



Influence of Interest, Infrastructures and Teaching Strategies on Students' Achievement in Basic Science

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Abstract

This study investigated the influence of interest, provision of infrastructures, and teachers' adopted teaching strategies on students' achievement in Basic Science. Three research questions and three hypotheses were posed to guide the study. Causal comparative research design was adopted for the study. The population of this study comprised 3789 Junior Secondary School Three (JSS3) Basic Science students in Oshimili South local government area of Delta state that sat for Basic School Certificate Examination in 2021/2022 academic session. A sample size of four hundred and twenty (420) JSS3 Basic Science students from fourteen (14) public Schools which were selected using simple random sampling technique by balloting. Instruments for data collection were developed by the researchers. Four instruments were used, which were Students' Interest in Basic Science Questionnaire (SIBSQ), Students' Perception of Teachers' Teaching Strategies Questionnaire (SPTTSQ), Status of Learning Infrastructure Questionnaire (SLIQ), and Students' Achievement in Basic Science Proforma (SABSP). The estimate of internal consistency of the SIBSQ, SPTTSQ and SLIQ was determined using Cronbach alpha which yielded reliability coefficients of 0.89, 0.91, and 0.85 respectively. The research question was answered using mean and Standard deviation while the hypotheses were tested using a t-test statistic. The findings of the study revealed that there is a significant influence of students' interest, infrastructure, and teaching strategies on students' achievement in Basic Science. Based on the findings, it was recommended, among others, educational stakeholders should ensure that infrastructure facilities are provided for effective teaching and learning in the schools.

Key words: Academic Achievement, Basic Science, Infrastructure, Interest, Teaching Strategies.

Introduction

Science is the foundation upon which technological advancement depends. Many technological breakthroughs are being achieved through the knowledge and applications of science. It is because of the usefulness of science that it is being taught at all levels of education in one form or the other. For Nigeria to be part of developed nations of the world, there is need to make science more interesting among citizenry and ensure effective teaching of science in schools (Obomanu, 2010). Science is concerned with finding solution to problems of human beings as integral part of the environment. Science enables children to think and reason in a logical manner. It equips learners on how to solve simple problems they encounter on a day to day basis. The knowledge gathered about our environment constitutes the field of study called science. At junior secondary school level,

the student acquires scientific knowledge through school subjects such as Basic Science

Basic science is the study that relates to basic discovery and inventions in the field of science. Basic science is defined as the fundamental principles of scientific knowledge and skills that deals with precise application of facts or principle and proficiency (Bajah, 2012). It is the knowledge of knowing about facts. Basic science is a core subject in basic education curriculum, in that it is compulsory for all the students at the junior secondary school level. Basic Science emphasizes the development of the spirit of enquiry, acquisition of skills, development of manipulating skill and scientific attitude rather than accepting scientific facts and dogma. Ogbu, Agugoesi, Ugwu and Owolawi asserted that Basic science is planned to inculcate in the students' the basic principles of sciences and that it is



expected of the students to develop interest in studying sciences after passing through junior secondary education. Basic science as an integrated science course is a subject that deals with the study of living and non-living things. It combines all science subject such as physics, biology, chemistry, health science, and geography. It is hoped that students would acquire foundational knowledge necessary to pursue science-based careers through Basic Science

Basic science is planned or designed to reduce ignorance about science especially at elementary levels. To actualize the plans, Basic Science has three main objectives as was stated by Federal Republic of Nigeria, National Policy on Education (2013) which include providing pre-vocational orientation for further training in science, providing basic literacy for everyday activities, and stimulating creativity. Consequently, students are therefore trained to acquire the art of creativity in their basic science lessons which help them acquire their occupational skills (Achebe, 2010). Basic Science eliminates the repetition of subject matter from the various sciences and does not recognize the traditional subject boundaries (Cohen, 2014). In Nigeria basic science is inter-disciplinary in nature and is a deliberate attempt to achieving a specific national design (Chukwuemeka, 2012). Hence, it is important that students in junior secondary schools acquire basic knowledge, skill and awareness in science through Basic Science that could serve as eye opener for choosing careers. Considering the usefulness of science, it is therefore, expected that students' achievement in Basic Science should be satisfactory.

Unfortunately, the achievement of students in Basic science seems not to commensurate with the importance of the subject. It has been observed that student's achievement has been consistently more on pass and fail than credit and distinction in Junior Secondary School certificate examination, (2021). In fact, Poor achievement in science subjects such as Biology, Chemistry, and Physics as reported by the West African Examination Council (WAEC, 2020, 2021, & 2022) could not be unconnected with poor and adequate knowledge of Basic Science. Carry over learning weaknesses and difficulties in Basic Science account for students' abysmal poor performance in Biology (Adewake, 2016). Factors that account could for poor achievement in Basic science include ineffective teaching strategies and poor teacher qualification (Balaraba, 2016). Unfortunately, persistent poor performance in science has become a major problem threat to sustainable education in

Nigeria. Therefore, if this ugly trend is not checkmated, secondary school students may not have the prerequisite skills to pursue science and technology related courses, and graduates from the post-primary school may lack be employable skills, and consequently, could easily be engaged in anti-social activities. Hence, compounding the economic problems and security problems facing Nigeria. Students' achievement in Basic Science could improve if students' interest to learn Basic science is enhanced.

Students' interest determines the level of efforts and engagement the students display in executing tasks in a given subject. Interest describes students' feeling of happiness with the associated attention and greater concentration to learn (Mazer, 2010). Interest is the students' affective behaviour which describes the students' learning mood. Interest could arouse from individual or situation (Harackiewicz & Hulleman, 2010). Individual interest is internally generated and leaves long lasting feelings on the individual. In contrary, the situational interest is like extrinsic motivation which is aroused as a result of external stimuli. The primary duty of teachers to bring positive change in the behaviour of the learners and this could easily be accomplished by enhancing the students' interest to learn. It is asserted that teachers' abilities and competences to arouse the learners' interest is very essential for maintaining higher academic achievement (Okafor, 2020). Okoro (2011) stated that interest reflect a central feature in the knowledge value system of a learner, meaning that learner's interest is influenced by the value they have for an activity or knowledge. Ugwu (2019) stated that student interest in basic science affect their academic performance. It was noticed that student's factor that contribute to an improvement in academic performance include regular study, self-motivation, punctuality and regular class attendance, hard work, interest in a subject (Abaidoo, 2018).

Many studies, although have explored the relationship between students' interest and students' academic achievement in different subjects, there seems to be scanty of studies on the influence of interest on students' achievement in Basic Science. To establish the effect of interest on students' achievement in Basic science demand for more current studies on the influence of interest of students' achievement in Basic science. Hence, the need for this study. Of course, students cannot develop high interest in learning if the needed infrastructural facilities are lacking.



Infrastructure accessibilities is very essential for school learning. Of course, declined in the quality of education cannot be unconnected with low quality of infrastructures in the school system. This is obvious as one of the key investments to education is infrastructural facilities. School infrastructure entails physical structures that comprised classrooms, laboratories, administrative offices, toilets, reading rooms, dispensaries, libraries, and examination halls (Uwimana, 2020). Infrastructure simply means the physical facilities needed for teachers, administrators, and students to function effectively in the schools. Adequate infrastructure facilities make both teachers and students comfortable in school and helps to facilitate maximum outputs.

It is asserted that school facilities such as conducive classrooms have effects on students' learning activities as they support the continuity of learning (Nugroho & Wibowo, 2019). The difference between high and low performing schools could in part lie in the differential level of infrastructure facilities provision in the school. In fact, best schools are ones that offer friendly environment where students, teachers, and parents sees themselves as part of the school community where issues of learning are handled in home-like learning place (Barret, Treves, Shmis, Ambasz, & Ustinova, 2019). When infrastructure facilities are adequately provided, the issue of overcrowded classrooms can easily be tackled given adequate number of teachers. Studies have shown that adequate school infrastructure has positive impact on students learning outcomes (Owoeye & Yara, 2011; Lawanson & Gede, 2011).

Science subjects such as Basic Science, are meant to be taught in the laboratories. However, in Nigeria secondary schools' unavailability of laboratories and other facilities in most secondary school make it impossible for the students to learn science subjects in laboratories. Considering the fact that some schools may have adequate infrastructural facilities while others may not have, examining the influence of infrastructure on junior secondary school students' achievement in Basic Science becomes pertinent. More so, while researchers found positive and significant relationship between access to infrastructure and students' academic achievement (Barret et al., 2019), there seem to be little or no studies on the influence of students' perception of availability of school infrastructure on their achievement in various school subjects. Hence, this study poised to explore the influence of students' perceived infrastructure facilities

provision on the students' achievement in Basic Science. Infrastructural facilities in school could affect students' achievement in Basic science if teachers are making use of appropriate and innovative teaching strategies.

In presence of other necessary conditions, the teaching strategies adopted by teachers could determine the degree of behavioural change the students display. Teaching strategy is defined as the principles and techniques teachers use for instruction delivery (Pooja, 2017). Teaching strategies could broadly be classified into teacher-centred teaching strategies and learner-centred teaching strategies. In teacher-centred, the emphasis is on the teachers; as teachers are seen as the embodiments of knowledge that students passively receive knowledge from. This strategy does not allow students to explore and discover knowledge that allows for effective learning. Teacher-centred method is being criticized on the ground that it is ineffective in facilitating the actualization of the desired learning objectives (Adunola, 2011).

The learner-centred teaching strategies place learning responsibilities on the students and make teachers facilitators of knowledge. These strategies awaken the spirit of critical thinking, inquiry, and collaboration in the students in attempt to solve educational problems. The learner-centred, unlike the teacher-centred, increase students' retention over time. Consequently, there has being a growing demand for teachers to adopt and continue adopting learner-centred teaching methods as the methods enable students to be in monitor and regulate their learning through active exploration and discovery (Hesson & Shad, 2007). There are numerous learner-centred teaching strategies which include the use of Information and Communication Technologies, demonstration, laboratories, games, guided discovery, advance organizer, project-based learning, field-trip, and host of others. While researchers, mostly in controlled experiment, have found that these teaching strategies are effective in enhancing learning (Isa, Mammam, Badar, & Bala, 2020), the knowledge on actual utilization of these teaching strategies in schools and the influence on students' achievement in various school subject examination such as Basic Science has not been given required attention.

Isa, et al. (2020) found out that most of the teaching methods teachers adopt in classrooms have great effects on students' performance. Tomaszewski, Xiang, Huang, Western, McCourt, and McCarthy (2022) demonstrated that effective teaching has both

direct and indirect effect on students' performance. Pooja (2017) also reported significant relationship between students perceived teachers' teaching strategies on the students' academic success. It is worthy to point out that most studies that examined the relationship between teaching strategies and students' academic achievement are either carried out by researcher using very few students in experimental design or by using a relatively large number of students whose academic achievement are not measured by a single subject. When few students are used, generalizing to the entire population is limited and when students' academic achievement is not narrowed down to a particular subject, information is lost and interventions could not be effectively implemented. Based on the forgoing, this study is poised to fill these gaps by examining the influence of students' perceived teaching strategies adopted by the teachers on the students' achievement in Basic Science.

Considering the importance of Basic Science, students' achievement in the subject is expected to be satisfactory. Unfortunately, students' achievement in Basic Science is noted to be poor and does not commensurate with the importance attached to the subject. If the poor achievement of students in Basic science is not checkmated, many secondary school students may not acquire the prerequisite skills for further education, and could easily engage in anti-social activities. Low interest to learn, lack of basic infrastructural facilities, and the use of ineffective teaching strategies has been attributed to the ugly situation. Students' interest to learn, availability of infrastructural facilities, and teaching strategies have found to influence students' performance significantly, however, most studies that related these variables to students' performance either used small sample size or were conducted outside Basic Science. To establish the influence of interest, infrastructures, and teaching strategies on students' achievement' in Basic Science, it becomes pertinent to examine the data from all the schools in Oshimili South Local Government Area. Hence, the thrust of the study is to explore the influence of students' interest, perception of provision of school infrastructure, and teachers' teaching strategies on students' achievement in Basic Science.

Research Question

The following research questions guided the study:

1. What is the influence of interest on students' academic achievement in junior secondary

school certificate examination in Basic Science?

2. What is the influence of teaching strategies on students' academic achievement in junior secondary school certificate examination in Basic Science?
3. What is the influence of infrastructures on students' academic achievement in junior secondary school certificate examination in Basic Science?

Hypothesis

The following hypothesis, tested at 0.05 level of significance guided the study:

1. There is no significant influence of interest on students' academic achievement in junior secondary school certificate examination in Basic Science.
2. There is no significant influence of teaching strategies on students' academic achievement in junior secondary school certificate examination in Basic Science.
3. There is no significant influence of infrastructures on students' academic achievement in junior secondary school certificate examination in Basic Science

Methods

The research design used for this study is a causal comparative research design. According to Nworgu (2015), a causal comparative research is one in which already existing effects are linked to dependent variables as the causal agents without manipulation of the independent variables. The design is considered suitable for this study because the already perceived effect of independent variables (interest, teaching strategies, and infrastructure) are linked to students' achievement in Basic science using non-experimental procedure. The population of this study comprised 3789 Junior Secondary School Three (JSS3) Basic Science students in Oshimili South local government area of Delta state who sat for Basic School Certificate Examination in 2021/2022 academic session. There are 14 public secondary school in Oshimili south local government area of Delta state. Sample size for the study was 420 JSS3 students who sat for Basic School Certificate Examination, which was determined using Taro Yamen formula. The sample size was selected from all the 14-secondary school in Oshimili South local government area. Thirty (30) JSS3 students were selected from each of the 14 public secondary school



using simple random sampling technique. The first was the selection of one intact JSS3 class from 14 JSS3 intact classes from each of the 14 school in the Local Government Area using simple random sampling by balloting without replacement. The second stage was the selection of 30 students from each of the selected intact class in first stage making a total of 30 times 14 (420 students) using balloting (without replacement). Four instruments developed by the researchers were used for data collection in this study. The first was titled “Students’ Interest in Basic Science Questionnaire (SIBSQ)” The SIBSQ comprised 10 items that measure students’ interest in Basic Science and was scored on a 4-point scale. The scale ranges from strongly disagree (1) to strongly agree (4). The minimum and maximum scores on the SIBSQ are 10 and 40 respectively. A high score on the SIBSQ implies a high interest in Basic Science. The second instrument was titled “Students’ Perception of Teachers’ Teaching Strategies Questionnaire (SPTTSQ)”. The SPTTSQ comprised 10 items that measure students’ perception of teachers’ teaching strategies and was scored on a 5-point scale. The scale ranges from *hardly ever* (1) to *in almost every lesson* (5). The items demanded the students to indicate how often different teaching strategies are used by the teachers in instructions. The minimum and maximum scores on the SIBSQ are 10 and 50 respectively. A high score on the SPTTSQ indicates a high perception of teachers’ teaching strategies. The third instrument was titled “Status of Learning Infrastructure Questionnaire (SLIQ)”. The SLIQ comprised 10 items that measure students’ perception of the status of learning infrastructure in their schools and was scored on a 5-point scale. The scale ranges from *not available* (1) to *highly adequate* (5). The minimum and maximum scores on the SLIQ are 10 and 50 respectively. A high score on the SLIQ indicates high perception of status of learning infrastructure. The fourth instrument was titled “Students’ Achievement in Basic Science Profoma

(SABSP)” designed to collect recorded achievement of students in BECE in the schools. The instrument was face validated by two lecturers (one in Educational Measurement and Evaluation and one in Chemistry Education). The experts were asked to check for appropriateness and clarity of the items and also to make suggestion and recommendations that would improve the quality of the instrument. The two lecturers helped in modifying and improving the content and face validity of the instrument. The reliability of the instruments was subjected to analysis using Cronbach alpha. The estimate of internal consistency of the SIBSQ, SPTTSQ, and SLIQ yielded reliability coefficients of 0.89, 0.91, and 0.85 respectively. The data were collected by personally administering the questionnaire to the respondents by the researchers with the help of the class teachers during the time the students were preparing to write the BECE. After the students’ BECE results have been released, the researcher went back to schools with the profoma and collected students’ achievement in Basic Science. A total of 20 students who responded to the questionnaire did not write the Junior Secondary School Certificate Examination (JSSCE), hence, out of the sample size of 420, respondents, data obtained from 400 students were used in the final analysis. The obtained data were analyzed in SPSS (Statistical Package for the Social Sciences) version 25. The research questions were answered using mean and standard deviation while the hypotheses were tested using a t-test statistic at 0.05 level of significance. Interest, Perception. of teachers’ teaching strategies, and perception of the status of infrastructure were categorized into high and low using median ratings as suggested by Sauerbrei and Royston (2010). The rating scores below the median score were considered low, while rating scores above the median rating score were considered high. Rating scores that correspond to the median score were omitted from the analysis.

Results

The results of data analysis based on the sequence of the research questions that guided the study are presented in this section. The major findings of the study are also presented here.

Table 1: Mean and Standard Deviation Achievement Scores of Students in JSSCE in Basic Science based on the Students level of interest

Level of Interest	N	\bar{x}	SD
Low Interest	161	48.54	3.03
High Interest	239	53.57	4.73



From Table 1, the mean and standard deviation achievement scores in JSSCE in Basic Science for students with low interest in the subject are 48.54 and 3.08 while the mean and standard deviation achievement score for students with high interest in the

subject are 53.57 and 4.73 respectively. From the Table 1, the mean achievement score of students with high interest in Basic Science is greater than the mean achievement scores of students with low interest.

Table 2: A t-test for significance of the Difference in Mean Achievement Scores of Students Based on the Students' Perception of Level of Interest

Grouping Variable	N	Mean	SD	T	Df	Sig.
Low Interest (<25)	161	48.54	3.03	-11.94	398	.001
High Interest (≥25)	239	53.57	4.73			

Table 2 shows that the mean interest score in Basic Science for students with low interest in Basic Science ($Mean = 48.54, SD = 3.03$) is statistically significant lower ($t = -11.94, df = 398, p = 0.001$) than students with higher interest in the subject ($Mean = 53.57, SD = 4.73$). It implies that students'

interest in the Basic Science significantly influenced students' achievement in JSSCE in Basic Science. Hence the null hypothesis one that there is no significant influence of interest on students' academic achievement in JSSCE in Basic Science.

Table 3: Mean and Standard Deviation Achievement Scores of Students in JSSCE in Basic Science based on the Students level of Perception of Teaching Strategies

Level of Interest	N	\bar{x}	SD
Low Perception of Teachers' Teaching Strategies	246	48.74	4.09
High Perception of Teachers' Teaching Strategies	154	54.48	4.21

From Table 3, the mean and standard deviation achievement scores in JSSCE in Basic Science for students with low perception of teachers' teaching strategies in the subject are 48.74 and 4.09 while the mean and standard deviation achievement score for students with high perception of teachers' teaching strategies in the subject are 54.48 and 4.21 respectively.

From the Table 1, the mean achievement score of students with high perception of teachers' teaching strategies in Basic Science is greater than the mean achievement scores of students with low perception of teachers' teaching strategies. The difference in the means appears to influence students' achievement in Basic Science.

Table 4: A t-test for significance of the Difference in Mean Achievement Rating Scores of Basic Science Students Based on the Students' Perception of Teaching Strategies

Grouping Variable	N	Mean	SD	T	df	Sig.
Low Percep. of Teachers' Teaching Strategies	246	48.74	4.09	-13.49	398	.001
High Percep. of Teachers' Teaching Strategies	154	54.48	4.21			

Table 4 shows that the mean Basic Science achievement score of students with low perception of teachers' teaching strategies in the subject ($Mean = 48.74, SD = 4.09$) is significant different ($t = -13.49, df = 398, p = 0.001$) from students with

high perception of the teachers teaching strategies ($M = 54.48, SD = 4.21$). This implies that teachers' teaching strategies significant influence student's achievement in JSSCE in Basic Science.



Table 5: Mean and Standard Deviation Achievement Scores of Students in JSSCE in Basic Science based on the Students level of Perception of the status of the Current Learning Infrastructure

Level of Interest	N	\bar{x}	SD
Low perception of the status of Infrastructure	128	47.86	5.07
High perception of the status of Infrastructure	272	56.08	5.93

From Table 5, the mean and standard deviation achievement scores in JSSCE in Basic Science for students with low perception of status of learning infrastructure are 47.87 and 5.07 while the mean and standard deviation achievement score for students with high perception of status of learning infrastructure are 56.08 and 4.93 respectively. From the Table 5, the mean

achievement score of students with higher perception of status of learning infrastructure is greater than the mean achievement score of students with low perception of status of learning infrastructure. The difference in the means appears to influence students' achievement in Basic Science.

Table 6: A t-test for significance of the Difference in Mean Achievement Rating Scores of Basic Science Students Based on the Students' Perception of the Status of Infrastructure

Grouping Variable	N	Mean	SD	T	df	Sig.
Low percep. of the status of Infrastructure	128	47.86	5.07	-13.53	398	.000
High percep. of the status of Infrastructure	272	56.08	5.93			

Table 5 shows that the mean Basic Science achievement score of students with low perception of the status of learning infrastructure ($M = 47.86, SD = 5.07$) is statistically significant lower ($t = -13.53, df = 398, p = 0.01$) than mean Basic Science achievement score of student with high perception of the status of learning infrastructure ($M = 56.08, SD = 5.93$). Therefore, the status of infrastructures in school significantly influenced students' academic achievement in JSSCE in Basic Science.

Discussion

From Table 1, the mean achievement score of students with high interest in Basic Science is greater than the mean achievement scores of students with low interest. The findings of this study revealed that there is a significant influence of students' interest in students' achievement in JSSCE in Basic Science. The significant influence of interest on achievement in Basic Science obtained in the current study is in line with the findings of (Goni, et al., 2021; Okafor, 2020, Ugwu, 2019, Awodum, et al., 2013), who have also discovered significant influence of interest on students' academic achievement. The likely reason for the influence of interest on students' achievement could be that students with high interest are more motivated, have more persistent, and more involved in learning than those with low interest. Those with low interest might miss class, avoid assignments and engage more in non-

academic activities than those with high interest to learn.

More so, From Table 3, the mean achievement score of students with high perception of teachers' teaching strategies in Basic Science is significantly greater than the mean achievement scores of students with low perception of teachers' teaching strategies. The findings of the study revealed that there is a significant influence of teachers' adopted teaching strategies on achievement of students in JSSCE in Basic Science. The findings of the study are in agreement with (Tomaszewsik, et al., 2022; Isa et al., 2020, Abaidoo, 2018, Pooja, 2017) who found out that teaching strategies adopted by teacher influence student's achievement in the subject. The reason could be that effective teaching strategies help the students to have conceptual understanding of the contents. The students easily remember what is taught using best appropriate method.

From Table 5, the mean achievement score of students with higher perception of status of learning infrastructure is greater than the mean achievement score of students with low perception of status of learning infrastructure. The findings of the study revealed that there is a significant influence of learning infrastructure status on students' academic achievement in Basic Science. These findings are in agreement with (Nugroho & Wibowo, 2019; Barret, et al., 2019; Uwimana, 2018) who discovered that level of infrastructure facilities in school's influence students'



academic performance. This is obvious as infrastructure facilities make students to feel comfortable in schools and increase students' learning engagement which in turn improve the students' achievement.

Conclusion

Based on the findings of the study, it was concluded that there is a significant influence of students' interest on students' achievement in Basic Science; and that teachers' teaching strategies and status of learning infrastructures significantly influence students' achievement in Basic Science.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. It is recommended that Government and school owners should provide modern infrastructural facilities for effective teaching and learning.
2. Teachers, guidance and counsellors should ensure that student's interest to learn is properly aroused and sustained before starting the proper lesson.
3. Basic Science teachers should attend in service training in order to updating their knowledge on the innovative teaching strategies that are capable to sustain students' interest and produce desired results.

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