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SCIENTIFIC LITERACY SKILLS AND ACADEMIC PERFORMANCE OF SCIENCE STUDENTS IN IGNATIUS AJURU UNIVERSITY OF EDUCATION RIVERS STATE, NIGERIA.

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ABSTRACT

The citizen vision of every community is the development of scientific literacy skills of its learners to proffer solutions to compelling scientific demands that is confronted in our everyday engagements. Acquisition of scientific literacy skills is a yardstick for societal, growth and development. Therefore, the study investigated students' level of scientific literacy skills and academic performance of science students in Ignatius Ajuru University of Education. The study adopted descriptive research design. Instruments for data collection were "Questionnaire on Scientific Literacy Skills Assessment Template", (SLSAT) with reliability coefficient index of 0.849 and the data was analyzed using descriptive statistics and chi-square at 0.05 level of significance. The study revealed that

Introduction:

Scientific literacy skill is the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person, therefore, is willing to engage in reasoned discourse about science and technology which requires the competencies to explain phenomena scientifically recognize, offer and evaluate explanations for a range of natural and technological phenomena, evaluate and design scientific inquiry – describe and appraise scientific investigations and propose ways of addressing questions

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relationship between level of scientific literacy skills and students' academic performance of science students were statistically significant. Furthermore, the scientific literacy skill level of science students were low because most students were found to have their scientific literacy skills level at the nominal scale. The study recommended that science lecturers should adopt practical instructional strategies that will be devoid of rote memorization as to encourage active engagement of students in order to enhance scientific literacy skills.

Keywords: Scientific Literacy skills, science students, Academic Performance.

Scientifically, interpret data and evidence scientifically analyse and evaluate data, claims and arguments in a variety of representations and draw appropriate scientific conclusions. According to the United States National Centre for Education Statistics (USNCES, 2018), scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. The ultimate objective of scientific literacy or science literacy is to produce scientifically responsible citizens, as scientists or otherwise as normal members of the society (Adams, 2015). Scientific literacy has the following components; science as inquiry, ability to utilize the process of scientific inquiry, knowledge of significant scientific facts, concepts, principles and theories, ability to apply relevant knowledge in everyday life, possession of informal attitudes and interest related to science, final understanding of general ideas about the characteristics of science and important interaction of science, technology and society.

The greatest power that man would ever yearn for is knowledge and understanding of the realities of basic components of nature, which is scientific skills. While providing sound explanation using cause-effect relationship. Basic knowledge or literacy is a function of intellectual growth which every developed and undeveloped world is cultivating, literacy is simply the fulcrum to knowledge development and understanding required to function actively in a society. United Nations

Educational Scientific and Cultural Organization (2017), (UNESCO, 2017) stipulated that literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society. From the perspective of mathematics, literacy connotes the degree of mastery of basic mathematical symbols and recognition of numbers. Literacy can be categorized into a spectrum consisting of basic literacy, cultural and civic literacy, functional literacy and scientific literacy. Adu-Gyamfi and Mwakapenda (2016) explained that scientific literacy is a broad term that incorporates scientific ideas and concepts within and across various scientific discipline as well as scientific practice. Scientific literacy is the foundation of understanding scientific laws, principles and concepts which are essential for problem solving and decision making. Evidently, a scientific literate individual is one that have acquired scientific knowledge with the sole aim of proffering solutions to problems. Al-Fadhli and Khalfan (2019) opined that been scientific literate entails the knowledge and the applicability of science. Many natural phenomena encountered in our everyday life experiences can be explained by scientific principles and facts which abound in our environment for example, if the vulture pitches on one's roof the non-science persons see it as omen, but a scientific literate persons will view it as nothing. Since they are aware that vulture is a scavenger, it parched on the roof as to see cacas that is at a far distance. This can only be done by scientific literate individuals. A scientifically literate person has acquired the ability to hold a scientific worldview, engage in scientific inquiry, and appreciate the scientific enterprise. In order for the developed nations of the world to flow with the tide of scientific and technological transition, conscious effort have been made to restructure their resources to the development and engagement of scientific literate citizens (Cohen et al, 2017). The complexities existing in all aspects of human endeavour have triggered scientific curiosity and consequently, necessitate the need for everyone to be scientifically literate. Importantly, the future of mankind in terms of sustainability and livelihood is largely dependent on the application of science and technology which is

the tool required to confront societal challenges. Unfortunately, the potentials of science and technology cannot be achieved unless there is a deliberate effort in promoting the understanding of science and scientific literacy. Holbrook and Rannikmae (2019) reiterated that in order for the optimum attainment of scientific literacy of citizens, the schools have an important role to play. As such, the delivery of science content should be analytical, reflective, simplistic and interestingly packaged to empower students to be scientific literate. Science learning should be centralized on the development of scientific literacy and its usefulness in helping students solve every problem and making positive science related decisions.

The position of scientific literacy in the functionality of any science student in modern society cannot be overemphasised. For any science student or graduate to be able to fit into society is dependent on his/her scientific literacy skills (Glaze, 2018). In Nigeria, there are different types of tertiary institutions like polytechnic, monotechnic, science and technology schools, many universities with diversified science courses where students learn science. Therefore, due to differences in curricula, the scientific literacy expected from these institutions differ. The scientific literacy in Nigeria is low; thus; the curriculum is designed to inculcate the scientific knowledge and enhancing understanding of concept thought for a real-life situation (Eraikuemen & Ogumogu, 2018).

The university is the highest level of these institutions, and the scientific literacy in this level of the institution is higher than all others. Another category of the tertiary institutions is the college of education established to train professional teachers for the primary education and lower secondary schools. The level of scientific literacy skills in these schools is a bit lower than that of the university. Nonetheless, there are some skills peculiar to the university of education that shall be a focal point for this study. It is germane that all students in science class should have an understanding of the risks and the benefits derived from science (Holbrook & Rannikmae, 2019) as scientifically literate students. The gender gap in science enrolment and achievement are not strange in science education and most countries of the world including Nigeria (Kelly, 2016; Holtman &

Mukwada, 2016; Derrick et al, 2017). Thus, the acquisition of any skill in learning is equally gender bias (Kelly, 2016). In every global society men and women responses to issues like decision-making, problem-solving and leadership styles differ to a great extent. The decision-making and problem-solving skills are dependent on the level of scientific literacy of an individual.

Statement of the Problem

Despite the vast importance of scientific literacy skills to life and the world at large, it is still surprising to note, here, see perceive that the performance of science students is below expectation. This is made known by the annual performance of students in graduation examination and a host of other national and international examinations; to buttress this WASEC of 2021 just released is evidence where 30% were science students while arts students 70% passed. This has been a point of concern to educational administrators, planners, parents, teachers and the government. Attempt at addressing the problems have centred on building laboratories, desks and science equipment by both governments and non-governmental agencies. For example, Education Trust Fund (ETF) has supplied school equipment's and resources to universities so as to bridge the gap. Unfortunately, those attempts to improve learning facilities seem not to improve academic performance of science students

Purpose of the Study

Is to investigate the relationship between scientific literacy skill and academic performance of science students in Ignatius Ajuru University of Education. The specific objectives of the study are to determine (1) The relationship between scientific literacy skills and students' academic performance in in Ignatius Ajuru University of Education (2) Any gender gap in scientific literacy skills among the science students in their academic performance in Ignatius Ajuru University of Education.

Research Questions

1. What is the relationship between scientific literacy skills and academic performance of science students in Ignatius Ajuru University of Education?
2. Is there any gender gap in scientific literacy skills among the science students in their academic performance in Ignatius Ajuru University of Education?

Hypotheses

1. There is no significant relationship between scientific literacy skills and academic performance of science students in Ignatius Ajuru University of Education.
2. There is no significance difference between the gender gap in the scientific literacy skills among the science students in their academic performance in Ignatius Ajuru University of Education

Literature Review

Hence Ang, (2015) stressed that graduate employability awareness should be based on scientific literacy performance as to, accelerate the science students in our place to be more serious. Dragos (2015), decried the scientific literacy in schools are not encouraging in one of his paper and called on non-Governmental Organization (NGO) to be more active in their assistance to Governmental efforts. Genc (2015) in his paper titled "the effect of scientific studies on students' science literacy and attitude. It find out that the attitude of students contribute to their ill scientific literacy and performance. Mc Combes (2019) critize that the students 'understanding different sampling method is a significant aspect the derails the scientific skill acquisition. He continued that science teachers in any level should use scientific method to teach his/her students as to avoid been bias in the scientific literacy and performance. Conclusively, Shwartz (2016), lamented in the use of scientific literacy taxonomy for assessing science students in high schools so as to find growth in their scientific literacy.

Siagian (2017), commented that scientific skill of seventh grade junior high schools and their performance is not encouraging based on the much expenses made by Ngo and government of any country both the developed and undeveloped nations of the world. Despite all these attempts and effort from different sectors and individual supports to encourage and improve the academic performance of science students, they still perform below expectation.

Research Design

The study adopted the correlational and cross-sectional survey. A descriptive study is aimed at collecting and describing in a systemic manner, the characteristics, features and facts about a given population.

Population for the Study

The population of this study comprised of few final year science students in Ignatius Ajuru University of Education from the faculty (mathematics, chemistry, physics, biology, computer science, integrated science, human kinetics, health and safety education) which totalled 469 students of 2020/2021 academic session.

Sample and Sampling Techniques

The formula used to determine the sample size is the Taro Yamane. According to Taro Yamane sample size of the population for research can be derived as follows;

$$n = \frac{N}{1+N(e)^2}$$

Where n= sample size required

N= Number of people in the population, which is 469

e= Sample error assumed as (0.005)

Therefore, a sample size of approximately 201 was used while the sampling techniques adopted were stratified random sampling.

Sources of Data

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In this study, the researcher used primary sources which includes the use of questionnaire, personal observation and interview, which consists of raw data or information obtained directly from the respondent for onward use in the study. The need for primary data was because of the depth of the information required for this study. This approach was adopted in order to collect data for this study and they are hand administered questionnaire.

Procedure for Data Collection

The instruments used for data collection are questionnaire. The questionnaire was distributed and collected by the researcher. The instrument used by the researcher for the study was self-designed questionnaire structured to get designed responses from the respondents. The research questions consist of 35 items based on three-point response scale from **(1) agree, (2) strongly agree, (3) disagree &(4) strongly disagree.**

Methods of Data Analysis

The retrieved copies of the questionnaire were collated, coded and analyzed using the descriptive statistics of frequency, percentage counts, mean, standard deviation, and chi-square to answer the research questions using SPSS version 20.0. on scientific literacy skill and academic performance of science students.

Validity and Reliability of the Instrument

The instrument was validated by other experts in the department of integrated science. All their comments, suggestions and modifications were effected during the final construction of the instrument. The Cronbach Alpha method was used to establish the internal consistency of the non-cognitive instrument. To do this, 50 students who were not included in the study were administered. Then the 50 copies of the non-cognitive instrument were administered to them and upon completion their responses were retrieved, coded, analyzed using the Cronbach Alpha (r^a) method to establish the

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reliability coefficient of 0.849 which necessitated the use of the non-cognitive alpha instrument for the study.

RESULTS AND DISCUSSION

This present the analysis of the data obtained from the study, its interpretation and discussion of findings

Research Question 1:

Is there any relationship between scientific literacy skills and academic performance of science students in Ignatius Ajuru University of Education?

Table 1: School environment

S/N	School environment	A	SA	D	SD	Mean	SD	Decision
1	Do your department have laboratory	136 (60.9)	0 (0.0)	14 (6.3)	51 (32.7)	3.11	1.16	Agree
2	The laboratory is equipped with modern facilities	5 (2.2)	43 (19.3)	166 (74.4)	9 (4.0)	2.33	0.81	Disagree
3	We conduct practical in each topic learnt	67 (30.0)	31 (13.9)	103 (46.2)	22 (9.9)	2.43	1.25	Disagree
4	I understand all the concept, law and principles in the class	133 (59.6)	0 (0.0)	55 (24.7)	35 (15.7)	3.45	1.16	Agree
5	My lecturer teaches well to my understanding	5 (2.2)	166 (74.4)	43 (19.3)	9 (4.0)	2.63	0.81	Agree
6	Better understanding affect my scores positively	136 (60.9)	0 (0.0)	14 (6.3)	51 (32.7)	3.11	1.16	Agree

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Hypothesis Ho 1: There is no significance relationship between scientific literacy skills and academic performance of science students in Ignatius Ajuru University of Education.

Table 4.1: Chi-squared test showing perceived association between scientific literacy skill and academic performance of science students in Ignatius Ajuru University of Education.

Test variables	Df	X^2-value	P-value	Decision
SLS	199	527.73	0.159	Ho Rejected
Academic performance				

*p<0.05 Significant (SLS= scientific literacy skills)

Research Question 2:
Is there any gender gap in scientific literacy skills among the science students in their academic performance in Ignatius Ajuru University of Education?

Table 2: Gender gaping

S/N	Gender gap	A	SA	D	SD	Mean	SD	Decision
1	My sex affect my understanding of science	14 (6.3)	0 (0.0)	136 (60.9)	51 (32.7)	2.11	1.16	Disagree
2	Men perform well in sciences than women	5 (2.2)	43 (19.3)	166 (74.4)	9 (4.0)	2.63	0.81	Agree

Hypothesis Ho2: There is gender gap in scientific literacy skills among the science students in their academic performance in Ignatius Ajuru University of Education.

Table 3: Chi-squared test showing perceived association between gender gap and academic performance of science students in Ignatius Ajuru University of Education.

Test variables	Df	X^2-value	P-value	Decision
Gender gap	199	489.25	0.155	Ho Rejected
Academic performance				

*p<0.05 Significant

Discussion of Findings

The hypothesis implies that scientific literacy skill is a major and necessary factor for learning, understanding, and good performance in science courses in general. It shows that it is possible for students who are scientific literacy skill to perform better than those who are not scientific literate. Science is not something you just jump into since it is a concept that works under the influence of different principles, laws and theories. It is therefore incumbent for students who wants to do and further science to first of all have a prior understanding of scientific concepts and process involved in science. With this, the academic performance of students will be significant. Stefanoya et al, (2010) asserted that the ultimate objectives of scientific literacy skills are to produce scientifically possible citizens as scientists or otherwise as normal members of the society. Watkins and Mazur (2013) concluded that scientific literacy skill is a necessary element of education in our modern science and technology driven society and that it is crucial to teach science to all citizens, not only for those who actively involved in science careers. In line with this study Maguire & Delahunt (2017) pointed out that development skills which are associated with science and technology aids the learning and understanding of science. Also, Legewie & Diprete, (2016) in their study of framing technology posited that framing various technologies in certain ways can equal or overwhelm the effect of providing someone with basic information related to emerging technologies. Also, in line with this study, Day et al, (2016) explored public perception toward scientific literacy in both the United States and Europe and found out that scientific literacy and educational levels correlate differently with several different application areas of scientific literacy. In the same vein Kristyasari et al, (2018) explored the effects of scientific literacy and numeracy on climatic change attitudes and

found out that both scientific knowledge and numeracy were associated with decreased risk perceptions regarding the dangers of climatic change. It is clear that scientific literacy is very necessary in learning science. Hence, learners should be encouraged to be scientific literate before venturing into the study of science courses. This would help a great deal as learners don't only come to learn science from the scratch but come with some elements of scientific knowledge since the teacher's duty is to build on what the learners have learnt from their immediate environment. With this the performance of students in science courses would be greatly encouraged according to Nwoye (2019)

The outcome of the current study on the gender gap in scientific literacy is on the same page with Nwoye (2019) which shows the indifference between male and female students' achievement in science courses. However, it is slightly different from the outcome of Kristyasari et al. (2018). Kristyasari et al. (2018) observed that mastery of science literacy of male students is better than that of the female-only based on the school level. The debate on the gender gaps in science education has been trending for an extended period (Abdullahi, Abubakar, Abubakar, & Aliyu, 2019; Day, Stang, Holmes, Kumar, & Bonn, 2016; Koul et al., 2016; Sax, Lehman, Barthelemy, & Lim, 2016). Many factors are attributed to the issue of gender gaps in science education which could also influence the current study. According to Aina. (2017) and Abdullahi et al. (2019) the poor enrolment and academic performance of female students in science education in Nigeria is due to culture, religion and poverty. Other factors are the school environment (Legewie & DiPrete, 2012); interest, attitude and school levels (Kristyasari, Yamtinah, Utomo, Ashadi, & Indriyanti, 2018).

Conclusion

Scientific literacy entails higher-order innovative thinking, curiosity, understanding and explanation of nature phenomenon using cause-effect relationship. Students with scientific literacy knowledge and understanding of science concepts, ask probing questions during inquiry

process, sensitive to determine answers from daily experience. They can identify scientific issues and possess the ability to engage in scientific discuss at local or national levels.

RECOMMENDATIONS

In light of the above conclusion on the scientific literacy skills and academic performance, the following are the recommendations:

1. The government should revise the science curriculum to include science literacy as a concept for teaching in the university.
2. Science lecturers should be vast in the research-based paradigms of teaching as the convectional lecture method is not sufficient to enhance scientific literacy skills.
3. It is essential to replicate this study in another college and university as these findings cannot be generalized for the Nigerian students.

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