

# Availability, Adequacy and Utilization of Basic Science Equipment in Rural and Urban Secondary Schools in Ekiti State, Nigeria

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## Abstract:

The study examined availability, adequacy and utilization of basic science equipment in rural and urban secondary schools in Ekiti state, Nigeria. The study specifically examined the availability, adequacy and utilization of science equipment in secondary schools and the difference in the availability, adequacy and utilization of science equipment between rural and urban public secondary schools in Ekiti State. The descriptive research design of the survey type was adopted in the study. The population of this study consisted of all the teachers of all secondary schools in Ekiti State. The sample for this study consisted of 30 teachers which were selected from 30 secondary schools in Ekiti State. The sample was selected through multi stage sampling procedure. Basic Science Equipment Checklist (BSEC) was used to collect relevant data for the study. The data collected for this study were analyzed using descriptive and inferential statistics. All hypotheses were tested at 0.05 level of significance. The findings revealed that the levels of availability, adequacy and utilization of science equipment in secondary schools in Ekiti State are moderate. It was also revealed that there was location difference in the availability of science equipment in Basic Science between rural and urban public secondary schools while adequacy and level of utilization of science equipment between rural and urban public secondary schools do

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not differ. It was recommended among others that there should be strict adherence to the implementation of education policy concerning provision of science equipment for Basic Science.

**Keywords:** Availability, Adequacy, Utilization, Equipment, Rural, Urban,

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## Introduction

There appears to be shortage and complete absence of science equipment in Nigerian schools. Availability of science equipment is the rate at which the available equipment is used during laboratory experiments. In some cases, the equipment may be available but not utilized during science teaching. The researchers observed that many secondary schools in Nigeria are not satisfactorily equipped with modern science equipment as part of instructional materials needed for successful teaching and learning process in Basic science and where available, they were poorly utilized.

Educational facilities are instructional materials that enhance teaching and learning thereby making the process significant and purposeful. Ezeani (2011) opined that resource sufficiency is crucial to the actual functioning of an educational institution. It goes to building up a pleasant atmosphere and sustains the working condition within a school. There have been numerous reports in the print and electronic media on the poor performance of junior secondary school students in Basic Science due to under-utilization and unavailability of science equipment for teaching and learning of the subjects. In some cases where the equipment are moderately available, they were under-utilized and this seems to be having negative effects on the self-efficacy of the students that may motivate them towards better performance.

It has been observed that despite the presence of laboratories in most secondary schools in Nigeria, inadequacy of modern science equipment prevails. Also, experience has shown that in some cases, students are not allowed to use the existing equipment during science practical as most of these students are exposed to practical a day before examination. It is not unlikely that students will not have the self-conviction to perform well in laboratory activities.

There appears to be uneven distribution of science equipment among secondary schools in urban and rural areas. Owoeye (2011) opined that urban areas are those with high population density while rural areas are those with low population and subsistence mode of life. Researcher Observed that students in the rural schools were deprived of the provision of modern school facilities such as laboratory equipment and where such exist, they are often been characterized with obsolete equipment and poor utilization.

The poor utilisation of the inadequate science equipment in rural schools may not be unconnected to low practical oriented Basic Science teachers. Meanwhile, urban schools seem to have better supply of science equipment than rural schools. Also, students in urban schools seem to be adequately exposed to the use of science equipment as there was more enabling environment in carrying out science practical such as regular supply of electricity and adequate science teachers.

Based on the foregoing, the study examined availability, adequacy and utilization of basic science equipment in rural and urban secondary schools in Ekiti state, Nigeria. The study specifically examined:

1. the availability, adequacy and utilization of science equipment in secondary schools; and
2. the difference in the availability, adequacy and utilization of science equipment between rural and urban public secondary schools in Ekiti State.

## Research Questions

The following research questions were raised for the study

1. What is the level of availability of science equipment in secondary schools in Ekiti State?
2. What is the adequacy of science equipment in secondary schools in Ekiti State?
3. How often do the teachers utilize the available science equipment for teaching and learning Basic Science?

## Research Hypotheses

The following research hypotheses were postulated for this study:

1. There is no significant difference in the availability of science equipment between rural and urban public secondary schools in Ekiti State.
2. There is no significant difference in the adequacy of science equipment between rural and urban public secondary schools in Ekiti State.
3. There is no significant difference in the utilization of science equipment between rural and urban public secondary schools in Ekiti State.

## Methodology

The descriptive research design of the survey type was adopted in the study. The survey design was employed because the study covered large area from which sample was selected. The population of this study consisted of all the teachers of all secondary schools in Ekiti State. The sample for this study consisted of 30 teachers which were selected from 30 secondary schools in Ekiti State. The sample was selected through multi stage sampling procedure. Basic Science Equipment Checklist (BSEC) was used to collect relevant data for the study. Basic Science Equipment Checklist BSEC consisted of section A and B. Section A consisted of bio-data of the respondents while section B contained 55 items.

The researcher personally administered the instrument and provided them with all relevant guidelines to enable them respond appropriately to the instruments. The data collected for this study were analyzed using descriptive and inferential statistics. The questions raised were answered using descriptive statistics of means and standard deviation. Hypotheses 1 – 3 were tested using t-test analysis. All hypotheses were tested at 0.05 level of significance.

## Results

**Question 1:** What is the level of availability of science equipment in secondary schools in Ekiti State?

**Table 1: Frequency and Percentage analysis of availability of science equipment**

S/N	Science Equipment	Available		Not Available	
		F	%	F	%
1.	Convex Lens	24	80.00	06	20.00
2.	Concave Lens	23	76.67	07	23.33
3.	Lenses Holder	19	63.33	11	36.67
4.	Meter Board	28	93.33	02	6.67
5.	Prism	19	63.33	11	36.67
6.	Magnet	28	93.33	02	6.67

7.	Simple Pendulum	26	86.67	04	13.33
8.	Compasses	27	90.00	03	10.00
9.	Stop watch	26	86.67	04	13.33
10.	Weighing Scale	19	63.33	11	36.67
11.	Ruler	30	100.00	00	0.00
12.	Mirror	30	100.00	00	0.00
13.	Pin	30	100.00	00	0.00
14.	Bulb	26	86.67	04	13.33
15.	Battery	27	90.00	03	10.00
16.	Drawing Board	26	86.67	04	13.33
17.	Bursen Burner	24	80.00	06	20.00
18.	Tripod Stand	25	83.33	05	16.67
19.	Test Tube	24	80.00	06	20.00
20.	Dropping Funnel	27	90.00	03	10.00
21.	Graduated Cylinder	14	46.67	16	53.33
22.	Thermometer	21	70.00	09	30.00
23.	Litmus Paper	30	100.00	00	0.00
24.	Beaker	28	93.33	02	6.67
25.	Test Tube Rack	23	76.67	07	23.33
26.	Glass funnel	24	80.00	06	20.00
27.	Condenser	22	73.33	08	26.67
28.	Droppers	23	76.67	07	23.33
29.	Filter paper	29	96.67	01	3.33
30.	Burettes	24	80.00	06	20.00
31.	Separating funnel	25	83.33	05	16.67
32.	Volumetric flask	24	80.00	06	20.00
33.	Conical flask	24	80.00	06	20.00
34.	Round bottom flask	23	76.67	07	23.33
35.	Measuring Cylinder	27	90.00	03	10.00
36.	Pipette	24	80.00	06	20.00
37.	Beam Balance	25	83.33	05	16.67
38.	Dissecting kit	26	86.67	04	13.33
39.	Insect Collecting Net	25	83.33	05	16.67
40.	Forceps	21	70.00	09	30.00
41.	PH Indicator	19	63.33	11	36.67
42.	Barometer	16	53.33	14	46.67
43.	Human model	04	13.33	26	86.67
44.	Skeleton	11	36.67	19	63.33
45.	Plant models	02	6.67	28	93.33
46.	Microscopic slide	09	30.00	21	70.00
47.	Plane slide	11	36.67	19	63.33
48.	Desiccator	11	36.67	19	63.33

49.	Animal Specimen	23	76.67	07	23.33
50.	Scapel	21	70.00	09	30.00
51.	Colbalt Chloride Paper	19	63.33	11	36.67
52.	Caliper	21	70.00	09	30.00
53.	Micrometer Screw Guage	21	70.00	09	30.00
54.	Spatulas	19	63.33	11	36.67
55.	Dissecting Tray	18	60.00	12	40.00

Table 1 showed the level of availability of science equipment in secondary schools in Ekiti State. The table showed that over 70% of the sampled schools have at least 40 of the listed 55 materials. The table also showed that all the schools have ruler, mirror, pin and litmus paper. The least available material is plant model with only 6.67% of the sampled schools having it in their laboratory. The table showed that none of the schools have all the recommended science equipment.

**Question 2:** What is the adequacy of science equipment in secondary schools in Ekiti State?

**Table 2: Frequency and Percentage analysis of adequacy of science equipment**

S/N	Science Equipment	Adequate		Not Adequate	
		F	%	F	%
1.	Convex Lens	11	36.67	19	63.33
2.	Concave Lens	10	33.33	20	66.67
3.	Lenses Holder	11	36.67	19	63.33
4.	Meter Board	15	50.00	15	50.00
5.	Prism	11	36.67	19	63.33
6.	Magnet	09	30.00	21	70.00
7.	Simple Pendulum	14	46.67	16	53.33
8.	Compasses	16	53.33	14	46.67
9.	Stop watch	14	46.67	16	53.33
10.	Weighing Scale	11	36.67	19	63.33
11.	Ruler	21	70.00	09	30.00
12.	Mirror	22	73.33	08	26.67
13.	Pin	23	76.67	07	23.33
14.	Bulb	18	60.00	12	40.00
15.	Battery	10	33.33	20	66.67
16.	Drawing Board	19	63.33	11	36.67
17.	Bursen Burner	13	43.33	17	56.67
18.	Tripod Stand	14	46.67	16	53.33
19.	Test Tube	13	43.33	17	56.67
20.	Dropping Funnel	16	53.33	14	46.67
21.	Graduated Cylinder	11	36.67	19	63.33
22.	Thermometer	16	53.33	14	46.67
23.	Litmus Paper	18	60.00	12	40.00
24.	Beaker	12	40.00	18	60.00
25.	Test Tube Rack	11	36.67	19	63.33

26.	Glass funnel	13	43.33	17	56.67
27.	Condenser	14	46.67	16	53.33
28.	Droppers	13	43.33	17	56.67
29.	Filter paper	14	46.67	16	53.33
30.	Burettes	13	43.33	17	56.67
31.	Separating funnel	12	40.00	18	60.00
32.	Volumetric flask	11	36.67	19	63.33
33.	Conical flask	10	33.33	20	66.67
34.	Round bottom flask	12	40.00	18	60.00
35.	Measuring Cylinder	14	46.67	16	53.33
36.	Pipette	11	36.67	19	63.33
37.	Beam Balance	12	40.00	18	60.00
38.	Dissecting kit	09	30.00	21	70.00
39.	Insect Collecting Net	09	30.00	21	70.00
40.	Forceps	10	33.33	20	66.67
41.	PH Indicator	12	40.00	18	60.00
42.	Barometer	16	53.33	14	46.67
43.	Human model	04	13.33	26	86.67
44.	Skeleton	09	30.00	21	70.00
45.	Plant models	02	6.67	28	93.33
46.	Microscopic slide	03	10.00	27	90.00
47.	Plane slide	09	30.00	21	70.00
48.	Desiccators	05	16.67	25	83.33
49.	Animal Specimen	11	36.67	19	63.33
50.	Scapel	12	40.00	18	60.00
51.	Colbalt Chloride Paper	10	33.33	20	66.67
52.	Caliper	10	33.33	20	66.67
53.	Micrometer Screw Guage	11	36.67	19	63.33
54.	Spatulas	11	36.67	19	63.33
55.	Dissecting Tray	10	33.33	20	66.67

Table 2 showed the level of adequacy of science equipment in secondary schools in Ekiti State. The table showed that only three science equipment were adequately available in over 70% of the sampled schools while other equipment were not adequately available in most of the sample schools. The table also showed that the highest adequately available science equipment was pin with 76.67% of the sampled schools having it in their laboratory while the least adequately available material is plant model with only 6.67% of the sampled schools having it in their laboratory. The table showed that none of the schools have adequate science equipment.

**Question 3:** How often do the teachers utilize the available science equipment for teaching and learning Basic Science?

**Table 3: Frequency and Percentage analysis of utilization of science equipment**

S/N	Science Equipment	Frequently Used		Hardly Used		Not Used	
		F	%	F	%	F	%
1.	Convex Lens	10	33.33	05	16.67	15	50.00
2.	Concave Lens	09	30.00	04	13.33	17	56.67
3.	Lenses Holder	10	33.33	04	13.33	16	53.33
4.	Meter Board	12	40.00	05	16.67	13	43.33
5.	Prism	10	33.33	03	10.00	17	56.67
6.	Magnet	08	26.67	05	16.67	17	56.67
7.	Simple Pendulum	11	36.67	04	13.33	15	50.00
8.	Compasses	11	36.67	03	10.00	16	53.33
9.	Stop watch	09	30.00	04	13.33	17	56.67
10.	Weighing Scale	06	20.00	04	13.33	20	66.67
11.	Ruler	14	46.67	04	13.33	12	40.00
12.	Mirror	13	43.33	02	6.67	15	50.00
13.	Pin	11	36.67	06	20.00	13	43.33
14.	Bulb	12	40.00	05	16.67	13	43.33
15.	Battery	07	23.33	04	13.33	19	63.33
16.	Drawing Board	08	26.67	03	10.00	19	63.33
17.	Bursen Burner	09	30.00	04	13.33	17	56.67
18.	Tripod Stand	11	36.67	08	26.67	11	36.67
19.	Test Tube	10	33.33	06	20.00	14	46.67
20.	Dropping Funnel	12	40.00	05	16.67	13	43.33
21.	Graduated Cylinder	08	26.67	05	16.67	17	56.67
22.	Thermometer	11	36.67	04	13.33	15	50.00
23.	Litmus Paper	12	40.00	05	16.67	13	43.33
24.	Beaker	07	23.33	04	13.33	19	63.33
25.	Test Tube Rack	08	26.67	03	10.00	19	63.33
26.	Glass funnel	11	36.67	05	16.67	14	46.67
27.	Condenser	10	33.33	04	13.33	16	53.33
28.	Droppers	11	36.67	06	20.00	13	43.33
29.	Filter paper	09	30.00	05	16.67	16	53.33
30.	Burettes	08	26.67	06	20.00	16	53.33
31.	Separating funnel	09	30.00	04	13.33	17	56.67
32.	Volumetric flask	09	30.00	05	16.67	16	53.33
33.	Conical flask	08	26.67	06	20.00	16	53.33
34.	Round bottom flask	10	33.33	05	16.67	15	50.00
35.	Measuring Cylinder	11	36.67	04	13.33	15	50.00
36.	Pipette	08	26.67	05	16.67	17	56.67
37.	Beam Balance	08	26.67	06	20.00	16	53.33
38.	Dissecting kit	07	23.33	04	13.33	19	63.33
39.	Insect Collecting Net	06	20.00	05	16.67	19	63.33

40.	Forceps	08	26.67	03	10.00	19	63.33
41.	PH Indicator	07	23.33	02	6.67	21	70.00
42.	Barometer	10	33.33	04	13.33	16	53.33
43.	Human model	02	6.67	01	3.33	27	90.00
44.	Skeleton	07	23.33	02	6.67	21	70.00
45.	Plant models	00	0.00	02	6.67	28	93.33
46.	Microscopic slide	02	6.67	02	6.67	26	86.67
47.	Plane slide	06	20.00	02	6.67	22	73.33
48.	Desiccators	03	10.00	03	10.00	24	80.00
49.	Animal Specimen	07	23.33	02	6.67	21	70.00
50.	Scapel	08	26.67	01	3.33	21	70.00
51.	Colbalt Chloride Paper	05	16.67	03	10.00	22	73.33
52.	Caliper	06	20.00	05	16.67	19	63.33
53.	Micrometer Screw Guage	07	23.33	04	13.33	19	63.33
54.	Spatulas	08	26.67	05	16.67	17	56.67
55.	Dissecting Tray	04	13.33	03	10.00	23	76.67

Table 3 showed the utilization of science equipment for teaching and learning Basic Science in secondary schools in Ekiti State. The table showed that ruler was the only materials fully utilized by 46.67% of the sampled schools as other materials are not fully utilized by over 53.33% of the sampled schools. The table also showed that the highest fully utilized material by the sampled schools is ruler while the least fully utilized material is plant model with none of the sampled schools fully utilized it. The table above showed that most of the teachers did not utilize the science equipment as recommended by Federal Ministry of Education (2014).

### Test of Hypotheses

**Hypothesis 1:** There is no significant difference in the availability of science equipment between rural and urban public secondary schools in Ekiti State.

**Table 4:** t-test analysis for availability of science equipment between rural and urban public secondary schools

Variations	No of Schools	Mean	SD	df	t <sub>cal</sub>	P (Sig)	Rem.
Urban	15	90.27	3.08	28	5.153	0.000*	Significant
Rural	15	85.07	2.40				

\*P<0.05

Table 4 shows that the t-cal value of 5.153 is significant because the P value (0.000) < 0.05 at 0.05 level of significance. This implies that null hypothesis is rejected. Hence, there is significant difference in the availability of science equipment between rural and urban public

secondary schools in Ekiti State. The direction of difference between urban and rural schools is in favour of the urban schools because of 5.20 differences in the mean scores.

**Hypothesis 2:** There is no significant difference in the adequacy of science equipment between rural and urban public secondary schools in Ekiti State.

**Table 5:** t-test analysis for adequacy of science equipment between rural and urban public secondary schools

Variations	No of Schools	Mean	SD	df	t <sub>cal</sub>	P (Sig)	Rem.
Urban	15	71.73	2.66	28	0.178	0.860	Not Significant
Rural	15	72.00	5.15				

P>0.05

Table 5 shows that the t-cal value of 0.178 is not significant because the P value (0.860) > 0.05 at 0.05 level of significance. This implies that null hypothesis is not rejected. Hence, there is no significant difference in the adequacy of science equipment between rural and urban public secondary schools in Ekiti State.

**Hypothesis 3:** There is no significant difference in the utilization of science equipment between rural and urban public secondary schools in Ekiti State.

**Table 6:** t-test analysis for utilization of science equipment between rural and urban public secondary schools

Variations	No of Schools	Mean	SD	df	t <sub>cal</sub>	P (Sig)	Rem.
Urban	15	123.53	6.47	28	0.231	0.819	Not Significant
Rural	15	123.00	6.16				

P>0.05

Table 6 shows that the t-cal value of 0.231 is not significant because the P value (0.819) > 0.05 at 0.05 level of significance. This implies that null hypothesis is not rejected. Hence, there is no significant difference in the utilization of science equipment between rural and urban public secondary schools in Ekiti State.

## Discussion

The study revealed that the levels of availability, adequacy and utilization of science equipment in secondary schools in Ekiti State were moderate. This seems to be in line and consistent with finding of Awoniyo (2006) and Okoye (2008) who found that availability and utilization of science equipment in secondary school are moderate in schools. According to Ekpo (2009), any effort to separate Science into practical and theory lesson account to perpetuating the dichotomy and this is antithesis of what science is. The researcher could infer that the availability of any educational resources such as science equipment plays a significant role if and only if it is effectively used during teaching – learning process.

It was also revealed that there was significant difference in the availability of science equipment between rural and urban public secondary schools in favour of urban schools. Furthermore, it was revealed that there was no significant difference in the adequacy and level of utilization of science equipment between rural and urban public secondary schools. The finding supports the contention of Okoye (2008) who pointed out that, in Nigeria most rural- based schools lack enough qualified teachers, are poorly equipped with science equipment and lack basic amenities, all serving as inhibiting factors to good self-efficacy and academic performance.

### Conclusion

Based on the findings of this study, it was concluded that the levels of availability, adequacy and utilization of science equipment in secondary schools in Ekiti State are moderate. There is location difference in the availability of science equipment in Basic Science between rural and urban public secondary schools while adequacy and level of utilization of science equipment between rural and urban public secondary schools do not differ.

### Recommendations

Based on the findings of this study, the following recommendations were made.

1. There should be strict adherence to the implementation of education policy concerning provision of science equipment for Basic Science and Science subjects in general. There should be a yearly budget for continuous procurement of equipment. Most of the items are not procured where provisions are made.
2. There should be regular training and re-training for Basic Science teachers in Public schools on the utilization of science equipment. New equipment is being invented everyday that require training for proficient use of them for effective and efficient delivery of learning and teaching.
3. There should be regular inspection of schools to ensure frequent utilization of science equipment in teaching Basic Science in Schools. The Inspectorate Division of the Ministry of Education Science and Technology should put schools on their toes by embarking on regular and unscheduled visits.

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