Adequacy of Mathematics Instructional Materials in Senior Secondary Schools in Afikpo Education Zone of Ebonyi State, Nigeria.

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ABSTRACT

This study titled adequacy of Mathematics Instructional Materials in Senior Secondary Schools in Afikpo Education Zone was carried out. The purpose of the study was to investigate the adequacy of Mathematics Instructional Materials in Senior Secondary Schools in Afikpo Education Zone of Ebonyi State, Nigeria. Three (3) research questions and two (2) hypotheses guided the study. The study employed a descriptive survey design. The population of the study was seventy six (76) public secondary schools and the researcher made use of the entire population. The study has one instrument in a two point scale form - a checklist on adequacy of mathematics instructional materials (CAMIM) which was developed by the researcher and used for data collection. The instrument was validated by three experts. Frequencies and ratios were used to answer research questions 1-3 while t-test was used to test the hypotheses at 0.05 alpha level. The result revealed that Mathematics Instructional Materials in Afikpo Education Zone were inadequate. Based on the findings of the study, the researcher therefore, recommends that the state government, private organizations and individuals should adequately provide mathematics instructional materials in Afikpo Education Zone. The educational implication of these findings is that students are not learning mathematics with adequate instructional materials and because of this their achievement in mathematics is low and their performance poor.

Keywords: Adequacy, Mathematics, Instructional, Materials, Secondary schools, Education and Zone.

INTRODUCTION

Mathematics is a very important subject and a requirement for higher learning in a number of science-related professional courses like medicine, agriculture and pharmacy [1]. It is a prerequisite subject for many fields of learning that contributes immensely to the technological growth of the nation [2]. This includes medicine, pharmacy, nursing, agriculture, forestry, biotechnology and nanotechnology [3]. Hence, mathematics is the language of all sciences. It is a natural science that deals with the living world, how the world is structured, how it functions and what these functions are, how living things came into existence, and how they interact with one another and with their environment [4-5]. Mathematics education is referred to as the practice of teaching and learning of mathematics in a way of solving problems involving the algorithms and formulas necessary for computation [6-7]. Mathematics instructional materials are those tools used in teaching mathematics which enables active learning and assessment. Basically, any resource a teacher uses to help him teach his students is an instructional material [8-9]. The main types of instructional materials are: Traditional materials, Graphic Organizers and Teacher-Made materials. School location is a place where children are educated. The locations in this study are the rural and the urban areas in Afikpo Education Zone of Ebonyi State [10-11]. The schools in the rural areas are those schools located in the village while the schools in the urban areas are those schools located in the town. In most cases, the location of a school may affect students' academic performance. It is important to choose location when sitting a school. On the other hand, the school types used in this study include the boys' secondary school, the girls' secondary school and the co-educational secondary school [12-13]. The boys' secondary schools are where we have only boys; the girl's secondary schools are where we have only the girls while the co-educational secondary schools are where we have both the boys and the girls studying together in a particular school.

Statement of the Problem

Despite the prime position mathematics occupies in the educational system and the efforts made by educators to enhance the performance of students in mathematics, students' achievement in mathematics, is still low. A number of educators [14-15] observed that mathematics has the lowest performance index among school subjects in Nigeria. In addition, achievement of students in mathematics has been persistently low over the past decades [16]. According to Darling 2015,

there are a lot of factors responsible for students' poor achievements and performance in mathematics which include inadequate mathematics instructional materials, lack of qualified mathematics teachers and poor teaching methods. The researcher observed that in most public secondary schools in Afikpo Education Zone of Ebonyi State, instructional materials for teaching mathematics are lacking and the ones that are available are not adequate and this condition had received little or no attention from education stakeholders in the state. Moreover, teachers find it difficult to improvise instructional materials to make up for the unavailable instructional materials [17].

Limitations of the study

Despite the fact that the study has made many interesting revelations, it is however subjected to the following limitations;

1. Most of the public secondary schools in Afikpo education zone were not willing to release the information needed. This may constitute a limitation for this study.

2. Many public secondary schools especially the ones in the rural areas do not know some of the instructional materials as they have not used it before and have no knowledge about it. This may constitute another limitation for this study.

3. Some mathematics teachers did not give the exact information on the level of adequacy of mathematics instructional materials. This may constitute a limitation for this study.

Research Method

The researcher describes the procedure that the researcher adopts for the study. They are organized in the following sub-headings: Design of the study, area of the study, population of the study, sample and sampling technique, instrument for data collection, validation of instrument, reliability of instrument, method of data collection and method of data analysis.

Design of the Study

This study adopted a descriptive survey research design. According to [3], a descriptive survey research design is one which aims at collecting data on, and describing in a systematic manner, the characteristic features or factors about a given population. Generally, the descriptive survey research design allows for analyses of facts and helps in the development of in-depth understanding of the research problem. Again, it is useful in the determination of the behaviour of people in a natural setting. This design is appropriate for this study because it involves collecting original data from sample of Senior Secondary Schools in Ebonyi State for the purpose of describing the characteristics, opinions and facts on adequacy of instructional materials in the teaching of mathematics in Senior Secondary Schools.

Area of the Study

The study was carried out in Afikpo Education Zone of Ebonyi state. Afikpo Education Zone comprises five local government areas which include Ivo, Afikpo-North, Afikpo-South, Ohaozara and Onicha Local Government Areas. Afikpo education zone lies within latitude $5^0 52^{'}$-$5^0 57'$N and longitude $7^0 52^{'}$-$7^0 58'$E.It covers a total landmass of 250km^2.It is bounded in the north by Abaomege; in the east and south by Cross River and in the west by Okigwe. Within the study area are located educational institutions such as Akanu Ibiam Federal Polytechnic, Unwana; David Umahi Federal University of Health Sciences, Uburu; Ebonyi State College of Nursing, Uburu and the Federal College of Education, Isu. There are also health institutions in the study area such as Mater Hospital, Afikpo and David Umahi Federal Teaching Hospital, Uburu. The major occupations of people of the area is farming and trading; only a few are civil servants. The common language they speak is Igbo language. Afikpo education zone is chosen as the study area because no research work on this topic has been carried out in the zone as revealed by literature reviewed. In addition, the researcher decided to carry out the study in Afikpo Education Zone of Ebonyi State due to frequent poor performance of students in mathematics in Senior Secondary School Certificate Examinations.

Population of the Study

The population of the study comprises 76 public secondary schools in Afikpo Education Zone, Ebonyi State. The distributions of the population among the five (5) Local Government Areas are as follows: 9 public secondary schools in Ivo Local Government Area, 20 public secondary schools in Afikpo-North; 12 public secondary schools in Afikpo South; 14 public secondary schools in Ohaozara and 21 public secondary schools in Onicha Local Government Area making a total of 76 public secondary schools.

Sample and Sampling Technique

The number of schools in the study area is 76 public secondary schools which is not too large. In terms of school location, there are 16 schools located in the urban areas and 60 located in rural areas. In terms of school type, schools that are boys only are 4 in number; schools that are girls only are 6 in number and co-educational schools are 66 in number. The researcher therefore used the entire population for the study and mathematics teachers as sample.

Instrument for Data Collection

The instrument used for the collection of data for this study was a checklist developed by the researcher. The checklist was used to determine the adequacy of mathematics instructional materials in the public secondary schools in Afikpo Education Zone. The instrument used was titled checklist on adequacy of mathematics instructional materials (CAMIM) with 42 items. The 42 items were subjected to trial testing by administering it to thirty (30) mathematics teachers' in secondary schools in Abakaliki education zone which are not part of the population of the study. The instrument is organized into three (3) Sections (A to C). Section B and C consists of 42 items each. Section A helped in capturing the bio-data of respondents. Section B sought information on the level of adequacy of mathematics instructional materials. The rating scale for the instrument is; if the specification is the same as the ratio then the instrument is adequate on the other hand, if the specification is not the same as the ratio then the instrument is inadequate.

Validation of instrument

The instruments were validated by three experts; one from measurement and evaluation and two from mathematics option in science Education Department all in Ebonyi State University, Abakaliki. These experts vetted the items. The views of these experts helped the researcher to correct the items.

Reliability of the Instrument

Data obtained were used to compute the reliability coefficient of the instrument. Kendall's coefficient of concordance was used for the computation. The instrument yielded index of concordance (w) as 0.78.

Method of Data Collection

The researcher employed the services of five (5) research assistants (one from each L.G.A for the administration of the instruments. The research assistants were trained on how to carefully carry out the administration of the instrument by instructing them to ensure that the instruments were administered to the various schools in the local government area assigned to them. They were as well instructed by the researcher to ensure all instruments were collected at the end and submitted back to the researcher as soon as possible. After the training, copies of the instrument were taken to the various schools across the five local government areas and administered directly to the mathematics teachers. The instruments were collected back on the spot after completion. This was to ensure maximum return of the instruments.

Method of Data Analysis

The data collected from the study were used to answer research questions and test of hypotheses. Frequencies and ratios were used to answer the research questions 1-3. The two hypotheses of the study were tested at an Alpha level of 0.05 using t-test.

Results and Discussions

The researcher presents and discusses the results of the study on adequacy of mathematics instructional materials in public secondary schools in Afikpo North education zone of Ebonyi State.

Research Question 1

What is the Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone?

Table1: Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone.

S/N	Facilities	Specification	Number of users	Number available	Ratio	Remarks
1	Mathematical Sets	1:1	14539	5925	1:3	Inadequate
2	Modular Arithmetic chart	1:3	14539	1162	1:13	Inadequate
3	Samples of shift duty charts	1:3	14539	930	1:16	Inadequate
4	Geometric box	1:1	14539	815	1:18	Inadequate
5	Pie demonstration board	1:4	14539	844	1:17	Inadequate
6	Standard form charts	1:4	14539	1115	1:13	Inadequate
7	Computers	1:1	14539	586	1:25	Inadequate
8	Power Point	1:1	14539	193	1:74	Inadequate
9	Television	1:5	14539	321	1:45	Inadequate
10	Indices charts	1:3	14539	974	1:15	Inadequate
11	Real globe	1:2	14539	825	1:18	Inadequate
12	Logarithm charts	1:2	14539	1308	1:11	Inadequate
13	Logarithm table booklet	1:2	14539	1708	1:9	Inadequate
14	Antilogarithm Table charts made of flex banner	1:3	14539	1529	1:10	Inadequate
15	Circle fraction	1:1	14539	838	1:17	Inadequate
16	Cylinder tin	1:1	14539	862	1:17	Inadequate
17	Calculator	1:2	14539	3888	1:4	Inadequate
18	Data from school records	1:3	14539	1126	1:13	Inadequate
19	Graph	1:2	14539	3880	1:4	Inadequate
20	Spherical globe	1:1	14539	1053	1:14	Inadequate
21	Chart showing how to find the roots of graph	1:4	14539	1210	1:12	Inadequate
22	Graph book	1:1	14539	4741	1:3	Inadequate
23	Ruler	1:2	14539	5433	1:3	Inadequate
24	Completing the square sheet	1:1	14539	1578	1:9	Inadequate
25	Quadratic equation box	1:2	14539	1675	1:9	Inadequate
26	Pencil	1:1	14539	14539	1:1	Adequate
27	Matrix charts	1:3	14539	1271	1:11	Inadequate
28	Matrix subtraction charts	1:3	14539	1267	1:11	Inadequate
29	Matrix addition charts	1:3	14539	1475	1:10	Inadequate
30	Graph board	1:3	14539	2554	1:6	Inadequate
31	T-square	1:1	14539	2130	1:7	Inadequate
32	Spheres	1:1	14539	2375	1:6	Inadequate
33	Drawing board	1:1	14539	4051	1:4	Inadequate
34	Determinant charts	1:3	14539	2594	1:6	Inadequate
35	Cardboard paper	1:1	14539	6658	1:2	Inadequate
36	Rectangle	1:1	14539	2223	1:7	Inadequate
37	Square	1:1	14539	1744	1:8	Inadequate
38	Trapezium	1:1	14539	1749	1:8	Inadequate
39	Cone	1:1	14539	1609	1:9	Inadequate

40	Kite	1:1	14539	1796	1:8	Inadequate
41	Prism	1:1	14539	2146	1:7	Inadequate
42	Triangle	1:1	14539	2690	1:5	Inadequate

Table 1 shows the adequacy of mathematics instructional materials for teaching of mathematics in senior secondary schools in Afikpo Education Zone of Ebonyi State. The data in table 1 shows that all but one of the mathematics instructional materials in senior secondary schools in Afikpo Education Zone is inadequate. The only item that is adequate is pencil. Hence, the required specifications of instructional materials for teaching of mathematics are not met.

Research Question 2

What is the of Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone based on School Location?

Table 2: Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone based on School Location.

S/N	Facilities	Specification	Location	Number of users	Number available	Ratio	Remarks
1	Mathematical Sets	1:1	Urban	2602	1617	1:2	Inadequate
			Rural	11937	4308	1:3	
2	Modular Arithmetic chart	1:3	Urban	2602	414	1:6	Inadequate
			Rural	11937	748	1:16	
3	Samples of shift duty charts	1:3	Urban	2602	275	1:9	Inadequate
			Rural	11937	655	1:18	
4	Geometric box	1:1	Urban	2602	121	1:22	Inadequate
			Rural	11937	694	1:17	
5	Pie demonstration board	1:4	Urban	2602	198	1:13	Inadequate
			Rural	11937	646	1:18	
6	Standard form charts	1:4	Urban	2602	166	1:16	Inadequate
			Rural	11937	949	1:13	
7	Computers	1:1	Urban	2602	162	1:16	Inadequate
			Rural	11937	424	1:28	
8	Power Point	1:1	Urban	2602	75	1:35	Inadequate
			Rural	11937	118	1:101	
9	Television	1:5	Urban	2602	94	1:28	Inadequate
			Rural	11937	227	1:53	
10	Indices charts	1:3	Urban	2602	217	1:12	Inadequate
			Rural	11937	757	1:16	
11	Real globe	1:2	Urban	2602	255	1:10	Inadequate
			Rural	11937	570	1:21	
12	Logarithm charts	1:2	Urban	2602	277	1:9	Inadequate
			Rural	11937	1031	1:12	
13	Logarithm table booklet	1:2	Urban	2602	314	1:8	Inadequate
			Rural	11937	1394	1:9	
14	Antilogarithm Table charts made of flex banner	1:3	Urban	2602	399	1:7	Inadequate
			Rural	11937	1130	1:11	
15	Circle fraction	1:1	Urban	2602	165	1:16	Inadequate
			Rural	11937	673	1:18	
16	Cylinder tin	1:1	Urban	2602	204	1:13	Inadequate
			Rural	11937	658	1:18	

17	Calculator	1:2	Urban	2602	585	1:4	Inadequate
			Rural	11937	3303	1:4	
18	Data from school records	1:3	Urban	2602	217	1:12	Inadequate
			Rural	11937	909	1:13	
19	Graph	1:2	Urban	2602	648	1:4	Inadequate
			Rural	11937	3232	1:4	
tinuation of table 2	globe	1:1	Urban	2602	282	1:9	Inadequate
			Rural	11937	771	1:15	
21	Chart showing how to find the roots of graph	1:4	Urban	2602	311	1:8	Inadequate
			Rural	11937	899	1:13	
22	Graph book	1:1	Urban	2602	646	1:4	Inadequate
			Rural	11937	4095	1:3	
23	Ruler	1:2	Urban	2602	1010	1:3	Inadequate
			Rural	11937	4423	1:3	
24	Completing the square sheet	1:1	Urban	2602	445	1:6	Inadequate
			Rural	11937	1133	1:11	
25	Quadratic equation box	1:2	Urban	2602	305	1:9	Inadequate
			Rural	11937	1370	1:9	
26	Pencil	1:1	Urban	2602	2602	1:1	Adequate
			Rural	11937	11937	1:1	
27	Matrix charts	1:3	Urban	2602	218	1:12	Inadequate
			Rural	11937	1053	1:11	
28	Matrix subtraction charts	1:3	Urban	2602	244	1:11	Inadequate
			Rural	11937	1023	1:12	
29	Matrix addition charts	1:3	Urban	2602	198	1:13	Inadequate
			Rural	11937	1277	1:9	
30	Graph board	1:3	Urban	2602	386	1:7	Inadequate
			Rural	11937	2168	1:6	
31	T-square	1:1	Urban	2602	353	1:7	Inadequate
			Rural	11937	1777	1:7	
32	Spheres	1:1	Urban	2602	355	1:7	Inadequate
			Rural	11937	2020	1:6	
33	Drawing board	1:1	Urban	2602	619	1:4	Inadequate
			Rural	11937	3432	1:3	
34	Determinant charts	1:3	Urban	2602	483	1:5	Inadequate
			Rural	11937	2111	1:6	
35	Cardboard paper	1:1	Urban	2602	1047	1:2	Inadequate
			Rural	11937	4611	1:3	
36	Rectangle	1:1	Urban	2602	446	1:6	Inadequate
			Rural	11937	1777	1:7	
37	Square	1:1	Urban	2602	355	1:7	Inadequate
			Rural	11937	1389	1:9	
38	Trapezium	1:1	Urban	2602	463	1:6	Inadequate
			Rural	11937	1286	1:9	
39	Cone	1:1	Urban	2602	540	1:5	Inadequate
			Rural	11937	1069	1:11	

40	Kite	1:1	Urban	2602	543	1:5	Inadequate
			Rural	11937	1253	1:10	
41	Prism	1:1	Urban	2602	557	1:5	Inadequate
			Rural	11937	1589	1:8	
42	Triangle	1:1	Urban	2602	685	1:4	Inadequate
			Rural	11937	2005	1:6	

Table 2 shows the level of adequacy of mathematics instructional materials for teaching of mathematics in urban and rural public secondary schools in Afikpo Education Zone of Ebonyi State. The data in table 2 shows that out of 42 instructional materials, 1 item (pencil) was adequate and met the required specification of instructional materials for teaching mathematics in schools in both urban and rural areas of Afikpo North Education Zone. The rest of 41 instructional materials are inadequate. This result implies, statistically that instructional materials for teaching mathematics in public secondary schools located in urban and rural areas of Ebonyi State are inadequate

Research Question 3

What is the   of Adequacy of Mathematics Instructional   Materials   for   Teaching   of Mathematics in Senior Secondary Schools in Afikpo Education Zone based on School Type?

Table 3: Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone based on School Type.

S/N	Facilities	Specification	School Type	Number of users	Number available	Ratio	Remarks
1	Mathematical Sets	1:1	Boys	605	330	1:2	Inadequate
			Girls	992	575	1:2	Inadequate
			Co-edu	12942	5020	1:3	Inadequate
2	Modular Arithmetic chart	1:3	Boys	605	120	1:5	Inadequate
			Girls	992	34	1:29	Inadequate
			Co-edu	12942	1008	1:13	Inadequate
3	Samples of shift duty charts	1:3	Boys	605	125	1:5	Inadequate
			Girls	992	28	1:35	Inadequate
			Co-edu	12942	777	1:17	Inadequate
4	Geometric box	1:1	Boys	605	114	1:5	Inadequate
			Girls	992	48	1:21	Inadequate
			Co-edu	12942	653	1:20	Inadequat
5	Pie demonstration board	1:4	Boys	605	180	1:3	Adequate
			Girls	992	105	1:9	Inadequate
			Co-edu	12942	559	1:23	Inadequate
6	Standard form charts	1:4	Boys	605	230	1:3	Adequate
			Girls	992	9	1:110	Inadequate
			Co-edu	12942	876	1:15	Inadequate
7	Computers	1:1	Boys	605	8	1:76	Inadequate
			Girls	992	11	1:90	Inadequate
			Co-edu	12942	567	1:23	Inadequate
8	Power Point	1:1	Boys	605	4	1:151	Inadequate
			Girls	992	58	1:17	Inadequate
			Co-edu	12942	131	1:99	Inadequate
9	Television	1:5	Boys	605	6	1:101	Inadequate
			Girls	992	134	1:7	Inadequate
			Co-edu	12942	181	1:72	Inadequate
10	Indices charts	1:3	Boys	605	160	1:4	Inadequate
			Girls	992	54	1:18	Inadequate
			Co-edu	12942	760	1:17	Inadequate
11	Real globe	1:2	Boys	605	86	1:7	Inadequate
			Girls	992	50	1:20	Inadequate
			Co-edu	12942	689	1:19	Inadequate

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Continuation of Table 3

12	Logarithm charts	1:2	Boys	605	152	1:4	Inadequate
			Girls	992	79	1:13	Inadequate
			Co-edu	12942	1077	1:12	Inadequate
13	Logarithm table booklet	1:2	Boys	605	148	1:4	Inadequate
			Girls	992	15	1:66	Inadequate
			Co-edu	12942	1545	1:8	Inadequate
14	Antilogarithm Table charts made of flex banner	1:3	Boys	605	179	1:3	Adequate
			Girls	992	32	1:31	Inadequate
			Co-edu	12942	1318	1:10	Inadequate
15	Circle fraction	1:1	Boys	605	29	1:21	Inadequate
			Girls	992	93	1:11	Inadequate
			Co-edu	12942	716	1:18	Inadequate
16	Cylinder tin	1:1	Boys	605	142	1:4	Inadequate
			Girls	992	65	1:15	Inadequate
			Co-edu	12942	655	1:20	Inadequate
17	Calculator	1:2	Boys	605	415	1:2	Adequate
			Girls	992	107	1:9	Inadequate
			Co-edu	12942	3366	1:4	Inadequate
18	Data from school records	1:3	Boys	605	133	1:5	Inadequate
			Girls	992	57	1:17	Inadequate
			Co-edu	12942	936	1:14	Inadequate
19	Graph	1:2	Boys	605	275	1:2	Adequate
			Girls	992	138	1:7	Inadequate
			Co-edu	12942	3467	1:4	Inadequate
20	Spherical globe	1:1	Boys	605	168	1:4	Inadequate
			Girls	992	40	1:25	Inadequate
			Co-edu	12942	845	1:15	Inadequate
21	Chart showing how to find the roots of graph	1:4	Boys	605	219	1:3	Adequate
			Girls	992	65	1:15	Inadequate
			Co-edu	12942	926	1:14	Inadequate
22	Graph book	1:1	Boys	605	335	1:2	Inadequate
			Girls	992	209	1:5	Inadequate
			Co-edu	12942	4197	1:3	Inadequate
23	Ruler	1:2	Boys	605	528	1:1	Adequate
			Girls	992	405	1:2	Adequate
			Co-edu	12942	4500	1:3	Inadequate
24	Completing the square sheet	1:1	Boys	605	175	1:4	Inadequate
			Girls	992	95	1:10	Inadequate
			Co-edu	12942	1308	1:10	Inadequate
25	Quadratic equation box	1:2	Boys	605	110	1:6	Inadequate
			Girls	992	16	1:62	Inadequate
			Co-edu	12942	1549	1:8	Inadequate
26	Pencil	1:1	Boys	605	635	1:1	Adequate
			Girls	992	716	1:1	Adequate
			Co-edu	12942	7617	1:2	Adequate
27	Matrix charts	1:3	Boys	605	175	1:4	Inadequate
			Girls	992	19	1:52	Inadequate
			Co-edu	12942	1077	1:12	Inadequate
28	Matrix subtraction charts	1:3	Boys	605	205	1:3	Adequate
			Girls	992	8	1:124	Inadequate
			Co-edu	12942	1054	1:12	Inadequate

No	Material	Ratio	Group	Pop	N	Ratio	Remark
29	Matrix addition charts	1:3	Boys	605	176	1:4	Inadequate
			Girls	992	7	1:142	Inadequate
			Co-edu	12942	1292	1:10	Inadequate
30	Graph board	1:3	Boys	605	420	1:2	Adequate
			Girls	992	87	1:11	Inadequate
			Co-edu	12942	2047	1:6	Inadequate

Continuation of table 3

No	Material	Ratio	Group	Pop	N	Ratio	Remark
3_	_quare	_:_	Boys	605	400	1:2	Inadequate
			Girls	992	32	1:31	Inadequate
			Co-edu	12942	1698	1:8	Inadequate
32	Spheres	1:1	Boys	605	341	1:2	Inadequate
			Girls	992	117	1:9	Inadequate
			Co-edu	12942	1917	1:7	Inadequate
33	Drawing board	1:1	Boys	605	604	1:1	Adequate
			Girls	992	222	1:5	Inadequate
			Co-edu	12942	3225	1:4	Inadequate
34	Determinant charts	1:3	Boys	605	500	1:1	Adequate
			Girls	992	170	1:6	Inadequate
			Co-edu	12942	1924	1:3	Adequate
35	Cardboard paper	1:1	Boys	605	684	1:1	Adequate
			Girls	992	615	1:2	Inadequate
			Co-edu	12942	5359	1:3	Inadequate
36	Rectangle	1:1	Boys	605	269	1:2	Inadequate
			Girls	992	204	1:5	Inadequate
			Co-edu	12942	1750	1:7	Inadequate
37	Square	1:1	Boys	605	206	1:3	Inadequate
			Girls	992	213	1:5	Inadequate
			Co-edu	12942	1325	1:10	Inadequate
38	Trapezium	1:1	Boys	605	170	1:4	Inadequate
			Girls	992	375	1:3	Inadequate
			Co-edu	12942	1204	1:11	Inadequate
39	Cone	1:1	Boys	605	312	1:2	Inadequate
			Girls	992	376	1:3	Inadequate
			Co-edu	12942	921	1:14	Inadequate
40	Kite	1:1	Boys	605	315	1:2	Inadequate
			Girls	992	386	1:3	Inadequate
			Co-edu	12942	1095	1:12	Inadequate
41	Prism	1:1	Boys	605	328	1:2	Inadequate
			Girls	992	283	1:4	Inadequate
			Co-edu	12942	1535	1:9	Inadequate
42	Triangle	1:1	Boys	605	374	1:2	Inadequate
			Girls	992	381	1:3	Inadequate
			Co-edu	12942	1935	1:7	Inadequate

Table 3 shows the level of adequacy of mathematics instructional materials for teaching of mathematics in boys, girls and co- educational schools in Afikpo North Education Zone of Ebonyi State. The data in table 3 shows that out of 42 instructional materials, 13 items (pie demonstration board, standard form charts, antilogarithm table charts made of flex banner, calculator, graph, charts showing how to find roots of graph, ruler, pencil, matrix subtraction charts, graph board, drawing board, determinant charts and cardboard) were adequate and met the required specification of instructional materials for teaching mathematics in boys secondary schools only. The rest of 29 instructional materials were inadequate. In the girls secondary school, out of 42 instructional materials, 2 items (ruler and pencil) were adequate. The rest of 40 instructional materials were inadequate. In co-educational schools, out of 42 instructional materials, 2 items (pencil and determinant charts) were adequate. The rest of 40 instructional materials were inadequate. This result implies, statistically, that instructional materials for teaching mathematics

in boys, girls and co-educational schools in public secondary schools inAfikpo North Education Zone are inadequate.

Hypothesis 1: Adequacy of Mathematics Instructional Materials for Teaching of

Mathematics in Senior Secondary schools in Afikpo Education Zone does not significantly depend on School Location.

Table 4: **Chi Square test of dependence of adequacy of mathematics instructional materials for teaching of mathematics in senior secondary schools in Afikpo Education Zone based on school location.**

S/N	Facilities	Location	Number of Users	Observed & Expected Frequencies	X^2cal	X^2-crit	Inference
1	Mathematical Sets	Urban	2602	1617 (2602)		18. 307	Reject Ho
		Rural	11937	4308 (11937)	5250		
2	Modular Arithmetic chart	Urban	2602	414 (868)		18. 307	Reject Ho
		Rural	11937	748 (3979)	2861		
3	Samples of shift duty charts	Urban	2602	275 (868)		18. 307	Reject Ho
		Rural	11937	655 (3979)	3182		
4	Geometric box	Urban	2602	121 (2602)		18. 307	Reject Ho
		Rural	11937	694 (11937)	12955		
5	Pie demonstration board	Urban	2602	198 (651)		18. 307	Reject Ho
		Rural	11937	646 (2985)	2148		
6	Standard form charts	Urban	2602	166 (651)		18. 307	Reject Ho
		Rural	11937	949 (2985)	2111		
	Computers	Urban	2602	162 (2602)		18. 307	Reject Ho
		Rural	11937	424 (3979)	5464		
8	Power Point	Urban	2602	75 (2602)		18. 307	Reject Ho
		Rural	11937	118(11937)	14156		
9	Television	Urban	2602	94 (521)		18. 307	Reject Ho
		Rural	11937	227 (2388)	2306		
10	Indices charts	Urban	2602	217 (868)		18. 307	Reject Ho
		Rural	11937	757 (3979)	3097		
11	Real globe	Urban	2602	255 (1301)		18. 307	Reject Ho
		Rural	11937	570 (5969)	5724		
12	Logarithm charts	Urban	2602	277 (1301)		18. 307	Reject Ho
		Rural	11937	1031 (5969)	4891		
13	Logarithm table booklet	Urban	2602	314 (1301)		18. 307	Reject Ho
		Rural	11937	1394 (5969)	2428		
14	Antilogarithm Table charts made of flex banner	Urban	2602	399 (868)		18. 307	Reject Ho
		Rural	11937	1130 (3979)	2293		
15	Circle fraction	Urban	2602	165 (2602)		18. 307	Reject Ho
		Rural	11937	673 (11937)	10629		
16	Cylinder tin	Urban	2602	204 (2602)		18. 307	Reject Ho
		Rural	11937	658 (11937)	10657		
17	Calculator	Urban	2602	585 (1301)		18. 307	Reject Ho
		Rural	11937	3303 (5969)	1585		
18	Data from school records	Urban	2602	217 (868)		18. 307	Reject Ho
		Rural	11937	909 (3979)	2857		
19	Graph	Urban	2602	648 (1301)		18. 307	Reject Ho
		Rural	11937	3232 (5969)	1583		
20	Spherical globe	Urban	2602	282 (2602)		18. 307	Reject Ho
		Rural	11937	771 (11937)	12513		
21	Chart showing how to find the roots of graph	Urban	2602	311 (651)		18. 307	Reject Ho
		Rural	11937	899 (2985)	1635		
22	Graph book	Urban	2602	646 (2602)		18. 307	Reject Ho
		Rural	11937	4095 (11937)	6622		
23	Ruler	Urban	2602	1010 (1301)		18. 307	Reject Ho
		Rural	11937	4423 (5969)	466		

No.	Material	Location	N	O (E)		x^2critical	Decision
24	Completing the square sheet	Urban	2602	445 (2602)		18. 307	Reject Ho
		Rural	11937	1133 (11937)	11567		
25	Quadratic equation box	Urban	2602	305 (1301)		18. 307	Reject Ho
		Rural	11937	1370 (5969)	4306		
26	Pencil	Urban	2602	1509 (1301)		18. 307	Reject Ho
		Rural	11937	7459 (5969)	405		
27	Matrix charts	Urban	2602	218 (868)		18. 307	Reject Ho
		Rural	11937	1053 (3979)	2638		
28	Matrix subtraction charts	Urban	2602	244 (868)		18. 307	Reject Ho
		Rural	11937	1023 (3979)	2645		
29	Matrix addition charts	Urban	2602	198 (868)		18. 307	Reject Ho
		Rural	11937	1277 (3979)	2352		
30	Graph board	Urban	2602	386 (868)		18. 307	Reject Ho
		Rural	11937	2168 (3979)	1092		
31	T-square	Urban	2602	353 (2602)		18. 307	Reject Ho
		Rural	11937	1777 (11937)	10591		
32	Spheres	Urban	2602	355 (2602)		18. 307	Reject Ho
		Rural	11937	2020 (11937)	10179		
33	Drawing board	Urban	2602	619 (2602)		18. 307	Reject Ho
		Rural	11937	3432 (11937)	7571		
34	Determinant charts	Urban	2602	483 (868)		18. 307	Reject Ho
		Rural	11937	2111 (3979)	1048		

Continuation of table 4

No.	Material	Location	N	O (E)		x^2critical	Decision
				047 (2602)		18. 307	Reject Ho
				.611 (11937)	5425		
36	Rectangle	Urban	2602	446 (2602)		18. 307	Reject Ho
		Rural	11937	1777 (11937)	10434		
37	Square	Urban	2602	355 (2602)		18. 307	Reject Ho
		Rural	11937	1389 (11937)	11261		
38	Trapezium	Urban	2602	463 (2602)		18. 307	Reject Ho
		Rural	11937	1286 (11937)	11262		
39	Cone	Urban	2602	540 (2602)		18. 307	Reject Ho
		Rural	11937	1069 (11937)	11529		
40	Kite	Urban	2602	543 (2602)		18. 307	Reject Ho
		Rural	11937	1253 (11937)	11192		
41	Prism	Urban	2602	557 (2602)		18. 307	Reject Ho
		Rural	11937	1589 (11937)	10578		
42	Triangle	Urban	2602	685 (2602)		18. 307	Reject Ho
		Rural	11937	2005 (11937)	9696		

For hypothesis 1, results in table 4 shows that the calculated Chi-square (x^2cal) for all the items, 1-42, is greater than the critical value (x^2critical) at alpha level of 0.05. The decision rule is to reject the null hypothesis if the calculated value is greater than the critical value at a given probability level. The null hypothesis was therefore rejected which means that the mathematics instructional materials used for teaching mathematics in the urban and rural areas depend significantly on school location.

Hypothesis 2: The Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone does not significantly depend on School Type.

Table 5: **Chi-Square test of dependence of adequacy of mathematics instructional materials for teaching of mathematics in senior secondary schools in Afikpo Education Zone based on school type.**

S/N	Facilities	Location	Number of Users	Observed &Expected Frequencies	X^2cal	X^2-crit	Inference
1	Mathematical Sets	Boys	605	330 (605)			
		Girls	992	575 (992)	5149	18. 307	Reject Ho
		Co-edu	12942	5020 (12942)			
2	Modular Arithmetic chart	Boys	605	120 (202)			
		Girls	992	34 (331)	2833	18. 307	Reject Ho
		Co-edu	12942	1008 (4314)			
3	Samples of shift duty charts	Boys	605	125 (202)			
		Girls	992	28 (331)	3207	18. 307	Reject Ho
		Co-edu	12942	777 (4314)			
4	Geometric box	Boys	605	114 (605)			
		Girls	992	48 (992)	12966	18. 307	Reject Ho
		Co-edu	12942	653 (12942)			
5	Pie demonstration board	Boys	605	180 (152)			
		Girls	992	105 (248)	2302	18. 307	Reject Ho
		Co-edu	12942	559 (3236)			
6	Standard form charts	Boys	605	230 (152)			
		Girls	992	9 (248)	1992	18. 307	Reject Ho
		Co-edu	12942	876 (3236)			
7	Computers	Boys	605	8 (605)			
		Girls	992	11 (992)	13392	18. 307	Reject Ho
		Co-edu	12942	567 (12942)			
8	Power Point	Boys	605	4 (605)			
		Girls	992	58 (992)	14158	18. 307	Reject Ho
		Co-edu	12942	131 (12942)			
9	Television	Boys	605	6 ((121)			
		Girls	992	134 (199)	2370	18. 307	Reject Ho
		Co-edu	12942	181 (2589)			
10	Indices charts	Boys	605	160 (202)			
		Girls	992	54 (331)	3168	18. 307	Reject Ho
		Co-edu	12942	760 (4314)			
11	Real globe	Boys	605	86 (303)			
		Girls	992	50 (496)	5723	18. 307	Reject Ho
		Co-edu	12942	689 (6471)			
12	Logarithm charts	Boys	605	152 (303)			
		Girls	992	79 (496)	4922	18. 307	Reject Ho
		Co-edu	12942	1077 (6471)			
13	Logarithm table booklet	Boys	605	148 (303)			
		Girls	992	15 (496)	4296	18. 307	Reject Ho
		Co-edu	12942	1545 (6471)			
14	Antilogarithm Table charts made of flex banner	Boys	605	179 (202)			
		Girls	992	32 (331)	2353	18. 307	Reject Ho
		Co-edu	12942	1318 (4314)			
15	Circle fraction	Boys	605	29 (605)			

Continuation of table 5

		Girls	992	93 (992)	12913	18. 307	Reject Ho
		Co-edu	12942	716 (12942)			
16	Cylinder tin	Boys	605	142 (605)			
		Girls	992	65 (992)	12886	18. 307	Reject Ho
		Co-edu	12942	655 (12942)			
17	Calculator	Boys	605	415 (303)			
		Girls	992	107 (496)	1836	18. 307	Reject Ho
		Co-edu	12942	3366 (6471)			
18	Data from school records	Boys	605	133 (202)			
		Girls	992	57 (331)	2896	18. 307	Reject Ho
		Co-edu	12942	936 (4314)			
19	Graph	Boys	605	275 (303)			
		Girls	992	138 (496)	1656	18. 307	Reject Ho
		Co-edu	12942	3467 (6471)			
20	Spherical globe	Boys	605	168 (605)			
		Girls	992	40 (992)	12536	18. 307	Reject Ho
		Co-edu	12942	845 (12942)			
21	Chart showing how to find the roots of graph	Boys	605	219 (152)			
		Girls	992	65 (248)	1813	18. 307	Reject Ho
		Co-edu	12942	926 (3236)			
22	Graph book	Boys	605	335 (605)			
		Girls	992	209 (992)	6647	18. 307	Reject Ho
		Co-edu	12942	4197 (12942)			
		ys	605	528 (303)			
Continuation of table 5		ls	992	405 (496)	784	18. 307	Reject Ho
		edu	12942	4500 (6471)			
24	Completing the square sheet	Boys	605	175 (605)			
		Girls	992	95 (992)	11575	18. 307	Reject Ho
		Co-edu	12942	1308 (12942)			
25	Quadratic equation box	Boys	605	110 (303)			
		Girls	992	16 (496)	5437	18. 307	Reject Ho
		Co-edu	12942	1549 (6471)			
26	Pencil	Boys	605	635 (303)			
		Girls	992	716 (496)	664	18. 307	Reject Ho
		Co-edu	12942	7617 (6471)			
27	Matrix charts	Boys	605	175 (202)			
		Girls	992	19 (331)	2429	18. 307	Reject Ho
		Co-edu	12942	1077 (4314)			
28	Matrix subtraction charts	Boys	605	205 (202)			
		Girls	992	8 (331)	2779	18. 307	Reject Ho
		Co-edu	12942	1054 (4314)			
29	Matrix addition charts	Boys	605	176 (202)			
		Girls	992	7 (331)	2437	18. 307	Reject Ho
		Co-edu	12942	1292 (4314)			
30	Graph board	Boys	605	420 (202)			

		Girls	992	87 (331)	1607	18. 307	Reject Ho
		Co-edu	12942	2047 (4314)			
31	T-square	Boys	605	400 (605)			
		Girls	992	32 (992)	10767	18. 307	Reject Ho
		Co-edu	12942	1698 (12942)			
32	Spheres	Boys	605	341 (605)			
		Girls	992	117 (992)	10279	18. 307	Reject Ho
		Co-edu	12942	1917 (12942)			
33	Drawing board	Boys	605	604 (605)			
		Girls	992	222 (992)	7300	18. 307	Reject Ho
		Co-edu	12942	3225 (12942)			
34	Determinant charts	Boys	605	500 (202)			
		Girls	992	170 (331)	1842	18. 307	Reject Ho
		Co-edu	12942	1924 (4314)			
35	Cardboard paper	Boys	605	684 (605)			
		Girls	992	615 (992)	4597	18. 307	Reject Ho
		Co-edu	12942	5359 (12942)			
36	Rectangle	Boys	605	269 (605)			
		Girls	992	204 (992)	11304	18. 307	Reject Ho
		Co-edu	12942	1750 (12942)			
37	Square	Boys	605	206 (605)			
		Girls	992	213 (992)	10428	18. 307	Reject Ho
		Co-edu	12942	1325 (12942)			
38	**Continuation of table 5**		05	170 (605)			
			92	375 (992)	11323	18. 307	Reject Ho
		Co-edu	12942	1204 (12942)			
39	Cone	Boys	605	312 (605)			
		Girls	992	376 (992)	11774	18. 307	Reject Ho
		Co-edu	12942	921 (12942)			
40	Kite	Boys	605	315 (605			
		Girls	992	386 (992)	11354	18. 307	Reject Ho
		Co-edu	12942	1095 (12942)			
41	Prism	Boys	605	328 (605)			
		Girls	992	283 (992)	10688	18. 307	Reject Ho
		Co-edu	12942	1535 (12942)			
42	Triangle	Boys	605	374 (605)			
		Girls	992	381 (992)	9826	18. 307	Reject Ho
		Co-edu	12942	1935 (12942)			

For hypothesis 2, it can be observed from table 5 that in all the 42 items used for teaching mathematics, the t-calculated (t-cal) is greater than the t-critical (t-crit) at alpha level of 0.05. Since the calculated value is greater than the critical value at 0.05 probability level, the null hypothesis is rejected. This means that the adequacy of mathematics instructional materials used in teaching in the boys, girls and co- educational

schools in Afikpo Education Zone depends significantly on school type.

SUMMARY
Summary of Results

The results of data analysis presented in tables 1-10 show that:

1. 41 out of the 42 mathematics instructional materials for teaching mathematics in Afikpo Education Zone were inadequate. This is obvious in tables 1and 2.
2. Only 1 material (pencil) out of a total of 42 instructional materials is adequate for teaching mathematics in Afikpo Education Zone. This is evident from tables 1 and 2.
3. There are 13 items which are adequate in teaching mathematics in the boys secondary schools only. The materials are menstrual charts, standard form charts, antilogarithm table charts made of flex banner, calculator, graph, charts showing how to find roots of graph, ruler, pencil, matrix subtraction charts, graph board, drawing board, determinant charts and cardboard. The rest of 29 instructional materials were inadequate. In the girls secondary school, out of 42 instructional materials, 2 items (ruler and pencil) were adequate. The rest of 40 instructional materials were inadequate. In the Co-educational schools, out of 42 instructional materials, 2 items (pencil and determinant charts) were adequate. The rest of 40 instructional materials were inadequate. This is apparently depicted in table 3.

Summary of Discussions

The researcher summarizes the discussions of the findings of this study under the following sub- headings:

1. Adequacy of mathematics instructional materials for teaching of mathematics in senior secondary schools in Afikpo education zone.
2. Adequacy of mathematics instructional materials for teaching of mathematics in senior secondary school in Afikpo education zone based on school location.
3. Adequacy of mathematics instructional materials for teaching of mathematics in senior secondary schools in Afikpo education zone based on school type.

Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone.

The results of the study show that all the 42 mathematics instructional materials were not adequate for teaching of mathematics in senior secondary schools in Afikpo education zone of Ebonyi State. This indicates that students are not being taught mathematics with instructional materials since the materials available are not adequate. This agrees with [15], who conducted a study on availability and utilization of instructional materials in teaching mathematics in secondary schools in Nsukka Local Government Area of Enugu State. His findings indicate that the materials are not available talk more of its utilization.

Adequacy of Mathematics Instructional Materials for Teaching of Mathematics in Senior Secondary Schools in Afikpo Education Zone based on school location.

From the results obtained, it was revealed that out of 42 instructional materials considered in this study, 1 item (pencil) was adequate and met the required specification of instructional materials for teaching mathematics in schools. The rest of the 41 instructional materials in secondary Schools in Afikpo education zone were inadequate.

Adequacy of Mathematics Instructional Materials for teaching of mathematics in Senior Secondary Schools in Afikpo Education Zone based on School Type.

From the results obtained, it was observed that out of 42 instructional materials, 13 items (pie demonstration board, standard form charts, antilogarithm table charts made of flex banner, calculator, graph, charts showing how to find roots of graph, ruler, pencil, matrix subtraction charts, graph board, drawing board, determinant charts and cardboard) were adequate and met the required specification of instructional materials for teaching mathematics in boys secondary schools only. The rest of 29 instructional materials were inadequate. In the girls secondary school, out of 42 instructional materials 2 items (ruler and pencil) were adequate. The rest of 39 instructional materials were inadequate. In the co-educational schools, out of 42 instructional materials, 2 items (pencil and determinant charts) were adequate. The rest of 40 instructional materials were inadequate. This result implies, statistically that instructional material for teaching mathematics in boys, girls and co-educational schools in public secondary schools in Afikpo Education Zone are inadequate.

CONCLUSION AND RECOMMENDATIONS
CONCLUSION

Majority of the schools in Afikpo Education zone of Ebonyi State whether urban or rural, boys, girls or co-educational schools have little or no mathematics instructional materials for teaching mathematics. The little ones that are available are not adequate as recommended in the minimum benchmark for teaching mathematics in mathematics curriculum in the state. It can be concluded that the level of adequacy of mathematics instructional materials in the urban and rural areas and in the boys, girls, and co-educational schools in Afikpo Education Zone of Ebonyi State is very poor.

RECOMMENDATIONS

It is therefore recommended based on the results of this study that:

1. The government should sponsor the provision of mathematics instructional materials to schools and send delegates to monitor the classroom teachers concerning the adequacy of the materials provided so as to ensure effective teaching and learning of the subject. The government should also organize train-the-trainer-workshops occasionally for mathematics teachers on the use of instructional materials in teaching mathematics.

2. The school authorities should as much as possible support in the provision of mathematics instructional materials without necessarily waiting for whenever the government is ready for the procurement. This can be done in collaboration with the Parents/Teachers Association (P.T.A).

3. Mathematics teachers should improvise mathematics instructional materials in cases where they are lacking without necessarily waiting for the authorities. Mathematics teachers should occasionally attend workshops where training on the use of the instructional materials are held. This will enable them to be updated with the latest version and method of application of these materials.

Hence, the researcher calls on the attention of education stakeholders, government, policy makers, school authorities, individuals, parents and non-governmental agencies to cooperate in the provision of adequate instructional materials for teaching mathematics. Teachers should be enhanced and encouraged to improvise materials for teaching.

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