

RELATIONSHIP BETWEEN STUDENT'S ACHIEVEMENT IN SCIENCE AND TECHNOLOGY WITH THE ADEQUACY OF LABORATORY FACILITIES, IN THREE SELECTED TERTIARY INSTITUTIONS IN YOBE STATE, NIGERIA

¹B.A. Jinjiri, ²A.U. Mustapha.

¹Department of Basic studies/Science laboratory technology

²Department of General studies/ Science laboratory technology

Mai Idris Aloomo polytechnic P.M.B 1020, Geidam, Yobe State, Nigeria

ABSTRACT: To determine the relationship between student's achievement in science and technology with the adequacy of laboratory facilities in three selected tertiary institutions, is conducted by methods that include: research design, area of study, sampling procedures, treatment of data collected, the population, instrument used in data collection and sample. It has been observed that institution with adequate laboratory facilities where students performs practical excel better and achieves higher results, while institutions with poor or inadequate laboratory facilities where students do not perform practical achieves lower results. From the assessment of final year graduation results in selected institutions it was find out that 70% and above of students performed creditably had partially adequate laboratory facilities, while 25% of the students performed very well in the school with adequate facilities. Most of the reagents, apparatus and equipment in the selected institutions were quite up to date.

Index Terms: Achievement, Science, Technology, Laboratory, Facilities, Students, Lecturers, Teachers, Institution, Performance, selected.

Introduction

In the study of science and technology, the equipment to which the students' are exposed is crucial because the country's system is geared toward the improvement of science and technology, and to produce individuals who are scientifically Oriented. Ivowi (2000). The materials or science facilities referred to here are infrastructural materials, audio-visual aids, laboratory equipment, technicians and laboratory spaces etc.

Which are used to foster the learning of sciences and technology? Educationist attention is tailored towards arousing the interest of students in learning of sciences/technology. There is need for the improvement of science laboratory equipment and infrastructural facilities in order to enhance and arouse the interest of student in sciences.

Effective teaching and learning of science and technology can only be possible when well-planned and designed laboratories with adequate equipment and facilities are provided both at the disposal at teachers and at students. This will enable students to excel academically. The importance of a well-equipped laboratory is that it will enable students become personally involved in the knowledge they acquire and by so doing they achieve a better results at the end of their study.

Science is the systematize body of knowledge which derives from observation, experiment and carry out determine principles on the study. Federal college of education hand Book (2001).

Technology in essence, deals with the application of scientific knowledge for practical purposes. Hence, the present declining performance of students in science and technology has been argued to have relationship with the unavailability or inadequacy of laboratory equipment, it on this basis that this study anchors its investigations.

Frightened by the declining performance of students in science, individual science educators and professional in sciences, associations such as science teachers association of Nigeria (STAN) as a group have strived tirelessly for two decades to deal decisively with problems of students' under achievement in science, developing innovative teaching strategies that will improve learning of science concept-Oriafe (1956).

Equally, research reports have shown that students performance in science at senior secondary schools and some tertiary institutions is not encouraging- Ogunniyi et el (2006) attribute this students' underachievement in science and technology to many factors such as: use of ineffective teaching methods and lack of/inadequacy of laboratory facilities in most schools.

According to Okebukola et al (2000) ascertained the impression that science is difficult and for the exceptionally brilliant, limited number of professionally trained science teachers. Students' nonchalant attitudes to school work and lack of interest in science, from the above it can be analyzed that students' achievement over the years in science has been a discouragement as students' performance in sessional results or in the annual SSCE examinations records mass failure in sciences. Concerned researchers in the areas have attributed the causes of this under achievement to a multiple of factors of which lack/inadequacy of science/laboratory facilities is among them with this necessary hypothesis it could be done to find out if this factor has relationship with students' achievement in science and technology.

There are factors identified by various science educationist to be the causes affecting the under achievement observed in sciences. They include:

According to Onuoha (1997), myths associated with the subjects (courses) and frequent changes in educational policy as results of unstable government, societal value, and lack of teaching facilities, poor preparation and incompetent teachers/lectures.

In the same way, Okwankwo (2007) stated that from the physical resources which form science facilities, the bedrock of science and technology institutions, he further asserted that the facilities are the catalyst for promoting teaching and learning processes.

Material and method

Design of Study

The design used in this research is the descriptive research design using the correlation study type, so as to find out whether there is relationship between students' achievements in science and technology with the adequacy of laboratory facilities in selected tertiary institution in Yobe State, Nigeria. Ninety (90) students sample were selected for the purpose of the work and the examination record offices of the institutions were visited.

Area of the Study

The research was carried out in Yobe state, Nigeria; among the tertiary institutions students in the three selected schools are used as a representative of eight tertiary institutions in the state were investigated. The institutions are:

1. Yobe State University, Damaturu, Nigeria
2. Mai Idris Aloom polytechnic, Geidam, Yobe State, Nigeria
3. Umar Suleiman College of Education, Gashu'a, Yobe State, Nigeria

Population

A population of ninety (90) students were researched, thirty from each school. Fifteen (15) teachers/lectures were also researched on and the examination offices were consulted by the permission of concerned authorities in the three selected tertiary institutions.

Sample and sampling procedure

Both institutions and students sampled were done using the simple random sampling method.

School sampling

The sample was drawn from three tertiary institutions in Yobe state, Nigeria. They are all offering science and technology courses/papers, as it is compulsory for both science and engineering students. Thirty students were sampled from each institution and the number of schools was not just hand-picked, it was sampled out of the population in the study area. This was done in such a way as to reflect the diversity of the institutions.

Students Sampling

As earlier mentioned, the students were drawn from the institutions sampled. In each institution, thirty representatives from first, second and third year were randomly selected by method of random sampling. Small pieces of paper bearing "selected and not selected were cut and mixed in a box for the students to pick; those that pick "selected" were one the one use for the study.

A total of eight (80) questionnaires were collected for the analysis.

Instrument used in data collection

The instrument used in collecting data for this research study were questionnaires, sessional/annual results and list of laboratory equipment, the questionnaires and lab equipment inventory were developed out of the quest to investigate the relationship between students achievements and the adequacy of laboratory facilities and has question related to the problem under investigation.. The

questionnaires were validated by the researcher and some modifications were made. The validated questionnaires were produced for the distributions to the respondents.

Administration of the instruments

The questionnaires were administered directly to the students and the science and technology teaching staff. After taking permission from the head of each institution, in each school, the researchers fully brief the students on the method of answering the questionnaires. Ninety student questionnaires and eleven teachers' questionnaires were also filled and used. Five inventory stocks for laboratory facilities were used from each institution; the researchers met the head of various institutions who in turn introduced them to the examination record offices where sessional/annual results for three years were collected.

Method of data analysis

The statistical tool emphasized in analyzing the data of this research work was simple percentages. The data on the table were derived from the ninety students sampled. The formula for the percentage is: $\frac{\text{Score}}{\text{Total in number}} \times 100$

Total in number 1

Score; represent the number of respondents, total number signifying all respondents. The tables were based on the agreed and disagreed questions answered by the staff and the check list by the science and technology laboratory equipment from the selected tertiary institution.

PRESENTATION OF RESULTS

Table 1: Qualification of science and technology in the selected schools

FACTORS	FREQUENCY	PERCENTAGE
Professor	1	9.05%
PhD	2	18.2%
MSc.	5	45.45%
BSc.	3	27.3%
Total	11	100%

Table 2: Teachers/lecturers response to the state of the laboratory

(Only eleven teachers/lectures returned the filled questionnaires)

FACTORS	AGRED	PERCENTAGE	DISAGRED	PERCENTAGE
The available equipment is proportional to the students in each class.	3	27.3%	8	72.8%
The provision of facilities for maximum use by the staff and students are satisfactory.	4	36.4%	7	63.6%
Student's achievement in science and technology hinges strongly on the availability of the laboratory equipment.	8	72.7%	3	27.3%
The standard of the science and technology laboratory and its equipment is satisfactory.	9	81.8%	2	18.2%
2-3 periods of science and technology lectures should be allowed per week.	10	90.0%	1	9.1%

Table 2:

Science equipment is serviced by laboratory technicians when they are faulty.	6	54.5%	5	45.5%
Lectures/teachers could help by improving science and technology teaching equipment.	9	81.8%	3	27.3%
The storage and retrieval system are adequate and very effective.	7	63.6%	4	36.4%
The laboratory and its equipment are kept clean and serviced regularly to make sure they are in good working order.	9	81.8%	2	18.2%
The laboratory should be well secured to avoid frequent accident and breakage of equipment.	11	100%	0	0.0%

Table 3: Students responses to the Questionnaire

Factors	Agreed	%	Disagreed	%
Do you have demonstration equipment?	77	77%	13	13%
Do you have work benches and seats for laboratory experiments?	80	80%	10	10%
During practical, working individually is preferable than working in group?	64	64%	26	26%
If yes, are they sufficient?	39	39%	51	51%
Is there electrical supply in the laboratory?	66	66%	24	24%
Does the laboratory have water system and hand washing basins?	46	46%	44	44%
Is the equipment available and functioning?	72	72%	18	18%
Are chemicals and reagents available?	73	73%	17	17%

Final year graduating Students results from 2014 to 2016 and information on the adequacy of science and technology facilities

Table 4: Performance of students

Schools	Adequacy of facilities	Total population	First class/Distinction		Upper credit/credit		Lower credit/merit		Pass/third class		Fail	
			NO	%	NO	%	NO	%	NO	%	NO	%
Institution A (Yobe state university)	Adequate	2116	2	0.09%	541	24.9%	1083	50%	407	18.7%	133	6.1%
Institution B (Mai Idris Alooma polytechnic, Geidam)	Partially adequate	708	1	0.14%	126	17.7%	404	57.1%	127	17.9%	50	7.1%
Institution C (Umar Suleiman college of Education, Gashu'a)	Inadequate	1613	0	0%	322	19.96%	1075	66.7%	144	8.9%	72	4.5%

Discussion

Considering the factors: Lectures'/Teachers' qualification, from the data analyzed in table 1 above, one of the respondent is professor with a percentage of 9.055%, two respondents had PhD with a percentage of 18.2%, five respondents had MSc with a percentage of 45.45% and three respondents had BSc with a percentage of 27.3%. Professor and PhD are correlated with total percentage responses of 27.25, which imply that the number of higher degrees (higher academicians) in the selected institution is lesser than average (MSc) and lower (BSc) academicians which is 72.75. Therefore, majority of lectures in the selected institutions are average and lower academicians.

From the factor: the available equipment is proportional to students offering science and technology in each class. From the data in table 2, 3 respondents agreed with a percentage of 27.3% while 8 respondents disagreed with a percentage of 72.85. Since the percentage of disagreement is more than agreement, it can be concluded that the equipment available are not proportional to the number of students making use of them.

Viewing the factor: The provision of facilities for maximum use by the staff and the students are satisfactory, it means that the provision is not satisfactory.

Describing the factor: Students achievements in science and technology hinges strongly on the availability and workability of laboratory equipment, this indicated that students achievements hinges strongly on the availability and workability of laboratory equipment.

Analyzing the factor: The standard of science and technology laboratory and its equipment is satisfactory? This indicated that is not satisfactory in the selected institutions.

Considering the factor: 2-3 periods of science and technology lectures should be allowed per week? It means it should be allowed.

From the results in table 3 above, considering the factor: Do you have demonstration equipment? Shows that 77 respondents agreed with a percentage of 77% while 13% of the respondents disagreed, which implies that only 13 respondent disagreed but 77 respondents agreed, it can therefore, be concluded that the selected schools have demonstration equipment.

From the factor: Do you have work benches and seats for class experiments? This indicated that there are work benches and seats for class experiments.

Analyzing the factor: During practical work, individually is preferable than working in group? It can be concluded that is better to work individually than in group.

Analyzing the factor: If yes, are they sufficient? It can therefore, be concluded that the available chemicals and reagents are not sufficient.

Considering the factor: Is there electrical supply in the laboratory? It can be concluded that the institutions got electrical supply in their laboratories.

Describing the factor: Does the laboratory have water system and wash hand basins? This indicated that the average institutions selected have water system and wash hand basins.

From the table: Are the equipment available and functioning? It can be concluded that the equipment available in the selected institutions are functioning.

From the factor: Are chemicals and reagents available? It can be concluded that the sampled institutions have chemicals and reagents for conducting practical.

From the above table 4, the status of laboratory facilities is adequate and the total number of students investigated their graduation results is 2166 out of it 2 has first class/distinction with 0.09%, 541 got upper credit/credit with 24.9%, 1083 secured lower credit/merit with 50%, 407 have pass/third class with 18.7% while 133 failed with a percentage of 6.1% in their final graduating results.

In school B, the position of laboratory facilities is partially adequate and the total numbers of students investigated their graduation results is 708 among them only one student make first class/distinction in three consecutive session with 0.14%, 126 got upper credit/credit with 17.7%, 404 secured lower credit/merit with 57.1%, 127 obtained pass/third class with 17.9% while 50 students failed with a percentage of 7.1% in their final graduating results.

In school C, the condition of laboratory facilities is inadequate while the total number of students under study in their final year results is 1623 out of this figure none of them make first class/distinction in all the sessions investigated. 322 students got upper credit/credit with 19.96%, 1075 make lower credit/merit with 66.7%, 144 obtained pass/third class with 8.9% while 72 students failed with a percentage of 4.5 in their final graduation results.

Conclusion

The science and technology laboratories of the selected tertiary institutions in Yobe state, Nigeria were adequate in yobe state university, partially adequate in Mai Idris Alooma polytechnic, Geidam and inadequate in Umar Suleiman college of Education, Gashu'a. Most of the regents, apparatus and equipment in the three selected tertiary institutions were quite up to date. From the assessment of final year graduating students results it was discovered that 70% and above of students performed creditably well in all the selected institutions and 25% performed well but in schools with more facilities students achieved higher results. About 72% of the science and technology lecturers in the selected institutions are average and lower academicians, only 28% having higher degrees. The standard of the laboratories in all tertiary institutions selected were in accordance with National Universities Commission (NUC), National Board for Technical Education (NBTE) and National Commission for Colleges of Education (NCCE).

Acknowledgement

I thank the Tertiary Education Trust Fund (TETFund) for supporting me with a research grand throughout the periods of this research work as well as my institution Mai Idris Alooma polytechnic, Geidam for approving this work as a researchable work.

References

- [1] Ayo J.A (2000): Observation on the management of science teaching facilities for academic effectiveness, African journal of material and natural science vol.1 Nu pg. 197.
- [2] Kolo wale (1980): the role of laboratory in secondary school science program. Nigeria journal of research in education vol. 3 No. 1 p g 131-135.
- [3] Okwonkwo D.O (2007): the laboratory design, organization and safety STAN journal 27(13), 47-52.

- [4] Ahmed I. A, A.S., Umma, M., Hassan, K.Y and Ibrahim, M. (2015).
- [5] Abdullahi A, (1982): Science teaching in Nigeria, Ilorin Atoho.
- [6] Bologun T.A. (1982): Improvisation of school science teaching equipment STAN Journal vol. 10 pg. 131-137.
- [7] Cessac J. (1960): Science teaching in the secondary schools of the tropical Africa (UNESCO).
- [8] Fafunwa A.B. (1976): Teaching Science effectively. West African journal of education vol. 2 No.3, Institute of education university of Ibadan.
- [9] Johnson S.T. (2000): Improvisation teaching for colleges and schools of science equipment FCE Kano.
- [10] Maduabum A.A (1984): Effectiveness science teaching thought the use of local resources, Jos university press limited.
- [11] Ogunniyi M.B. (2002): An analysis of prospective science teachers, understanding nature of science Journal of research in science teaching 10.
- [12] Okebukola F.A. (1992): Assesment of learning environment of Nigeria science laboratory classes, journal of the science teachers association of Nigeria.
- [13] New UNESCO for science teaching press STAN (1986): Science teachers' handbook UNESCO (1986).
- [14] Victoria et. al. (1986): Classroom teachers and science subjects, Ibadan Excel press Ltd.