Investigation of Proficiency in Supportive Mathematics Topics among Senior Secondary Science Students in Rivers State

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Abstract
Supportive mathematics topics are those mathematics topics, learned earlier by senior secondary two (SS II) science students, that can help them succeed in their science subjects and courses. Studies revealed that secondary students have poor mathematical skills. This study therefore investigated students' proficiency in some supportive mathematics topics as it relates to their gender and the location of their schools. Descriptive research design was adopted. Simple random sampling and stratified sampling were used to select1652 students from 15 rural and 15 urban coeducational public secondary schools in Rivers State. Supportive mathematics Test (r=0.80) was used for data collection. Descriptive statistics and t-test were used to analyse the data at 5%level of significance. The result revealed that the highest mean score in supportive mathematics topics was in Decimal Fraction and Approximation ($\bar{x} = 42.65$) which is below average, meaning that, their performance in supportive mathematics was poor. There was no significant difference between the mean proficiency scores of male and female students in all the supportive mathematics topics (p>0.05). The mean proficiency scores of supportive mathematics topics of urban students were significantly

better than that of rural students. It was recommended among others that students should take their mathematics lessons seriously at all levels of education because the proficiency they acquire from their junior mathematics classes may positively or negatively influence their success in most science subjects and even science courses in higher institutions.

Keywords: Proficiency, supportive mathematics, senior secondary schools, science students,

Introduction

Mathematics plays a critical role in everyday life as well as in the scientific and technological development of any nation since its knowledge is required by scientists to quantify and accurately estimate results and changes in different fields of science. For instance, proficiency in mathematics is needed by pharmacists to estimate the quantity of a chemical that is needed to produce a specific quantity of a medicine. This implies that students who have poor mathematical skills are likely not to excel in science courses such as medicine, pharmacy, biochemistry, and engineering, among others that needs the application of such mathematical skills, and this will be bad for scientific and technological development.

Supportive mathematics topics are those mathematics topics learned earlier by senior secondary two (SS II) science students, that can help them succeed in their science subjects and courses. This is supported by the study of Udousoro (2011) which showed that students with high mathematics ability performed significantly better in chemistry. In the same vein, the study of Mitee, Obaitan and Adeleke (2015) revealed that cognitive entry characteristics in mathematics were positively and significantly associated with students' achievement in quantitative chemistry. Students with poor mathematical skills were unable to solve problems in quantitative chemistry because quantitative chemistry has so much to do with the application of mathematical skills learned earlier. This will probably be the case with most science courses since they also require the application of mathematical skills. Proficiency in supportive mathematics topics

therefore appears to be crucial to the success of secondary science students and its investigation seems to be worthwhile.

The aim of any educational institution is to provide students with effective instruction so that students can adequately learn. Unfortunately, the effective learning of students could be hampered by the location of their schools (rural or urban). School location is a factor that may influence the supportive mathematics proficiency of secondary science students. This is supported by the studies of Onoyase (2015) and Ellah and Ita (2017) which showed that students' performance in urban schools was better than their performance in rural schools. The reason is possibly because urban schools may provide better opportunities to learn for their students since they are likely to have better resources than rural schools. However, Ezeudu and Obi (2013) found a contrary result which revealed no significant influence of school location on students' performance.

Students' gender is another factor that might influence the mathematics proficiency of secondary science students. This is because several studies have shown that gender has substantial influence on students' performance (Adigun, Onihunwa, Irunokhai, Sada and Adesina, 2015; Amedu, 2015 and Nnamani and Oyibe, 2016). However, Amosun, (2011) and Dania (2014) found no significant influence of gender on students' performance. Although, it seems that none of these studies related gender or school location to secondary science students' proficiency in supportive mathematics topics. This study therefore investigated secondary science students' proficiency in supportive mathematics topics as it relates to their gender and the location of their schools.

Statement of the Problem

Mathematics is best learnt from known to unknown. Previous studies had established the importance of entry behaviour and how it relates to the students' academic performance in mathematics. There is need therefore to place emphasis on these prerequisite skills needed to flourish not only in mathematics but also in all science oriented courses. It is against this, that a study of this nature was carried out to

empirically analyse and establish students' proficiency in some supportive mathematics topics and how it relates to their gender and the location of their schools.

Research Questions

The research questions used to guide this study are:

1. What is the proficiency level of the SS II science students in supportive mathematics topics?

Hypotheses

1. There will be no significant gender difference in the proficiency of SSII Science Students in Supportive mathematics topics.

2. There will be no significant school location difference in the proficiency of SSII Science Students in Supportive Mathematics topics

Methodology

The study adopted a descriptive research design. Simple random sampling was used to select three Local Government Areas (LGAs) from the 21 LGAs that have rural and urban schools in Rivers State. All the public coeducational schools in each of the selected LGAs were stratified into rural and urban schools. Simple random sampling was again used to select 5 schools from each stratum (rural or urban) giving 10 schools per LGA making a total of 30 schools. An intact SS 2 science class was randomly selected from each school giving a total of 1652 students. Mathematics Proficiency Test was used to collect the data. It was constructed by the researchers based on mathematical knowledge and competencies that can support the learning of Science in Senior Secondary School. It is made up of two sections: sections A and B. Section A contains the demographic information about the students while Section B contains 15 items on Mathematics content students were exposed to in the previous classes. The instrument was given to experts in mathematics and Science education for content relevance after which it was trial tested and validated using a sample of 130 SS 2 Science students from co-educational public schools that

were not part of the sample that participated in the study. Kuder Richardson formula 20 (KR-20) was used to establish the reliability of the instrument, which was found to be 0.80. Descriptive statistics (mean, standard deviation, frequency and percentage) was used for the research question, while t–test distribution was used for the hypotheses at 5% level of significance.

Results

Research Question 1: What is the proficiency level of the SS II science students in supportive mathematics topics?

Table 1: Proficiency of SS II science students in supportive mathematics topics

Mathematics Content	Mean	Std. Deviation
Standard Form	37.03	30.26
Subject of Formula	33.31	29.20
Basic Arithmetic	27.88	34.88
Decimal Fraction and Approximation	42.65	37.75
Statistics	41.00	29.95

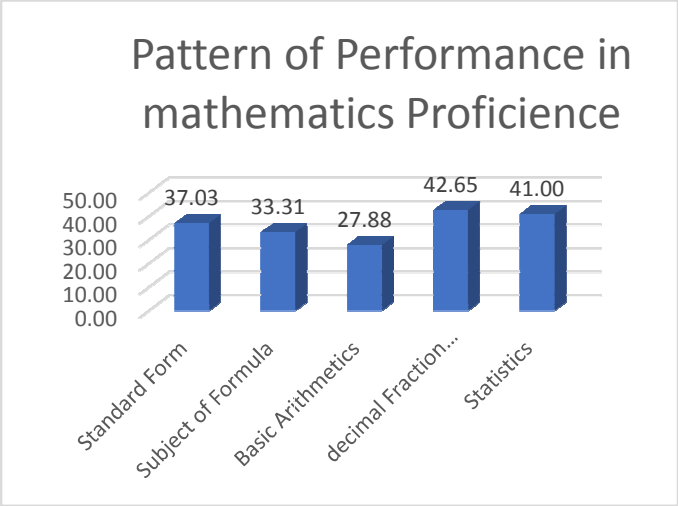

Fig. 1 Proficiency of SS II science students in supportive mathematics topics

Table 1 and Fig. 1 revealed that the highest mean score in supportive mathematics topics of SS II science students was in Decimal Fraction and Approximation ($\bar{x} = 42.65$) which is below average, followed by Statistics ($\bar{x} = 41.00$), Standard Form ($\bar{x} = 37.03$), Subject of Formula ($\bar{x} = 33.31$) and Basic Arithmetic ($\bar{x} = 27.88$).

Hypothesis 1. There will be no significant gender difference in the proficiency of SSII Science Students in Supportive mathematics topics.

Table 2: Proficiency of SSII science students in supportive mathematics topics based on Gender

	GENDER	N	Mean	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Standard Form	Male	815	36.81	30.29	1.06	-0.286	1650	0.775
	Female	837	37.24	30.25	1.05			
Subject of Formula	Male	815	34.11	29.60	1.04	1.106	1650	0.269
	Female	837	32.52	28.80	1.00			
Basic Arithmetic	Male	815	29.57	36.04	1.26	1.951	1650	0.051
	Female	837	26.22	33.65	1.16			
Decimal Fraction and Approximation	Male	815	43.01	37.26	1.31	0.383	1650	0.702
	Female	837	42.29	38.24	1.32			
Statistics	Male	815	41.92	30.51	1.07	1.234	1650	0.217
	Female	837	40.10	29.38	1.02			

Table 2 shows that the mean proficiency scores of male ($\bar{x}$ = 36.81%) and female ($\bar{x}$ = 37.24%) students were not significantly different in standard form content (t = -0.29; p> 0.05). The mean proficiency scores of male ($\bar{x}$ = 34.11%) and female ($\bar{x}$ = 32.52%) students were not significantly different in Subject of Formula content (t = 1.1; p> 0.05). The mean proficiency scores of male ($\bar{x}$ = 29.57 %) and female ($\bar{x}$ = 26.22 %) students were not significantly different in Basic Arithmetic content (t = 1.95; p> 0.05). The mean proficiency scores of male ($\bar{x}$ = 43.03 %) and female ($\bar{x}$ = 42.29%) students were not significantly different in Decimal Fraction an Approximation content (t = 0.38; p> 0.05). The mean proficiency scores of male ($\bar{x}$ = 41.92%) and female ($\bar{x}$ = 40.10%) students were not significantly different in Statistics (t =1.23; p> 0.05). The mean proficiency scores of Male and female SS II science students were not significantly different in all the supportive mathematics topics.

Hypothesis 2. There will be no significant school location difference in the proficiency of SSII Science Students in Supportive Mathematics topics

Table 3: Proficiency of SSII science students in supportive mathematics topics based on School Location

	School Location	N	Mean	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Standard Form	Urban	600	38.89	31.45	1.28	1.89	1650	0.06
	Rural	1052	35.96	29.52	0.91			
Subject of Formula	Urban	600	35.83	30.67	1.25	2.66	1650	0.01
	Rural	1052	31.86	28.24	0.87			
Basic Arithmetic	Urban	600	30.25	35.70	1.46	2.09	1650	0.04
	Rural	1052	26.52	34.35	1.06			
Decimal Fraction an Approximation	Urban	600	43.75	38.74	1.58	0.90	1650	0.37
	Rural	1052	42.02	37.18	1.15			
Statistics	Urban	600	43.00	31.34	1.28	2.05	1650	0.04
	Rural	1052	39.86	29.08	0.90			

The mean proficiency scores of urban students ($\bar{x}$ = 38.89 %) and rural students ($\bar{x}$ = 35.96%) students were not significantly different in Standard Form content (t =1.89; p>0.05). The mean proficiency scores of urban ($\bar{x}$ = 35.83%) and rural ($\bar{x}$ = 31.86%) students were significantly different in Subject of Formula content (t = 2.66; p<0.05). The mean proficiency scores of urban ($\bar{x}$ = 30.25%) and rural ($\bar{x}$ =26.52%) students were significantly different in Basic Arithmetic content (t = 2.09; p<0.05). The mean proficiency scores of urban ($\bar{x}$ = 43.75%) and rural ($\bar{x}$ = 42.02%) students were not significantly different in Decimal Fraction and Approximation content (t= 0.90; p>0.05). The mean proficiency scores of urban ($\bar{x}$ = 43.00%) and rural ($\bar{x}$ = 39.86%) students were significantly different in Statistics content (t = 2.05; p<0.05). The mean proficiency scores in supportive mathematics topics with Subject of Formula, Basic

Arithmetic and Statistics contents of urban and rural SS II science students were significantly different and in favour of urban students while the mean proficiency scores of urban and rural SS II science students were not significantly different in supportive mathematics topics with Standard Form and Decimal Fraction and Approximation contents.

Discussion

The result of the study revealed that the mean scores of the SS II science students in all the supportive mathematics topics were below average. It infers that the students were not proficient in the supportive mathematics topics (Decimal Fraction and Approximation, Statistics, Standard Form, Subject of Formula and Basic Arithmetic). The result corroborates that of the West African Examination Council chief examiner's report (2009) which indicated that students had poor mathematical skills. The reason for the result may be associated with the fact that students must have avoided learning the subject in their junior classes which must have negatively influenced their proficiency in the studied supportive mathematics topics. This is unfortunate because it will deprive the students from exceling in most science subjects and courses which are vital for scientific development because their success in most science subjects in secondary schools and science courses in higher institutions require proficiency in these supportive mathematics topics. This is supported by the study of Mitee, Obaitan and Adeleke (2018) which revealed that cognitive entry characteristics in mathematics (mathematics learned earlier) had positive and significant effect on students' achievement in quantitative chemistry. It is also in line with the study of Udousoro (2011) which showed that students with high mathematics ability performed significantly better in chemistry.

The finding of the study also revealed that the mean proficiency scores of male and female SS II science students were not significantly different in all the supportive mathematics topics. The finding is supported by the studies of Amosun, (2011) and Dania (2014) who found no significant influence of gender on students'

performance. This finding however, contradicts several other studies which revealed significant influence of gender on students' performance (Adigun, et al. 2015; Amedu, 2015 and Nnamani and Oyibe, 2016). The relationship between gender and students' performance has been a source of concern to stakeholders in education. Most studies revealed significant difference between the performances of male and female students and favouring male students. This trend appears to be changing as evident from the result of this study. Perhaps, the reason is because female students have received so much motivation from their teachers and competitive male classmates which must have positively driven them to achieve as high as their male counterparts.

Another aspect of the study revealed that the mean proficiency scores of urban and rural SS II science students were significantly different in three out of the five supportive mathematics topics (Subject of Formua, Basic Arithmetics and Statistics) and the difference was in favour of urban students. The result corroborates the studies of Onoyase (2015) and Ellah and Ita (2017) which showed that students' performance in urban schools was better than their performance in rural schools. The result is however contrary to the study of Okorie and Ezeh (2016) which revealed that the mean achievement score of students in rural schools was higher than students in urban schools. The result was probably so because the urban secondary school science students must have also attended urban primary and junior secondary schools and had acquired better supportive mathematics skills from such schools since these urban schools usually have better resources than rural schools. Students from urban schools must have had better opportunity to become more proficient in supportive mathematics than their counterparts in rural schools.

Conclusion

This study examined the proficiency of SS II science students in supportive mathematics topics as it relates to their gender and the location of their schools. The general proficiency in the studied supportive mathematics topics of the students were found to be

below average which implies that science students had poor proficiency in the studied supportive mathematics topics. This is bad for their success in most science subjects and courses in higher institutions and will likely hamper scientific development.

Urban science students were significantly more proficient in the supportive mathematics topics than rural science students. The result is expected because of the gap in the availability of resources that promote learning, which usually favours urban schools. This gap seems to be the case most of the time and should be bridged so that there will be no more disparity in the proficiency in supportive mathematics topics between urban and rural science students.

There was no significant difference in the proficiency in the studied supportive mathematics topics between male and female SS II science students. The relationship between gender and students' performance has been a source of concern to stakeholders in education since most studies usually reveal significant difference between the performance of male and female students and favouring male students. This trend appears to be changing as evident from the result of this study which indicated no gap in the proficiency in supportive mathematics topics between male and female students.

Recommendations

The following recommendations were made based on the result of the study:

1. Students should take their mathematics lessons seriously at all levels of education because the proficiency they acquire from their junior mathematics classes will positively or negatively influence their success in most science subjects and even science courses in higher institutions.

2. Teachers should motivate their students to learn mathematics and take their mathematics lessons seriously by telling them the importance of mathematics to their success in most science subjects and courses.

3. Curriculum planners should incorporate the revision of previous supportive mathematics topics learned in previous classes that are needed in the learning of mathematics topics in current class.

4. The Government should endeavour to provide enough resources like qualified mathematics teachers for rural schools. This way, the gap in the proficiency in supportive mathematics topics between urban and rural science students could be bridged since such provision is likely to improve the opportunity to learn of the rural science students.

References

Adigun, J.; Onihunwa, J.; Irunokhai, E.; Sada, Y. and Adesina, O. (2015). Effect of Gender on Students' Academic Performance in Computer Studies in Secondary Schools in New Bussa, Borgu Local Government of Niger State. *Journal of Education and Practice*. 6.33:1-7

Amedu, O.I. (2015). The Effect of Gender on the Achievement of Students in Biology Using the Jigsaw Method. *Journal of Education and Practice*. 6.17:176-179.

Amosun, P.A. (2011). Performance and Attitude of Male and Female Students in Physical Geography in Urban and Rural Schools of Ogun State, Nigeria. African Journal for the Study of Educational Issues, 4(3,4):195-198.

Dania, P.O. (2014). Effect of Gender on Students Academic Achievement in Secondary School Social Studies. *Journal of Education and Practice,* 5(21):78-84.

Ellah, K.E. and Ita, P.M. 2017. Correlational relationship between school location and students' academic performance in English language in Nigerian secondary schools. *International Journal of Scientific and Research Publications* 7.9: 381-384.

Mitee, T.L., Obaitan, G.N. and Adeleke 2018. Effect of mastery learning on senior secondary school students' learning outcome in quantitative chemistry. *Journal of Education and Practice* 6.5: 34-

38. Retrieved Nov. 17, 2016, from http://www.iiste.org/Journals/index.php/JEP/article/view/20020/20377.
Nnamani, S.C. and Oyibe, O.A. (2016). Gender and Academic Achievement of Secondary School Students in Social Studies in Abakaliki Urban of Ebonyi State. British Journal of Education. 4.8:72-83.
Okorie, E.U. and Ezeh, D.N. 2016. Influence of Gender and Location on Students' Achievement in Chemical Bonding. *Mediterranean Journal of Social Sciences* 7.3: 309- 317.
Onoyase, S.O. 2015. The impact of school management environment on students' output quality in Oyo state secondary schools. PhD. Thesis. Dept. of Educational Management. University of Ibadan. xvi+189pp.
Udousoro, U.J. 2011. The effects of gender and mathematics ability on academic performance of students in chemistry. *An International Multidisciplinary journal* 5:4. 201-213.
W.A.E.C. 2009. Chief examiner's report. West African School Certificate Examination. Lagos, Nigeria: WAEC Press Ltd.