School Location and Acquisition of Science-Technology-Society Literacy Among Secondary School Science Students

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ABSTRACT

The study was designed to determine the influence of school location on the level of Science-Technology-Society (STS) literacy of secondary school science students. The study was carried out in Ogoja Education Zone of Cross River State, Nigeria. The study employed a descriptive survey design. A total of 1,200 senior secondary school science students drawn by stratified random sampling technique were used as sample. Two research questions and one null hypothesis guided the study. The instrument for data collection was a 40-item Science-Technology-Society Literacy Scale (STSLS) developed by the researcher. This was validated by experts and reliability co-efficient using Cronbach Alpha was found to be 0.79. Data collected were analysed using mean and t-test statistics at 0.05 level of significance. The results showed that urban secondary school science students indicated significantly higher level of STS literacy than their rural counterparts in the identified STS literacy clusters. The study therefore recommended amongst others that teachers should always strive to adopt the STS literacy approach in the teaching of science and technology. Also, conscious efforts should be made to ensure that equal opportunities are given to all students irrespective of their school locations, in terms of encouragement and provision of teaching and learning resources for the realization of enhanced performance.


1 INTRODUCTION

Man lives in a dynamic world. A world characterized by increasing scientific and technological innovations. Thus, his success or failure depends, to a large extent, on his level of scientific and technological awareness [1, 2]. Perhaps, it was in realization of this that most developing nations are making frantic efforts to improve on the study of science and other allied subjects in their schools. For example, in Nigeria, the National Policy on Education stipulates that admission into the nation’s tertiary institutions should be based on 60:40 ratio for science- and arts-related subjects respectively [3]. Therefore, for adequate implementation of the United Nations’ Sustainable Development Goals (SDGs) in Nigeria and other developing nations, it is imperative that the citizenry, both in the urban and rural location, have substantially greater understanding of the intricate relationships between science, technology and society with a view to solving their personal and societal problems. Specifically, in September 2015, the United Nations adopted a set of goals to end poverty, protect the environment and ensure prosperity for all by the year 2030. Each goal has specific targets to be achieved within the next 15 years [4]. For the goals to be achieved, everyone, irrespective of location needs to do his part-government, private sector, civil society, the youths and the general populace. Appropriate education (STS) which guarantees a high degree of scientific and technological literacy on the learners and invariably on the entire populace is vital for the realization of these goals. Thus, the science teacher has a major role to play in ensuring that the learners and the general populace irrespective of their locations have the prerequisite knowledge, skills and attitude in actualizing the United Nations’ SDGs. For this to happen, governments at all levels must modify the approaches of the Millennium Development Goals (MDGs) era that left children (youths) and the rural dwellers out...
of the process [5]. Appropriate education such as Science-Technology-Society (STS) literacy that guarantees a high degree of scientific and technological literacy on the learners and ultimately on the entire populace is vital for the realization of this goal [6, 7] STS as an emergency, complementary and innovative paradigm shift in the teaching and learning of science and technical education deals with three main areas of human endeavour – Science (man’s natural world), Technology (man’s artificial world) and Society (man’s social world). According to Yagar and Yagar cited in [8], the capability of individuals to make crucial decisions about current problems and issues in the society and take personal actions as a result of the decisions based on their level of awareness of the importance, applications, basic concepts and relationship between science, technology and society is termed STS literacy. This approach to teaching and learning stresses the utilitarian value of science and technology with a view to solving real life issues confronting the students, the local community or the public at large. Furthermore, it demands that both teachers and students work co-operatively together towards achieving the set goals. Similarly, adequate resourcefulness on the part of the teachers and students is emphasized [9]. This makes the learning to be more responsive to the needs of the human society and not for mere acquisition of facts for their sake. Hence, acquisition of STS literacy is a major requirement in transforming the world especially as regards the actualization of the objectives of the SDGs in the developing nations and other parts of the world. This therefore, underscores the need to ascertain the level of STS literacy possessed by urban and rural secondary school science students in the study area. This population consisted of all the senior secondary school science students in Ogoja Education Zone of Cross River State, Nigeria.

3 PURPOSE OF THE STUDY
The purpose of this study was to ascertain the level of STS literacy of secondary school science students by school location in Ogoja Education Zone of Cross River State, Nigeria. Specifically, the study was designed to: 1) Determine the level of STS literacy of secondary school science students.
2) Determine the level of STS literacy of secondary school science students by school location.

3.1 Research Questions
Two research questions were posed for the study:
1) What is the level of STS literacy of secondary school science students in Ogoja Education Zone of Cross River State?
2) What is the level of STS literacy of secondary school science students in Ogoja Education Zone of Cross River State by school location?

3.2 Research Hypothesis
The following hypothesis was tested at 0.05 level of significance:
1) There is no significant difference between the mean STS literacy of secondary school science students by school location.

3.3 Research Design
A survey research design was used for the study. This design was adopted since the study merely sought information from the respondents as the situation exists in the study area. The population consisted of all the senior secondary school science students in the study area. This population consisted of students from both the urban and rural schools in the five Local Government Areas of Ogoja Education Zone. In each of the five Local Government Areas, eight schools were selected using stratified random sampling technique. This gave a total of 40 secondary schools. From each school, 30 senior secondary school class 3 (SSS 3) science students served as sample for the study (i.e. 40 x 30 = 1,200). The total number of students from the urban and rural schools were 600 each. This class of students (SSS III) was selected for the study because based on the school curriculum, it is expected that this category of students should have been fully exposed to all the rudiments of STS in the school programme.

3.4 Instrument for Data Collection
The instrument used for the study was a structured questionnaire – The Science-Technology-Society Literacy Scale (STSLS) for students. This was developed by the researcher based on extensive review of related literature. This 40-item instrument was validated by six experts – four experienced science educators and two experienced experts in Test and Measurement from both the Colleges of Education and Universities. The instrument was a four-point Likert-type scale.
divided into four clusters of STS literacy – Knowledge, Application, Communication and Appreciation of STS. The response options on the scale were Strongly Agree (SA), Agree (A), Disagree (DA) and Strongly Disagree (SD). Items were scored 4, 3, 2 and 1 respectively for all positive statements and the reverse for all negative statements. The respondents were requested to indicate their level of agreement or disagreement with each statement in the various clusters (or areas) of the questionnaire. Internal consistency reliability co-efficient of STSLS was established to be 0.79 using Cronbach’s Co-efficient Alpha. This was considered high enough and reliable.

4 DATA ANALYSIS AND RESULTS

Data collection from the sample was carried out by the Researcher and five Research Assistants. The data was analysed using mean and t-test statistics in accordance with the research questions and hypothesis. The mean performance level were determined and interpreted as follows: Above 3.50 means Adequately STS literate. 2.50-3.50 means Moderately STS literate. Below 2.50 means Not STS literate. In specific terms, Mean was used to answer the research questions while t-test statistics was used to test the hypothesis, in order to determine significance of the difference between the mean performance scores of the urban and rural respondents. The results of the analysis are as summarized in the following tables (1-2).

4.1 Research Question 1

What is the level of Science-Technology-Society (STS) literacy of secondary school science students in Ogoja Education Zone?

<table>
<thead>
<tr>
<th>Table 1. Mean Scores of Secondary School Science Students (By school location and overall) in the STSLS. N = 1,200.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/No STSLS Clusters</td>
</tr>
<tr>
<td>1 Knowledge of Science, Technology and Society</td>
</tr>
<tr>
<td>2 Application of Science and Technology in the Society</td>
</tr>
<tr>
<td>3 Communication of Science and Technology in the Society</td>
</tr>
<tr>
<td>4 Appreciation of Science and Technology in the Society</td>
</tr>
<tr>
<td>Overall</td>
</tr>
</tbody>
</table>

Table 1 above shows the mean scores of the respondents in the various clusters of STSLS. The mean scores in the various clusters are as follows – Knowledge (3.05); Application (2.63); Communication (2.47); Appreciation (2.24) and Overall (2.60). Since the cluster mean scores for Communication and Appreciation are below 2.50, these indicate that the respondents are not STS literate in these areas. However, the mean scores for Knowledge and Application are within the mean range of 2.50-3.50. These are indicative that the respondents are moderately STS literate in these areas. Similarly, the overall mean is within the mean range of 2.50-3.50. Hence, it can be concluded that the respondents are moderately STS literate.

4.2 Research Question 2

What is the level of STS literacy of Secondary School Science Students in Ogoja Education Zone by School Location?

Table 1 data shows the comparison of two group means (Urban and Rural students) on STSLS cluster – Knowledge (3.65 Vs 2.45); Application (3.02 Vs 2.24); Communication (2.66 Vs 2.28); Appreciation (2.34 Vs 2.14) and Overall (2.92 Vs 2.28). Since the cluster mean for urban students in the area of Knowledge is above 3.50, it is indicative that the urban students are adequately STS literate in this area. However, they are moderately STS literate in the areas of Application and Communication of STS as their mean scores are within mean range of 2.50-3.50. On the other hand, they are not STS literate in Appreciation of STS as their mean score is below 2.50.

For the rural students, they are not STS literate in all the areas of consideration. Their mean scores in the various areas of STS are below 2.50 (i.e. from 2.14 to 2.45). In the overall consideration, the overall mean score of the urban students is 2.92. This indicates that the urban students are moderately STS literate. On the contrary, the overall mean score of the rural students indicates that they are not STS literate. This is because the mean score of 2.28 is below the mean value of 2.50.

4.3 Hypothesis 1

There is no significant difference between the mean STS literacy level of secondary school science students by School Location.

<table>
<thead>
<tr>
<th>Table 2. The t-test of the Mean Rating of STS Literacy Level of Secondary School Science Students by School Location.</th>
</tr>
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<tbody>
<tr>
<td>Mean SD N Df Standard Error t-cal t-crit Decision</td>
</tr>
<tr>
<td>Urban Students 2.92 0.80 600 1,198 0.06 11.23 1.96 Reject H0</td>
</tr>
<tr>
<td>Rural Students 2.28 1.15 600</td>
</tr>
</tbody>
</table>

Where SD = Standard Deviation; t-cal = t-calculated and t-crit = t-critical (table value).

Table 2 above presents the t-test analysis of the difference between the mean rating of STS literacy levels of Urban and Rural secondary school science students in the identified literacy clusters. From the table, it can be observed that the t-calculated (11.23) at 1.96 degree of freedom (df) and
The above analysis of data has resulted into the following findings:

1) Secondary school science students in the study area indicated moderate level in STS literacy.

2) In specific terms, urban secondary school science students in the study area indicated moderate level in STS literacy.

3) Rural secondary school science students in the study area indicated that they are not STS literate.

4) Urban secondary school science students indicated significantly higher level of STS literacy than their rural counterparts in the identified literacy clusters.

5 DISCUSSION OF FINDINGS

The findings that secondary school science students are moderately STS literate is in line with the earlier findings of Ogunniyi, Eniayeju and Emeriole cited in [8] that the conditions in which scientific/technological literacy programme operates in schools are very unsatisfactory. They assert that only about one-third of the necessary requirements for its proper functioning had been met. In this not commendable performance of the science students in STS literacy, some specific areas are the most challenging. These are Communication and Appreciation of science and technology in the society. There is a dire need, therefore to consciously familiarize students with these areas of STS literacy to enable them contribute meaningfully to the society. This is very vital for the successful implementation of the SDGs in Nigeria [10]. Thus, the science teacher and the government have a major role to play in ensuring that the learners (both Urban and Rural students) and the general populace have the requisite knowledge, skills and attitudes in actualizing the United Nations' SDGs. This study also showed that urban secondary school science students have moderate level of STS literacy while their rural counterparts are not STS literate. Results in Table 1 further confirmed this finding by indicating statistically significant difference in STS literacy in favour of the urban students. This finding is not unexpected because one of the correlates of learning is the location of the school. As Akabogu cited in [8] asserts, the location of a school has impact on the quality of the learning environment as well as the mode and quality of learning. This is in line also with the finding of [11] that teachers in urban and rural schools tend to be different in perception and disposition to teaching. Hence, it can be said that school location has influence on the teacher’s methodology of teaching a given concept. This can be attributed mainly to the variation in the available teaching resources between the urban and rural schools. The acquisition of science process skills is of utmost importance in science-technology-society education. This means that STS learning, irrespective of school location and other similar factors requires the development of rational critical thought process in the students to enable them explore, discover, invent and develop some of the tools of inquiry appropriate to the field of science [6]. This can only be realized by the continuous and effective efforts of the teacher despite the conditions of the learning environment. It therefore follows that for effective and efficient attainment of global sustainable development in any society, equitable harnessing and maximizing of the human resources irrespective of location is necessary. Since the design, planning and implementation of the SDGs demand the involvement of all segments of the populace, there is need therefore for more efforts to enhance the STS literacy of both the urban and rural dwellers. This should start from the school by her marked improvement in the provision of both human and material resources for learning. This will help to avoid the lapses and poor implementation of the Millennium Development Goals (MDGs) experienced in most developing nations.

6 CONCLUSION AND RECOMMENDATIONS

The results of the study have shown the level of STS literacy of secondary school science students. Although urban secondary school science students indicated moderate level of STS literacy, their rural counterparts indicated that they were not STS literate. In other words, school location has been indicated as a significant factor in the level of STS literacy of secondary school science students. In view of the educational implications of the findings, the following recommendations are made with a view to realizing improved performance and enhanced national development:

1) Science and technology teachers should always strive to employ appropriate methodology (STS literacy approach/activity-based method) in teaching science and technology in schools since this will help immensely in enhancing the STS literacy level of their students.

2) The current curriculum for science and technology education should be redesigned to adequately emphasize the inter-relatedness of science, technology and society.

3) Equal opportunities should be given to all students irrespective of where their schools are located (urban or rural) in terms of encouragement and provision of teaching and learning resources in schools.

4) The government through the appropriate agencies should launch aggressive awareness campaigns on STS issues and programme for science and technology teachers and students as well as the entire populace to enhance their participation in the implementation of the SDGs in Nigeria and other developing nations.

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REFERENCES


