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An Assessment of the Level of Acquisition of Selected Basic Science Process Skills Among Senior Secondary School Biology Students in Delta Central Senatorial District

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ABSTRACT

The study assessed the level of acquisition of selected basic science process skills among senior secondary school Biology students in Delta Central Senatorial District. It was guided by three research questions and hypotheses and employed a descriptive survey design. The population comprised 26,571 SS II Biology students in 190 public senior secondary schools, while the sample included 720 students selected through a multistage sampling technique. The research instrument, *Science Process Skills Knowledge Test in Biology (SPSKTC)*, was pre-tested on 20 SS II students from two schools in Delta South Senatorial District, yielding a reliability coefficient of 0.79 using Kuder-Richardson formula 21. Data collection was conducted over five weeks with assistance from Biology teachers, and questionnaires were retrieved immediately after completion. Data were analyzed in line with the research questions using mean scores, while hypotheses were tested at the 0.05 significance level using t-test statistics. The findings revealed that: (i) students demonstrated a high level of acquisition of observation skill, with male students performing significantly better than females; (ii) students exhibited a high level of acquisition of classifying skill, again with males outperforming females; and (iii) measuring skill was also acquired at a high level, with males showing higher performance than females. Based on these findings, it was recommended that Biology teachers design and implement practical lessons that actively engage both male and female students. Strategies such as group activities, rotations in handling laboratory apparatus, and structured participation plans can ensure equal opportunities for all students to develop observation, classifying, and measuring skills.

Keywords: Basic Science Process Skill, observation, classifying, and measuring skills.

INTRODUCTION

The introduction of science and technology in Nigerian schools has made a significant impact on national development. Among other things, this has helped in the development of individuals who are scientifically and technologically oriented in the country. Different researchers in the field of science have defined science from different perspectives. The Oxford Advanced Learner's Dictionary (2022) defines science as the systematic knowledge of the structure and behaviour of the natural and physical world, gained through observation and experimentation and grounded in verifiable facts. This definition emphasizes science as an evidence-based discipline that relies on practical investigation and logical reasoning to understand and explain natural phenomena. Adedayo (2015) also defined science as a body of knowledge which can be acquired through observation and experimentation. From the above definitions, it is evident that science refers to a system of acquiring knowledge which employs the use of observation as well as experimentation in order to explain natural phenomena. It can further be deduced from these definitions that science has two major dimensions namely - the product of science and the process of science. The product of science includes concepts, facts, theories, principles and laws. All these constitute the basic content of science. The process on the other hand includes the skills and attitudes of a scientist which are needed in carrying out scientific investigations. These skills include observing, raising questions, classifying, measuring, formulating hypothesis, manipulating equipment, counting, predicting, communicating, inferring, experimenting, interpreting data, controlling variables, making operational definitions, formulating models etc. The skills are acquired in the course of learning or doing science. They are required for students' development in science and are popularly referred to as science process skills.

The concept of Science Process Skills (SPS) was popularized by the American Association for Advancement of Science. Accordingly, this Association, introduced the process approach to science teaching and learning which centres on the idea that what is presented to the children in the course of science learning should be similar to what scientists use and do in carrying out scientific investigations. The American Association for the Advancement of Science (Year) classified science process skills into fifteen. These are: observing, measuring, classifying, communicating, predicting, inferring, using number relationships, using space/time relationship, questioning, controlling variables, hypothesizing, defining operationally, formulating models, designing experiment and interpreting data. According to Valentino (2000), science process skills can be classified into two categories as basic and integrated process skills. The basic (simpler) process skills provide a foundation for learning the integrated (more complex) skills. Basic science processes are vital for science learning and concept formation at the primary and junior secondary school levels. More difficult and integrated science process skills are more appropriate at the secondary and tertiary school levels for the formation of models, experimenting and inference. Hence both basic and integrated science process skills are relevant and appropriate at the senior secondary schools' level in Nigeria.

The book by Akani (2015) referred to in the statement is titled *Foundations of Science Education: Concepts and Practice*. This book outlines the basic and integrated science process skills and emphasizes their relevance in the teaching and learning of biology, particularly within practical sessions, as integral components of the biology curriculum. Science process skills (SPS) are also defined as the adaptation of the skills used by scientists for composing knowledge, thinking about problems and drawing conclusion (Ahmed *et al.,* 2017). They are also the abilities each individual is supposed to possess in a science-based community as a science literate person (Tortop et al., 2019; Capel 2019) observed that science process skills have general commonality in all science subjects, serving as tools for information gathering, problem solving, decision making and adaptation. Science process skills are classified as basic (observing, measuring, classifying, collecting data and using number relationships), causal (predicting, identifying variables and drawing a conclusion) and experimental (formulating hypotheses, making models, experimenting, controlling variables and making a decision) (Abrantes et al., 2016). All of these science process skills are complementary of each other, providing students opportunities to reach meaningful learning goals in science. Science process skills also help in preventing the memorization of facts and developing negative attitudes in science (Ekon & Eni, 2015). Science process skills have great influence on education because they help students to develop higher mental processes such as problem-solving, critical thinking and making a decision (Ekon & Nwosu, 2018).

Science process skills are cognitive and psychomotor skills employed in problem solving. They are the skills which the sciences use in problem-identification, objective inquiry, data gathering, transformation, interpretation and communication. Science process skills can be acquired and developed through training such as are involved in science practical activities. They are the aspect of science learning which is retained after cognitive knowledge has been forgotten. Using science process skills is an important indicator of transfer of knowledge which is necessary for problem-solving and functional living. The knowledge of process skills in science is very important for proper understanding of concepts in science. Gecer and Zingin (2015) stated that process skills are fundamental to science, which allow everyone to conduct investigation and reach conclusions. They observed that there is a serious educational gap in this area, both in bringing these skills into the classroom and in the training of teachers to use them effectively. According to Udowong et al. (2023), science process skills are those intellectual skills which are needed to learn the underlying concepts, principles, theories, facts and laws of science. Also Safo-Adu et al. (2020) defined process skills as abilities, potentials as well as all the technical know-how which can be developed in a child through experience which can be employed in carrying out mental and physical operations in science. Science process skills are tools used to acquire information or gain knowledge in science classes

In recognition of the importance of science process skills and the, fact that these can be acquired only in the context of practical activities, the National Senior Secondary School Biology Curriculum (FME, 1985) provided ample learner activities. Hence the curriculum emphasizes a learner-centered and activity-oriented instructional approach that requires active participation of learners in the learning process. Ude and Onah (2017) observed that students' performance in biology has remained poor inspite of the improvements in the biology curriculum. This poor performance may partly be attributed to inadequate exposure of students to practical work in biology which will enhance the acquisition of science process skills. Wabuke (2013) noted that practical are activities carried out for the acquisition of skills, knowledge and attitudes in science. In other words, lessons conducted in the form of practical activities tend to enhance learners' level of acquisition of science process skills and widen their knowledge base. In the same vein, Uche (2018) emphasized that practical lessons are indispensable learning experience in biology due to the fact that students' learning is enhanced when they are exposed to practical lessons. Furthermore, it helps students to interact with concrete objects or situations directly thereby enhancing the students' understanding of the concepts and the development of positive interest in the subject.

The above notwithstanding, the conduct of biology practical in the schools is still characterized by apathy or indifference on the part of the teachers who still adopt the lecture method in the presentation of lessons (Salami, et al., 2023). This may be due to the fact that most biology teachers find it difficult to conduct good practical lessons for students - their major challenges being large class size and lack of laboratory facilities in schools.

In response to the usual complaint of lack of laboratory facilities posing a constraint to the provision of practical activities in schools. Sakiyo and Waziri (2015) observed that the facilities needed for a good practical science lesson that can enhance the acquisition of science process skills need not to be too elaborate or expensive. Most of these facilities can be obtained from our immediate environment if the biology teacher is highly resourceful. In essence, practical work in biology could be carried out in a classroom setting, laboratory or even in an open space (outdoor teaching). In some cases, the formal laboratory or the classroom setup may sometimes be changed to outdoor learning of science which also provides students with enough freedom to learn biology with resources in their immediate environment. Therefore, a practical lesson can simply be regarded as any teaching and learning exercise that guarantees students' active participation in the learning process. It is such an instructional approach that can support the acquisition of science process skills, which according to Okebukola (2016) constitute the sure foundation for the teaching and learning of science.

The West African Examinations Council (WAEC) makes use of practical test/examination to assess students' acquisition of various Biology practical skills. In these tests, students are required to carry out certain Biology practical activities following given instructions. The scores of the students indirectly indicate the levels of Biology practical process skills they could demonstrate during the practical examination. This mode of assessment is also adopted by Biology teachers who prepare the students for Senior School Certificate Examination (SSCE). This mode of assessment influences the teaching methods adopted by teachers. Also, students' learning style is influenced in such a way that students always try to find certain correct responses or answers, irrespective of the procedures adopted.

Students are to be made able to acquire scientific knowledge by the processes of thinking, analyzing and interpreting observed facts. A new approach capable of triggering the processes of thinking, analyzing and inferring in the students' mind is needed. Process approach is designed to attain these objectives in teaching science. Process approach presents the instruction in science in an intellectually stimulating and a scientifically authentic way. Here, emphasis is given to the ways of acquiring knowledge rather than to the content. This is a shift from the traditional approach. As a result, outlook on different aspects of instructional practice in science teaching, the designing of instructional objectives and the instructional strategies have changed totally, as also the method of evaluating the results of these processes, i.e. the process outcomes of science teaching. Process approach demands that students utilize their intellect and apply their ability to engage themselves in thinking and reasoning more dynamically. What is actually attained by the process approach is that students are initiated into being scientific investigators themselves. It is also expected to help students become better consumers of scientific knowledge and also enable them to make original scientific contributions to science.

The study by Chikelu (2019) showed that students experienced difficulty in process skills acquisition in science in secondary schools. Chikelu (2019) researched on students' experienced difficulty in 15 process skills acquisition in Integrated Science using 600 JS3 students from Delta State and his findings showed that: there are 8 areas of difficulty out of the 15 process skills: these are counting/number relations, communication, prediction, inference, controlling and manipulating variables, experimenting, manipulative techniques (instrument) and building mental models. Moreover, it was found that building mental models was the process skill found most difficult. This was followed by manipulative techniques, controlling and manipulating variables, communication, experimenting, counting/number relations, prediction and inference. The results indicated that students in general did not find the following process skills not difficult which include observation, formulating hypothesis, making operational definitions, measurement, interpreting data and classification, the last one being the simplest. This study contradicts the work of Bello (2015) who found measuring, prediction, communication, classification, raising question, and controlling variables, the last one being the simplest. Both studies also showed that students experienced difficulty more in integrated or higher skills than the basic skills and that sex and school location had no influence on the acquisition of process skills. Series of reports from the chief examiners of WAEC, 2006-2011 and that of Cossa and Uamusse (2015) showed that Biology students were deficient in interpreting data, descriptive ability, calculative ability, drawing inference and also in qualitative chemical analysis. It, therefore, follows that the trend is not improving even in recent years. Based on this background, this study intends to investigate assessment of levels of acquisition of science process skills by senior secondary school biology students in Delta Central Senatorial District.

Statement of the Problem

The senior secondary school biology curriculum was fashioned as a learner-centered and activity-oriented curriculum which emphasizes the acquisition of science process skills. However, it is a common experience that most biology teachers who implement this curriculum tend to "talk and discuss" biology instead of "doing" biology. The conduct of biology practical in the schools is still characterized by apathy or indifference on the part of the teachers who still adopt the lecture method in the presentation of lessons. This instructional approach appears inconsistent not only with the spirit of the senior secondary biology curriculum, but also with the current paradigm shift in science teaching which emphasizes a learner-centered and activity-oriented pedagogy. This raises a fundamental issue as to the extent to which this mode of implementation of can support the acquisition of the science process skills as stipulated in the senior secondary school biology curriculum.

Biology is taught in most schools as a bundle of abstractions without practical experiences. This has resulted to students' low acquisition of science process skills which has become more evident in the mass failure of students in the subject in public examinations. All the questions asked to test Biology students' knowledge in practical skills require that they demonstrate one form of process skill or the other. The inability of students to carry out these activities properly results in low scores in the test of practical knowledge.

The basic science process skills are useful in science and non-science situations while the integrated skills are the working behaviour of scientists and technologists. Thus, both basic and integrated science process skills are relevant and appropriate for all science subjects, in particular Biology at the senior secondary schools. Hence, there is need to find out the level of acquisition of the process skills, including the factors influencing their acquisition; and also to identify the science process skills inherent in the West African Senior Secondary School Certificate (WASSSC) Biology practical examination in Nigeria and classify them into various hierarchical levels in terms of students' difficulties. Process skills are very fundamental to science which allows students to conduct investigations and reach conclusions; but there is still a serious educational gap in this area both in bringing these skills into the classroom and in the training of teachers to use them effectively. Therefore, the

problem of this study is: What is the level of acquisition of selected basic science process skills among senior secondary school biology students in Delta Central Senatorial District?

Research Questions

The following research questions were raised to guide this study:

1. What is the level of acquisition of observation skill in Biology among senior secondary school students in Delta central senatorial district?
2. What is the level of acquisition of classifying skill in Biology among senior secondary school students in Delta central senatorial district?
3. What is the level of acquisition of measuring skill in Biology among senior secondary school students in Delta central senatorial district?

Hypotheses

The following research hypotheses were formulated for testing at the 0.05 level of significance:

H_O1: There is no significant difference between the mean scores of the level of acquisition of observation skill in Biology of female and male senior secondary school students in Delta central senatorial district.

H_O2: There is no significant difference between the mean scores of the level of acquisition of classifying skill in Biology among male and female senior secondary school students in Delta central senatorial district.

H_O3: There is no significant difference between the mean scores of the level of acquisition of measuring skill in Biology among male and female senior secondary school students in Delta central senatorial district

RESEARCH METHOD

The investigation employed the descriptive survey. The descriptive survey was used to determine the level of students' acquisition of science process skills in biology. The population for this study comprises a total of 26,571 SS II Biology students enrolled in 190 public senior secondary schools across the district. The study adopted a multistage sampling technique to ensure a fair representation of the population while considering key demographic and environmental factors. The sample of this study was 720 SS II Biology students in Delta Central Senatorial District. The research instrument used for this study is: Science Process Skills Knowledge Test in Biology (SPSKTC). The test (SPSKTC) consisted of two sections. the instrument consisted of 18 questions on three basic skills (observing, classifying, measuring). The test of knowledge on Science process skills were adapted from WAECSSCE Alternative to practical Biology past questions of 10 years: 2002 -2011. The Science Process Skills Knowledge Test in Biology (SPSKTC) was subjected to both content and face validity by using three experts in this area of study. The items were actually tested on a sample of the target population to determine the reliability. The items were pre-tested using 20 SS II Biology students in two randomly selected secondary schools in Delta South Senatorial District. The data obtained was subjected to Kuder Richardson formula 21 to obtain the correlation value. A correlation coefficient of 0.79 was obtained which was considered adequate for this study. Official permission was duly obtained from the heads of the selected schools of the subjects that participated in this study. The Biology teachers in each school were used as the research assistants. Before the administration of the test, the teachers were given orientation on the purpose of the study and on the science process skills which should be made applicable in student-activity classrooms as they prepare for the SSCE examination. The school syllabus has Biology quantitative and qualitative analysis for 8 weeks and strategies were made applicable for teachers to ensure that the SS II Biology students have knowledge of the process skills. All the schools used for this study have Biology laboratories, though some of them are not properly equipped; and also have qualified Biology teachers; so as to ensure that the result of the study is not distorted. The Science process skills Knowledge Test in Biology (SPSKTC) was administered with the help of the Biology teachers and the researcher in the schools. The questionnaires were collected from the students on the spot on completion by the researcher and Biology teachers in the selected schools. Five weeks was used to administer the questionnaire and collection of data. The data collected were arranged and analyzed in line with research questions and hypotheses. The research questions were answered using mean. The hypotheses were tested at 0.05 level of significance. Hypotheses were tested with t-test statistics at 0.05 level of significance

RESULTS AND DISCUSSION

Research question one: What is the level of acquisition of observation skill in biology among senior secondary school students in Delta central senatorial district?

Table 1: Level of acquisition of observation skill in biology among senior secondary school students

S/No	Items	N	$\bar{x}$	SD	Interpretation
1	I pay close attention to details when conducting biology experiments.	720	3.43	0.80	High
2	I can identify changes in living organisms during experiments.	720	3.62	0.60	High
3	I often describe what I see during biology lab sessions.	720	3.41	0.84	High
4	I use my senses effectively to gather information in biology.	720	3.06	0.92	High
5	I find it easy to notice patterns in biological data.	720	3.29	0.80	High
	Grand Mean		**3.36**	**0.79**	High

Criterion mean = 1.00 to 1.99, low level, 2.00 to 2.99 moderate level, 3.00 to 4.00 indicate a high level.

Table 1 showed the mean and standard deviation analysis of the level of acquisition of observation skill in biology among senior secondary school students. The table indicates that students demonstrated a high level of competence across all the observation skill indicators measured. This is evident from the individual mean scores, all of which fall within the criterion mean range of 3.00–4.00, indicating a high level of observation skill. The grand mean score of 3.36 with a standard deviation of 0.79 further confirms this finding, as it lies within the benchmark for a high level of acquisition. It was therefore concluded that senior secondary school students in Delta Central Senatorial District have a high level of acquisition of observation skill in biology.

Research Question Two: What is the level of acquisition of classifying skill in biology among senior secondary school students in Delta central senatorial district?

Table 2: Level of Acquisition of Classifying Skill in Biology Among Senior Secondary School Students

S/No	Items	n	$\bar{x}$	SD	Interpretation
1	I can categorize living organisms based on their characteristics.	720	3.29	0.84	High
2	I effectively group items in a biology lab according to their properties.	720	3.33	0.75	High
3	I understand the importance of classification in biology.	720	3.15	0.70	High
4	I can create a hierarchy of biological classifications (kingdom, phylum, etc.).	720	3.25	0.78	High
5	I regularly use classification systems when studying biology.	720	3.13	0.75	High
	Grand Mean		**3.23**	**0.76**	High

Criterion mean = 1.00 to 1.99, low level, 2.00 to 2.99 moderate level, 3.00 to 4.00 indicate a high level.

Table 2 showed the mean and standard deviation analysis of the level of acquisition of classifying skill in biology among senior secondary school students. The results indicate that students demonstrated a high level of competence across all the classifying skill indicators measured. This is evident from the mean scores of all the items, which fall within the criterion mean range of 3.00–4.00, indicating a high level of acquisition. The grand mean score of 3.23 with a standard deviation of 0.76 further supports this finding, as it lies within the benchmark for a high level. It was therefore concluded that senior secondary school students in Delta Central Senatorial District have a high level of acquisition of classifying skill in biology.

Research question three: What is the level of acquisition of measuring skill in biology among senior secondary school students in Delta central senatorial district?

Table 3: Level of Acquisition of Measuring Skill in Biology Among Senior Secondary School Students

S/No	Items	n	$\bar{x}$	SD	Interpretation
1	I am comfortable using different tools to measure biological samples (e.g., ruler, graduated cylinder).	720	3.62	0.60	High
2	I ensure accuracy in my measurements during biology experiments.	720	3.33	0.75	High
3	I understand metric units and use them in biology experiments.	720	3.18	0.65	High
4	I can convert measurements from one unit to another when necessary.	720	3.28	0.75	High
5	I consistently record my measurements accurately during experiments.	720	3.14	0.76	High
	Grand Mean		**3.33**	**0.72**	

Criterion mean = 1.00 to 1.99, low level, 2.00 to 2.99 moderate level, 3.00 to 4.00 indicate a high level.

Table 3 showed the mean and standard deviation analysis of the level of acquisition of measuring skill in biology among senior secondary school students. The results indicate that students demonstrated a high level of competence across all the measuring skill indicators assessed. This is evident from the mean scores of all the items, which fall within the criterion mean range of 3.00–4.00, indicating a high level of acquisition. The grand mean score of 3.33 with a standard deviation of 0.72 further confirms this finding, as it lies within the benchmark for a high level. It was therefore concluded that senior secondary school students in Delta Central Senatorial District have a high level of acquisition of measuring skill in biology.

Testing of Hypotheses

H_{O1}: There is no significant difference between the mean scores of the level of acquisition of observation skill in biology of female and male senior secondary school students in Delta central senatorial district.

Table 4: t-test showing the difference between the mean score of the level of acquisition of observation skill in biology of male and female senior secondary school students (n=720)

Variable	Gender	n	$\bar{x}$	SD	Sig. (2-tailed)	t	df	Cohen's d
Observation Skill	Male	366	18.38	0.59	.000	21.757	718	1.97059
	Female	354	15.18	2.75	.000			

Field work, 2025

Table 4 showed the results of the independent samples t-test indicate a statistically significant difference between male and female students in their acquisition of observation skills, $t(718) = 21.76$, $p < .001$. Male students (M = 18.38, SD = 0.59) outperformed female students (M = 15.19, SD = 2.75). The effect size

(Cohen's d = 1.97) suggests a large practical difference between the two groups. Thus, the null hypothesis is rejected in favour of the alternative hypothesis, indicating that gender has a significant influence on students' observation skill acquisition.

H_{O2}: There is no significant difference between the mean scores of the level of acquisition of classifying skill in biology among male and female senior secondary school students in Delta central senatorial district.

Table 5: T-test showing the difference between the mean score of the level of acquisition of classifying skill in biology among senior secondary school students

Variable	Gender	N	$\overline{x}$	SD	Sig. (2-tailed)	t	df	Cohen's d
Classifying Skill	Male	366	18.05	0.98	.00	32.25	718	1.61
	Female	354	14.19	2.07	.00			

Field work, 2025

Table 5 showed a statistically significant difference between male and female students in their classifying skill acquisition, t (718) = 32.25, p < .001. Male students (M = 18.05, SD = 0.98) had significantly higher scores than female students (M = 14.19, SD = 2.07). The effect size (Cohen's d = 1.61) suggests a large effect. Therefore, the null hypothesis is rejected, indicating that male students demonstrate better classifying skills in biology compared to female students.

H_{O3}: There is no significant difference between the mean scores of the level of acquisition of measuring skill in biology among male and female senior secondary school students in Delta central senatorial district

Table 6: T-test showing the difference between the mean scores of the level of acquisition of measuring skill in biology among senior secondary school students (n=720)

Variable	Gender	N	$\overline{x}$	SD	Sig. (2-tailed)	t	df	Cohen's d
Measuring Skill	Male	366	18.22	0.88	.00	31.106	718	1.47
	Female	354	14.82	1.89	.00			

Field work, 2025

In Table 6 a significant difference was observed in measuring skill acquisition between male and female students, t (718) = 31.11, p < .001. Male students (M = 18.22, SD = 0.88) scored significantly higher than female students (M = 14.82, SD = 1.89). The large effect size (Cohen's d = 1.47) indicates a notable practical difference. Thus, the null hypothesis is rejected, implying that gender plays a significant role in students' ability to acquire measuring skills in biology.

Discussion

The finding on observation skill revealed that the level of acquisition of observation skill in Biology among senior secondary school students in Delta Central Senatorial District is high, and that there is a significant difference between the mean scores of female and male students in favour of male students. This implies that, generally, students possess strong observation abilities required for effective engagement in biological experiments and practical activities, while male students demonstrated relatively higher proficiency than their female counterparts. A possible reason for the high level of acquisition of observation skill may be attributed to the emphasis placed on practical activities and laboratory work in Biology teaching at the senior secondary school level. Regular exposure to experiments, specimen study, and hands-on activities may have enhanced students' ability to pay attention to details, identify changes, and describe biological phenomena accurately. Observation is a fundamental science process skill, and frequent engagement with real-life biological materials is likely to strengthen students' competence in this area. The significant difference observed in favour of male students may be explained by differences in participation patterns during practical sessions. Male students may be more actively involved in handling laboratory apparatus, observing specimens closely, and experimenting during Biology practicals, which could give them more opportunities to sharpen their observation skills. Another explanation could be sociocultural factors that encourage males to be more exploratory and confident in science-related activities, thereby enhancing their observational competence compared to female students. This finding is consistent with the study of Abungu, Okere, and Wachanga (2014), who reported that frequent engagement in hands-on science activities significantly improves students' science process skills, including observation. Similarly, Danjuma and Adeleye (2019) found that students exposed to activity-based Biology instruction demonstrated higher levels of observation skill than those taught mainly through theoretical approaches. In relation to sex differences, the finding aligns with Yusuf and Afolabi (2018), who observed that male students performed better than female students in certain science process skills due to higher participation in laboratory-based activities. However, it contrasts with the study of Okoye (2021), who reported no significant difference between male and female students in observation skills when equal opportunities for practical engagement were provided.

The finding on classifying skill revealed that the level of acquisition of classifying skill in Biology among senior secondary school students in Delta Central Senatorial District is high, and that there is a significant difference between the mean scores of male and female students in favour of male students. This indicates that, in general, students possess a strong ability to categorize, group, and organize biological materials and concepts based on shared characteristics, which is a core science process skill in Biology learning. A possible reason for the high level of acquisition of classifying skill may be linked to the nature of Biology instruction, which places considerable emphasis on taxonomy, grouping of organisms, and organization of biological concepts during both theory and practical lessons. Continuous exposure to classification activities—such as grouping living organisms, using classification keys, and understanding hierarchical systems—may have enhanced students' competence in this skill. Regular classroom exercises and laboratory activities that require sorting and grouping of specimens could also contribute to this high level of acquisition. The significant difference observed in favour of male students may be attributed to differences in engagement and confidence during Biology practical and problem-solving activities. Male students may be more inclined to take the lead in classification tasks during group work, thereby gaining more practice and deeper understanding of classification systems. Another explanation could be sociocultural expectations that subtly encourage male students to engage more actively in analytical and task-oriented science activities, which may enhance their classifying skills compared to female students. This finding aligns with the study of Achor and Wilfred (2017), who reported that students exposed to frequent classification and sorting activities in science lessons demonstrated high levels of classifying skill. Similarly, Danjuma and Adeleye (2019) found that Biology students showed improved classifying ability when instruction emphasized practical taxonomy and specimen handling. In terms of sex differences, the finding supports Yusuf and Afolabi (2018), who observed that male students outperformed female students in certain science process skills, including classification, due to higher levels of participation in hands-on activities. However, it contrasts with Okafor and Uche (2020), who reported no significant sex difference in classifying skills when instructional strategies deliberately ensured equal participation. The finding on measuring skill revealed that the level of acquisition of measuring skill in Biology among senior secondary school students in Delta Central Senatorial District is high, and that there is a significant difference between the mean scores of male and female students in favour of male students. This suggests that students generally possess strong abilities in using measuring instruments, applying metric units, converting measurements, and accurately recording data during Biology experiments. A possible reason for the high level of acquisition of measuring skill may be attributed to the frequent use of measurement activities in Biology practical lessons, such as measuring length, mass, volume, and time during experiments. Regular exposure to laboratory tools—such as rulers, thermometers, and graduated cylinders—likely enhances students' familiarity and confidence in making accurate measurements. Additionally, the integration of measurement tasks across related science subjects may further reinforce students' measuring skills. The significant difference observed in favour of male students may be explained by higher levels of active participation and confidence among male students during laboratory activities that require handling of measuring instruments. Male students may be more willing to manipulate apparatus, take readings, and perform calculations during group practicals, which could lead to greater proficiency in measuring skills. Another explanation could be sociocultural factors that encourage males to engage more readily in technical and instrument-based tasks, thereby giving them an advantage over female students in this skill area. This finding is consistent with the study of Abungu, Okere, and Wachanga (2014), who reported that hands-on science instruction significantly improves students' measurement and other science process skills. Similarly, Danjuma and Adeleye (2019) found that students who frequently engaged in practical measurement activities demonstrated higher levels of measuring skill in Biology. With respect to sex differences, the finding aligns with Yusuf and Afolabi (2018), who observed that male students performed better than female students in measurement-related science process skills due to greater involvement in laboratory tasks. However, it contrasts with the findings of Okoye (2021), who reported no significant difference between male and female students in measuring skills when equal access to laboratory roles and instruments was ensured.

CONCLUSION

Based on the findings of this study, it can be concluded that senior secondary school students in Delta Central Senatorial District have high levels of acquisition of basic science process skills in Biology, including observation, classifying, and measuring skills. The grand mean scores for all the assessed skills fell within the high-level range, indicating that students are generally competent in carrying out core scientific processes such as observing biological phenomena, classifying organisms and materials, and accurately measuring biological samples during laboratory activities. However, the study also revealed a consistent significant difference between male and female students' performance, with male students outperforming female students across all the assessed skills. This suggests that while students are generally skilled in these scientific processes, gender disparities exist, possibly due to differences in participation levels, confidence, or sociocultural influences that affect engagement in practical science activities.

RECOMMENDATIONS

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

I. Biology teachers should design and implement practical lessons that actively involve both male and female students. Group activities, rotations in handling laboratory apparatus, and structured participation plans can ensure that all students have equal opportunities to develop observation, classifying, and measuring skills.

II. Schools in Delta Central Senatorial District should ensure that Biology laboratories are well-equipped with sufficient instruments, specimens, and teaching aids. Adequate resources will allow students to practice scientific processes more frequently, enhancing their competence and confidence in essential science process skills.

III. he Delta State Ministry of Education, in collaboration with school administrators, should organize regular training and skill development programs for senior secondary school students. This can include workshops, science clubs, and laboratory-based competitions designed to enhance students' practical Biology skills. Special attention should be given to encouraging female students to actively participate in these activities, in order to bridge the gender gap and promote balanced acquisition of essential science process skills among all students.

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