AN ASSESSMENT OF HUMAN AND MATERIAL RESOURCES FOR TEACHING AND LEARNING OF MATHEMATICS IN SENIOR SECONDARY SCHOOLS IN ABUJA, NIGERIA

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Abstract
This study assessed human and material resources for teaching and learning of mathematics in senior secondary schools Abuja, Nigeria. The purpose was to identify qualities of teachers, instructional resources and ascertain conditions of the instructional resources available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja. Three research questions and three null hypotheses guided the study. This study adopted descriptive survey research design. The population of the study consists of 358 mathematics teachers in the six Area Councils of the Federal Capital Territory Abuja. About 50% of the total population was randomly selected which gives 180 mathematics teachers as sample size. The instrument for data collection was a structured questionnaire and a checklist. A total of 180 copies of the questionnaires were distributed, 155 were retrieved and used for analysis using mean and standard deviation statistics for research questions; t-test statistics was used to test the null hypotheses at 0.05 levels of significance. The findings of the study revealed that qualified mathematics teachers and materials resources were inadequate for effective teaching and learning of mathematics in Senior Secondary Schools and the available instructional resources were not in good condition in Senior Secondary Schools in Abuja. It was recommended that FCT Administration should ensure that qualified applicants who studied Mathematics Education are recruited to teach mathematics; instructional resources for teaching and learning of mathematics should be provided by Education Secretariat through Secondary Education Board (SEB) down to the school principal; Monitoring and Evaluation unit should sensitize the school principals and teachers on the need to put more emphasis on utilisation and improvisation of instructional resources in teaching and learning of mathematics and above all, mathematics and other subjects at all level, should be subjected to accreditation and reaccreditation based on the adequacy of facilities, textbooks and other curricula elements by FCT Education Secretariat and other examining bodies from time to time.

Keywords: Human and Material Resources, Teaching, Learning, Mathematics and Senior Secondary Schools

Introduction

Human and material resources play significant roles in the development of any nation. It is a widely held opinion that the success or otherwise of any enterprise among other things depends largely on the availability and utilisation of relevant resources. This is due to the fact that the growth of tangible capital stock of a nation depends to a considerate degree on human capital development. Without adequate investment in developing the human and material resources of the education sector, the possibility of the growth of any nation might be hampered (Oduma, et. al., 2021). Resources whether human or material are recognised as vital facets of any successful human endeavour including education. Education is the vital instrument for social and economic mobility at the personal level and an instrument for transformation of society at the national level (Okpala, 2016).

Resources refer to materials, services, staff and other assets that are beneficial to organisational productive processes and ends (Kaufinan & Schneider, 2008). Resources are things that can give help or support when needed in order to achieve a goal or an objective by an individual, group of individuals or an organisation (Flippo, 2013). Furthermore, educational resources mean those things that are needed to help or support in achieving educational goals and objectives. Resources in this study are those human and materials needed for achieving teaching and learning of mathematics goals and objectives. Thus, effective teaching and learning of mathematics depends on availability and utilisation of diverse human and material resources.

Human resources, according to Inyiagu (2009), refer generally to human skills/expertise (staff) that are available to organisations for productive purposes. In the context of this study, human resources refer to male and female mathematics teachers who are the agents of curriculum implementation. Tanner and Tanner (2019) noted that the success of a curriculum largely depend on teachers handling it. Udofort in Osarenren-Osaghae and Irabo (2012) lamented that insufficient qualified teachers in both private and public schools have often resulted in the employment of unqualified people and this de-motivates the students through bad teaching. Also, male teachers tend to be more proactive in teaching of mathematics than the female teachers. No wonder male mathematics teachers are more than the female mathematics teachers. Without human efforts, skills or expertise, no organisation (education inclusive) can achieve its goals. On the other hand, Material resources are quantifiable material used to complete a task such as equipment; machines etc that often complement human input or resources in organisations (Miller & Spoolman, 2011).

Similarly, Nwaubani and Ezegbe (2010) argue that facilities in the learning environment such as furniture, electricity, workshops, equipment, etc are also parts of material resources.

Material resources could be tangible or intangible. Intangible resources include social learning environment, teaching methods, information, communication, finance, time, teachers' disposition and so on (Hill & Charalambous, 2012, Schell *et al.*, 2013). In educational perspective, material resources constitute the major tools mathematics teachers employ in promoting teaching and learning. Adeogun (2019) noted that it is the responsibility of the school administration, proprietors inclusive and the government to ensure that adequate materials resources are made available to the school. This will enable the schools to equip their students effectively and produce good performance on the part of both teachers and students; there is need for the provision of adequate human and materials resources in our secondary schools. Adequate human resources according to Adeogun (2019) means having the right quantity and quality of teachers in the school. Strategically, mathematics teachers are expected to utilise available resources in the school for instructional delivery. Selection of material resources helps for in-depth understanding of lesson, making the lesson attractive, capturing students' attention and motivating them to learn more. Before, instructional resources frequently used were maps, chart, and so on, which are used to enhance the teaching and learning of mathematics, but presently there is technological advancement where film slides, Ipads, laptops, projectors, television and internet system are the instructional resources which help in teaching and learning process (Usman, 2016). It is, therefore, imperative to find out the assessment of human and material resources for teaching and learning of mathematics in Senior Secondary Schools in Abuja, Nigeria.

Statement of the Problem

The availability of human and material resources in Senior Secondary Schools is crucial and Federal Capital Territory Administration has been consistent in ensuring that these educational resources are available for schools. Human and material resources make teaching and learning more understandable and meaningful. However, criticism abounds on the adequacy of human and material resources available for effective teaching and learning in many secondary schools in Nigeria. Also, Federal Capital Territory, Abuja have obviously been challenged with inadequate provision of necessary human and material resource needed in our schools such as buildings, books, good and modern library, Information and communication technology (ICT), Laboratory, etc as well as qualified mathematics teachers. Most researchers have discovered the inadequate human and material resources as one of the

major problem that lead to poor academic performance of students in mathematics in secondary schools.

But in spite of the benefits of human and material resources to teaching and learning, the scarcity of the material resources as well as inadequate qualified teachers in Senior Secondary Schools in Abuja has hindered, to some extent, the efficiency of teaching and learning of mathematics. In view of this difficulty, it is quite unfortunate to note by observation that teachers in mathematics related areas such as physics, engineering, economics and accountancy are deployed to teach mathematics in some schools that has no qualified mathematics teachers in Abuja. This has resulted to the theoretical method of teaching the subject in abstract.

Also the researcher has taught for a number of years in both primary and secondary schools. Through these experiences, the researcher observed that most teachers do not make use of material resources in the teaching of mathematics due to non-availability. This negligence of the effective use of the material resources and facilities in teaching and learning of mathematics and inadequate qualified mathematics teachers have been affecting the academic performance of students in mathematics in Senior Secondary Schools in Abuja. It is based on the aforementioned problems that the researcher is motivated to assess human and material resources for teaching and learning of Senior Secondary Schools mathematics in Abuja, Nigeria.

Conceptual Model

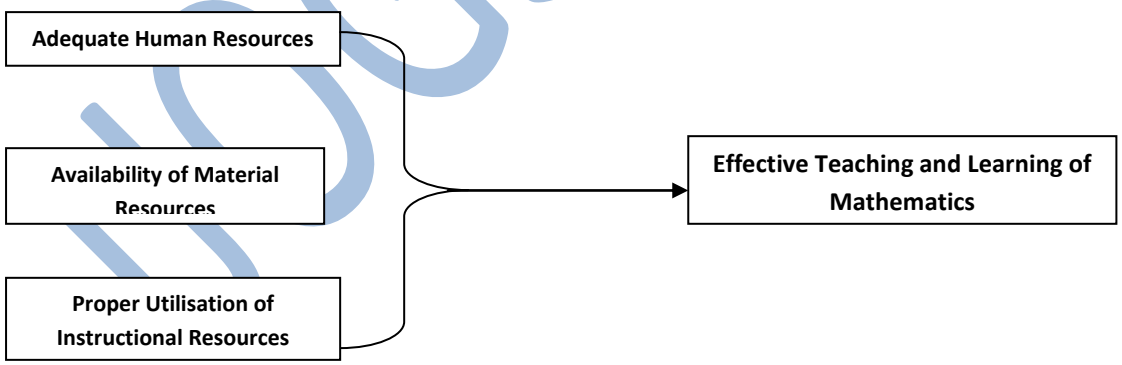

Figure 1: Resources Model for Teaching and Learning of Mathematics (RMTLM)

Source: The Researchers

Figure 1 described Resources Model for Teaching and Learning of Mathematics (RMTLM) developed by the researchers. Adequate human resources (mathematics teachers), availability of material resources (instructional resources) and proper utilisation of

instructional resources yield effective teaching and learning of mathematics in Senior Secondary Schools.

Research Questions

The study was guided by the following research questions:

1. What are the qualities of teachers available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja?
2. What are the instructional resources available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja?
3. What is the condition of the available instructional resources for teaching and learning of mathematics in Senior Secondary Schools in Abuja?

Research Hypotheses

The following hypotheses were formulated:

Ho_1: There is no significant difference in the mean response of the male and female teachers regarding the qualities of mathematics teachers for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja.

Ho_2: There is no significant difference in the mean response of the male and female teachers regarding the availability of instructional resources for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja.

Ho_3: There is no significant difference in the mean response of the experienced and inexperienced teachers on the condition of the available instructional resources for teaching and learning mathematics in Senior Secondary Schools in Abuja.

Research Methodology

Research design for this study was a descriptive survey design. The targeted population for this study comprised of 88 government Senior Secondary Schools and 358 mathematics teachers in the Federal Capital Territory Abuja. However, fifty percent (50%) of the total population were selected randomly from the six (6) Area Councils of F.C.T Abuja. This gives a total of 180 mathematics teachers which served as sample size for this study.

The instrument for data collection was structured questionnaire titled "Human and Material Resources Available for Effective Teaching and Learning of Mathematics Questionnaire (HMRAETLMQ) which contained items 1-6 and a checklist titled "Availability of Instructional Resources for Effective Teaching and Learning of Mathematics" (AIRETLM) with had items 7-16 and items 17-23 which based on the conditions of those items in the checlist were designed and used for data collection. The

questionnaire was structured on a four point scale based on: Very much Available (VMA); 4 points; Moderately Available (MA); 3 points; Rarely Available (RA); 2 points and Not Available (NA); 1 point for data collection in research question one and two, while Strongly Agree (SA); Agree (A), Disagree (D) and Strongly Disagree (SD) for question three. The instrument was validated by two experts in the area of Mathematics Education. The reliability of the instrument was determine using Cronbach Alpha method and yielded reliability co-efficient of 0.81.

One hundred and eighty (180) copies of the questionnaire were distributed to the respondents with the help of six research assistants after proper briefing. Out of One hundred and eighty (180) copies distributed, only 155 were correctly completed and returned for use in this study.

Mean and standard deviation were used to answer the research questions while the null hypotheses were tested using t-test statistics at 0.05 level of significance. The decision rule was based on the condition that any questionnaire items with a mean score of 3.50 – 4.00 was considered as VMA/SA, 2.50 – 3.49 as MA/A, 1.50 – 2.49 as RA/D and 1.00 – 1.49 as NA/SD. For the checklist, any material with percentage value of 50% and above was regarded as "Available" while materials which recorded percentage value of 49% and below was regarded as "Not Available". Similarly, null hypotheses were rejected if the calculated t-value is greater than the table value otherwise they were accepted.

Findings

Bio-data of the Respondents

Table 1: Frequency Distribution of Respondents by Areas of Specialisation

S/N	Respondents' Areas of Specialisation	Frequency	%
1	B.Sc. Statistics	39	25.2
2	B.Sc. Mathematics	45	29.0
3	B.Sc.(Ed.) Mathematics	37	23.9
4	B.Sc. in other related subjects	34	21.9
	Total	**155**	**100.0**

Table 1 showed frequency distribution of respondents by areas of specialization. About 45 (29.0%) teachers had B.Sc. in Mathematics without teaching qualification; 39 (25.2%) had B.Sc. Statistics; 37 (23.9%) had B.Sc.(Ed.) Mathematics and 34 (21.9%) had Bachelor degree in other related subjects. This results indicated that qualified mathematics teachers were inadequate in FCT Abuja.

Research Question 1: What are the qualities of teachers available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja?

Table 2: Summary of Mean and Standard Deviation of the Respondents on the Qualities of Teachers Available for Effective Teaching and Learning of Mathematics

S/N	Qualities of Teachers Available	N	$\bar{x}$	SD	Decision
1	Availability of mathematics teachers in your school	155	3.50	0.85	Very Much Available
2	Mathematics teachers with teaching qualifications are available	155	2.40	0.88	Rarely Available
3	Mathematics teachers with knowledge of method instruction are available	155	1.78	0.93	Rarely Available
4	Mathematics teachers with competent in the use of instructional resources are available	155	1.48	0.84	Not Available
5	Availability of mathematics teachers who are from other related field	155	3.45	0.79	Moderately Available
6	Available mathematics teachers specialising in Mathematics Education	155	2.31	0.89	Rarely Available
	Grand Mean		**2.48**		

Table 2 described summary mean and standard deviation of respondents on the qualities of teachers available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja. Respondents considered items 1 to be Very Much Available (VMA), items 2, 3 and 6 were Rarely Available (RA), item 5 was moderately available and item 4 was considered Not Available (NA) by the respondents. Grand mean of 2.48 implies that respondents agreed that the qualities of teachers for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja are rarely available.

Research Question 2: What are the instructional resources available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja?

Table 3: Summary of Frequency and Percentage of the Respondents on the Instructional Resources Available for Effective Teaching and Learning of Mathematics

S/N		Available		Not Available		Remark
	Available Instructional Resources	Freq.	%	Freq.	%	
7	Mathematics laboratories	7	4.5	148	95.5	Not Available
8	Mathematics textbooks	153	98.7	2	1.3	Available
9	Graphical charts/boards	36	23.2	119	76.8	Not Available
10	Instruments for construction	23	14.8	132	85.2	Not Available
11	Board rulers	127	81.9	28	18.1	Available
12	Overhead projector(s)	99	63.9	84	36.1	Available
13	Scale and weights	30	19.4	125	80.6	Not Available
14	2D and 3D shapes	43	27.7	112	72.3	Not Available
15	Computer	38	24.5	117	75.5	Not Available
16	Dice/Cards	19	12.3	136	87.7	Not Available

Table 3 showed responses of respondents on items 8, 11 and 12 as instructional resources available for teaching and learning of mathematics while items 7, 9, 10, 13, 14, 15 and 16 were not available. This implies that instructional resources needed for effective teaching and learning of mathematics are not available in Senior Secondary Schools in Abuja.

Research Question 3: What is the condition of the available instructional resources for teaching and learning of mathematics in Senior Secondary Schools in Abuja?

Table 4: Summary of Mean and Standard Deviation of the Respondents on the Condition of the Available Instructional Resources for Effective Teaching and Learning of Mathematics

S/N	Condition of the Available Instructional Resources	N	$\bar{x}$	SD	Decision
17	Textbooks available are latest edition	155	3.50	0.87	Agreed
18	Textbooks available are of good numbers	155	2.10	0.93	Disagreed
19	Available overhead projector(s) is/are functioning	155	1.35	0.90	Disagreed
20	Available board rulers are in good condition	155	3.63	0.86	Agreed
21	Graphical charts available are in good condition	155	1.29	0.84	Disagreed
22	Textbooks available in my school are relevant	155	3.75	0.92	Agreed
23	Available dice/cards are kept properly	155	1.86	0.89	Disagreed
	Grand Mean		**2.49**		

Table 4 showed summary mean and standard deviation of the respondents on the condition of the available instructional resources for effective teaching and learning mathematics. Items 17, 20 and 22 are rated agreed by the respondents, with mean scores of 3.50, 3.63 and 3.75 respectively. All other items are rated disagreed. However, with the grand mean of 2.49 indicated that mathematics teachers in Senior Secondary Schools Abuja are of the opinion that the condition of the available instructional resources for teaching and learning of mathematics were not in good shape in Federal Capital Territory Abuja.

Ho_1: There is no significant difference in the mean response of the male and female teachers regarding the qualities of mathematics teachers for effective teaching and learning of mathematics in Senior Secondary Schools Abuja.

Table 5: Independent t-test Analysis of Mean Difference between the Responses of the Male and Female Respondents regarding the qualities of Mathematics Teachers for Effective Teaching and Learning of Mathematics

Variables	N	$\bar{x}$	SD	Calculated t-value	Df	Critical t-value	Sig (2 tailed)	Decision
Male	128	5.46	1.53	1.39	153	1.96	0.094	Accept **Ho**
Female	27	4.37	1.84					

***P > 0.05**

Table 5 shows the t-test analysis between male and female respondents on qualities of mathematics teachers for effective teaching and learning of mathematics. The calculated t-value 1.39 is less than the critical t-value of 1.96 (1.39 < 1.96). Also, the observed probability

is 0.094 and this is greater than 0.05 (P > .05) probabilities for a 2-tailed test. Hence, the null hypothesis which stated that there is no significant difference in the mean response of the male and female teachers regarding the qualities of mathematics teachers for effective teaching and learning of mathematics in Senior Secondary Schools Abuja was accepted.

Ho_2: There is no significant difference in the mean response of the male and female teachers regarding the availability of instructional resources for effective teaching and learning of mathematics in Senior Secondary Schools Abuja.

Table 6: Independent t-test Analysis of Mean Difference between the Responses of the Male and Female Respondents regarding the Availability of Instructional Resources for Effective Teaching and Learning of Mathematics

Variables	N	$\bar{x}$	SD	Calculated t-value	Df	Critical t-value	Sig (2 tailed)	Decision
Male	128	6.39	2.02	1.65	153	1.96	0.086	Accept **Ho**
Female	27	5.28	1.71					

***P > 0.05**

Table 6 reveals the t-test analysis between male and female respondents on the availability of instructional resources for effective teaching and learning of mathematics. The calculated t-value 1.65 is less than the critical t-value of 1.96 (1.65 < 1.96). Also, the observed probability is 0.086 and this is greater than 0.05 (P > .05) probabilities for a 2-tailed test. Hence, the null hypothesis which stated that there is no significant difference in the mean response of the male and female teachers regarding the availability of instructional resources for effective teaching and learning of mathematics in Senior Secondary Schools Abuja was accepted.

Ho_3: There is no significant difference in the mean response of the Experienced and Inexperienced teachers on the condition of the available instructional resources for teaching and learning mathematics in Senior Secondary Schools Abuja.

Table 7: Independent t-test Analysis of Mean Difference between the Responses of the Experienced and Inexperienced Respondents regarding the Condition of the Available Instructional Resources for Effective Teaching and Learning of Mathematics

Variables	N	$\bar{x}$	SD	Calculated t-value	Df	Critical t-value	Sig (2 tailed)	Decision
Experienced	128	5.82	1.54	1.48	153	1.96	0.092	Accept **Ho**
Inexperienced	27	4.83	1.86					

***P > 0.05**

Table 7 reveals the t-test analysis between experienced and inexperienced respondents on the condition of the available instructional resources for effective teaching and learning of mathematics. The calculated t-value 1.48 is less than the critical t-value of 1.96 (1.48 < 1.96).

Also, the observed probability is 0.092 and this is greater than 0.05 (P > .05) probabilities for a 2-tailed test. Hence, the null hypothesis which stated that there is no significant difference in the mean response of the experienced and inexperienced teachers on the condition of the available instructional resources for teaching and learning mathematics in Senior Secondary Schools Abuja was accepted.

Discussion of Findings

The study found that qualities of teachers available for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja were inadequate. Most mathematics teaching mathematics in Federal Capital Territory Abuja were from other related disciplines. They were converted to mathematics teachers because of shortage of qualified teachers that studied Mathematics Education at first degree. Furthermore, hypothesis tested shows that there was no significant difference in the mean response of the male and female teachers regarding the qualities of mathematics teachers for effective teaching and learning of mathematics in Senior Secondary Schools Abuja. This study concur with study of Osarenren-Osaghae and Irabo (2012) who stated that it is very vital to have sufficient and adequate human resources in terms of teacher quality for the teaching of all subjects in the school curriculum. Without the teachers as implementing factors, the goals of education can never be achieved.

From the analysis of research question two, it was discovered that instructional resources needed for teaching and learning of mathematics in Senior Secondary Schools in Federal Capital Territory Abuja were not adequate. The available resources were not fully utilised as some mathematics teachers were teaching in abstract. Furthermore, hypothesis tested shows that there was no significant difference in the mean response of the male and female teachers regarding the availability of instructional resources for effective teaching and learning of mathematics in Senior Secondary Schools in Abuja. That is both male and female teachers were on the same page. This finding is supported by the study of Ademiluyi in Oduma, et. al. (2021) who has observed that tools and material needed to work in public schools are often not available; no text books, work books, revision text like questions and answers and other materials.

The results obtained from research questions three reveals that available instructional resources for teaching and learning of mathematics were not in good condition to support effective teaching and learning of mathematics in Senior Secondary Schools in Abuja. The study further revealed that some of the available resources are obsolete and were not

replaced. Hypothesis tested shows that there was no significant difference in the mean response of the Experienced and Inexperienced teachers on the condition of the available instructional resources for teaching and learning mathematics in Senior Secondary Schools Abuja. The findings is in line with the work of Adeogun (2019) who noted that it is the responsibility of the school administration and the government to make sure that adequate materials resources are made available to the school. This will strengthen teaching and learning process in the schools and in turn enhance students' academic performance in mathematics.

Conclusion

The role played by teachers in any educational system is tremendous. They are the implementers of educational policies and curriculum for all round achievement of the students. This is why the National Policy on Education stated that "no education can rise above the quality of its teachers". Similarly, no nation can rise above the quality of her education. The implementation of secondary school curriculum in mathematics therefore, lies with the quality of mathematics teachers. They must have required qualifications in order to ensure the successive implementation of quality instruction. In the same vein, mathematics instructional resources which also play vital roles in the teaching and learning of mathematics at secondary school level, should be made available and utilized. Based on the findings of the study, it was concluded that: The human and material resources for the teaching and learning of mathematics in Senior Secondary Schools in Abuja are inadequate and in some cases unavailable. Since available resources to train students are inadequate, effective teaching and learning of mathematics may not achieve the required knowledge and skills. Finally, Most of the available mathematics teachers are from related field, hence not qualified to teach mathematics because they did not study the course.

Recommendations

The following recommendations are made based on the findings of this study:

1. FCT Administration should ensure that qualified applicants who studied Mathematics Education are recruited to teach mathematics rather than the applicants with related discipline.
2. Instructional resources for teaching and learning of mathematics should be provided by Education Secretariat through Secondary Education Board (SEB) down to the school principal to aid teaching and learning processes.

3. Monitoring and Evaluation unit should sensitize the school principals and teachers on the need to put more emphasis on utilisation and improvisation of instructional resources in teaching and learning of mathematics.
4. Above all, mathematics and other subjects at this level, should be subjected to accreditation and reaccreditation based on the adequacy of facilities, textbooks and other curricula elements by FCT Education Secretariat and other examining bodies from time to time.

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