, identification skills by Basic Science students. The result indicated that students taught Basic Science using field-trip teaching method

performed better (Pretest; \bar{x} = 46.94, SD = 6.40),

(Post-test; \bar{x} = 95.65, SD = 7.34), Mean (Gain= 48.71) than student taught using conventional

teaching method (Pretest; \bar{x} 47.11, SD = 6.39),

(Post-test; \bar{x} = 61.05, SD = 14.88), Mean (Gain = 13.94). The implication of this result is that the utilization of field-trips method in teaching Basic Science proved more effective in the enhancement of students' acquisition of identification skills which make them scientific literate.

Table 2: Mean and Standard deviation of pre-test and post-test of the effect of the use of field-trips method and conventional method on the acquisition observational skills by biology students

Teaching Method	n	Pretest		Posttest		Mean Gain
		\bar{x}	SD	\bar{x}	SD	
Fieldtrip Method	54	46.02	22.79	96.76	7.84	50.74



Conventional Method	76	45.79	15.01	60.79	12.38	15.00
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Source: SPSS Computation

Table 2 shows the effect of the use of field-trips method and conventional method on the acquisition, observation skills by Basic Science students. The result indicated that students taught Basic Science using field-trip teaching method performed better (Pretest; $\bar{x} = 46.02$, $SD = 22.79$), (Post-test $\bar{x} = 96.76$, $SD = 7.84$), Mean (Gain =

50.74) than students taught using conventional teaching method (Pretest; $\bar{x} = 45.79$, $SD = 15.01$), (Post-test; $\bar{x} = 60.79$, $SD = 12.38$), Mean (Gain = 15.00). The result implies that the utilization of field-trips method in teaching Basic Science proved more effective in the enhancement of students' acquisition, observation skills.

Table 3: Mean and Standard deviation of pre-test and post-test of the effect of the use of field-trips method and conventional method on the acquisition predictive skills by Basic Science students

Teaching Methods	N	Pretest		Posttest		Mean Gain
		\bar{x}	SD	\bar{x}	SD	
Fieldtrip Method	54	45.74	13.61	97.31	5.56	51.57
Conventional Method	76	43.22	15.38	63.22	13.28	10.00

Source: SPSS Computation

Table 3 shows the effect of the use of field-trips method and conventional method on the acquisition of predictive skills by basic science students. The result indicated that students taught basic using field-trip teaching method performed better (Pretest; $\bar{x} = 45.74$, $SD = 13.61$, Post-test; $\bar{x} = 97.31$, $SD = 5.56$, Mean Gain = 51.57) than student

taught using conventional teaching method (Pretest; $\bar{x} = 43.22$, $SD = 15.38$, Post-test; $\bar{x} = 63.22$, $SD = 13.28$, Mean Gain 10.00). The result implies that the utilization of field-trips method in teaching basic science proved more effective in the enhancement of students' acquisition of predictive skills

Table 4: Summary of Analysis of Covariance (ANCOVA) on the difference in the pre-test and post-test of the effect of the use field trips method and conventional method on the acquisition identification skills by Basic Science students.

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	37783.63 ^a	1	37783.63	248.42	0.00
Intercept	775186.70	1	775186.70	5096.74	0.00
Group	37783.63	1	37783.63	248.42	0.00
Error	19468.10	123	152.10		
Total	796775.00	130			
Corrected Total	57251.73	129			

a. R Squared = .660 (Adjusted R Squared = .657) Source: SPSS Computation

Table 4 shows that there is a significant difference in the effect of the use of field-trips method and conventional method on the acquisition identification skills by Basic Science students, (F

(1-128) = 248.42, $pP = 0.00 < 0.05$). Hence, null hypothesis one is rejected at the 0.05 level of significance

Table 5: Summary of Analysis of Covariance (ANCOVA) on the difference in the pre-test and posttest of the effect of the use of field-trips method and conventional method on the acquisition of observational skills by Basic Science students

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	40845.08 ^a	1	40845.08	354.20	0.00
Intercept	783598.92	1	783598.92	6795.21	0.00
Group	4084.08	1	40845.08	354.20	0.00
Error	14760.50	123	115.32		

Total	801175.00	130
Corrected Total	55605.58	129

a. R Squared = .735 (Adjusted R Squared = .732) **Source:** SPSS Computation

Table 5 shows that there is a significant difference in the effect of the use of field-trips method and conventional method on the acquisition of observational skills by Basic Science students, (F(1-128)= 354.20, $pP= 0.00$). Hence, null hypothesis two is rejected at the 0.05 level of significance.

Table 6: Summary of Analysis of Covariance (ANCOVA) on the difference in the pre-test and post-test of the effect of the use of field-trips method and conventional method on the acquisition predictive skills by Basic Science students

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	36689.92 ^a	1	36689.92	315.81	0.00
Intercept	813621.46	1	813621.46	7003.20	0.00
Group	36689.92	1	36689.92	315.81	0.00
Error	14870.85	123	116.18		
Total	830050.00	130			
Corrected Total	51560.77	129			

a. R Squared = .712 (Adjusted R Squared = .709) **Source:** SPSS Computation

Table 6 shows that there is a significant difference in the effect of the use of field-trips method and conventional method on the acquisition of predictive skills by Basic Science students, (F(1-128) = 315.81, $pP= 0.00$). Hence, null hypothesis three is rejected at the 0.05 level of significance.

Discussion

The study investigated the effect of field-trip method on the enhancement of scientific literacy acquisition among basic Science students in selected secondary schools in Etche Local Government Area of Rivers State. The result in Table I shows that the utilization of field-trips method in teaching Basic Science proved more effective in the enhancement of students' acquisition of identified skills; while the result in Table 2 shows that the utilization of field-trips method in teaching Basic Science proved more effective in the enhancement of students' acquisition of observational skills. Table 3 showed that the utilization of field-trips method in teaching Basic Science proved more effective in the enhancement of students' acquisition of predictive skills. While The result of table 4 shows that there is a significant difference in the effect of the use of field-trips method and conventional method on the acquisition of identified skills by Basic Science students. This finding is in agreement with a similar study conducted by Irinoye, Bamidele, Adetunji and Awodele (2015), who examined the relative effectiveness of field-trips method and demonstration method on student's performance in practical Basic Science among secondary school students in Ifelodun Local Government Area in

Osun State. The findings indicated that; students achieved and retained more practical Basic Science knowledge when taught using field-trips method than with demonstration

Also, the result of table 5 showed that there is a significant difference in the effect of the use of field-trips method and conventional method on the acquisition of observational skills by Basic Science students. This finding is consistent with the findings of Ugwuadu (2018) who examined the effect of field-trips method and lecture methods on students' academic achievement in Basic Science: a case study of Yola North Local Government Area of Adamawa State. The findings indicated that; there is a significant difference between the achievements of students taught with field-trips method and those taught with lecture method in favour of field-trips method.

The result of table 6 showed that there is significant difference in the effect of the use of fieldtrips method and conventional method on the acquisition of predictive skills by basic science students. This finding is consistent with the findings of Olajide, (2019), who examined the effects of field trip and peer tutoring instructional strategies (as against the conventional method of teaching) on secondary school students' science process skills (observation, classification, communication, measurement, inference and prediction) acquisition in Basic Science and Technology in Junior Secondary Schools (JSS) in Osun State. The study revealed that there was significant effect of the treatment (use of field trip and peer tutoring) on science process skills of secondary school students as

follow: Observation ($F=1.030$, $p<0.05$), classification ($F=3.529$, $p<0.05$), communication ($F=1.326$, $p<0.05$), measurement ($F=6.623$, $p<0.05$), inference ($F=12.310$, $p<0.05$) and prediction ($F=21.210$, $p<0.05$); with peer tutoring leading in observation, classification, communication and measurement skills of students in Basic Science and Technology with $\bar{x}=30.6000$, $\bar{s}=31.3429$, $\bar{x}=24.9429$ and $\bar{x}=25.3714$ while students exposed to field trip strategy, exhibited higher students' inference and prediction skills in Basic Science and Technology with $\bar{x}=22.9714$ and $\bar{x}=27.4847$ respectively.

Conclusion

Based on the findings of the study, it was concluded that the field trip instructional method is effective and an innovative teaching methods that teachers could use in improving students' science process skills acquisition which will then transcend to the acquisition of scientific literacy. Therefore, since, the field-trip instructional method is effective in providing learners with firsthand experience, adding relevance to learning and interrelationships, strengthening identification, observation, predictive, and perception skills, as well as promoting personal and social development; it becomes imperative that field-trip method be adopted as the first choice for teachers in public secondary schools in the teaching science concepts especially when they involve practical.

Recommendation

1. Curriculum planners should include field-trip instructional methods of teaching, as the first choice for teaching practical science subjects in the secondary school curriculum.
2. Government should ensure that education policy statements are translated into reality; in terms of funding science education, so that school administrators can develop a strong approach to teaching science subjects irrespective of the location of the school (rural or urban).
3. Workshops, seminars and conferences should be organized for science teachers on a routine basis in the use of field-trip instructional methods of teaching science subjects in schools on regular basis, as well as on how to carry out cost effective field-trip instructional excursions.

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