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Contents

AN OVERVIEW OF THE FACTORS THAT MILITATE AGAINST SCIENCE AND TECHNOLOGY PROGRAMS IN HIGHER INSTITUTIONS IN THE SOUTH EASTERN PARTS OF NIGERIA

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ABSTRACT

This study's concern, was mainly on the reasons why Science and Technology Graduates don't do well internationally, why Nigeria is still backward technologically and why Science and Technology Graduates always get retrained in their various employment places before they can function. This concern prompted this study. Two factors were uppermost in the mind of the researcher and these were the adequacy of human and material resources. Three research questions and three hypotheses were formed with these two factors and the researcher also wanted to know if the available human and material resources meet the minimum standard requirement of the Federal Ministry of Education concerning science and technology. This study only focused on the higher institutions in the south eastern parts of Nigeria . The findings were amazing, it was discovered that the available human resources was grossly inadequate when matched with the minimum standard requiremen . It *was discovered that the material resources was also inadequate as compared to the minimum standard requirement for science and technology. Recommendations were proffered, hoping if adhered to, will bring about great improvement in the career of science and technology as a means for national development in Nigeria .*

INTRODUCTION

Education according to the 4th Edition of the National Policy on Education (2004) is an instrument for national development. It believe, that education fosters the worth and development of the individual, for each individual sake and for the general development of the society. It also believe that there is need for functional education for the promotion of a progressive and united Nigeria to this end, school programmes need to be relevant, practical and comprehensive, while interest and ability should determine the individual's direction in education. This is where science and Technology come to play, for education to be functional, it has to be geared towards self realization, better human relationship, individual and national efficiency, effective citizenship, national consciousness, national unity, as well as towards social, cultural, economic, political, scientific and technological progress. From the above it can be deduced that education is a tool to better the lives of the citizens of any nation and bring them to the awareness of facts. It is the practical instrument for generating and transmitting the appropriate value system to all citizens and for establishing a cultural identity. The lack of education invariably delimits the ability of the individual for taking advantage of numerous opportunities that life offers. In Nigeria however, though the national policy of Education is laudable, the actualization of these laudable education policy is far from being attained due to some certain facts that are militating against this reality other advanced countries of the world are enjoying. This paper will focus therefore on these factors and also proffer solutions which hopefully when adhered to will move the nation's education from theory to practice and functional. Since this paper is focusing on higher institutions, it will not be out of line to enlighten the readers on some specifics of a higher institutions. According to Sanda (1992), the Nigeria Higher institutions like its counterparts anywhere in the world is a complex organization. Every complex organization is characterized by multiple goals and objectives. The Tertiary Education in Nigeria has the following goals and objectives: National Policy on Education (2004). Tertiary educational institutions shall pursue these goals through:

a) teaching;
b) research and development;
c) virile staff development programmes;
d) generation and dissemination of knowledge;
e) a variety of modes of programmes including full-time, part-time, block-release, day-release, sandwich, etc;
f) access to training funds such as those provided by the Industrial Training Fund (ITF);
g) Students Industrial Work Experience Scheme (SIWES);
h) Maintenance of minimum educational standards through appropriate agencies;
i) Inter-institutional co-operation;
j) Dedicated services to the community through extra-mural and extension services.

These goals and objectives are laudable though not comprehensive enough to claim to have satisfied all the yearnings of the nation. It functions of teaching, research and public service are often pursued with a view of satisfying the goals of manpower development for the wider society, skill development for its individual student and product of cultured individual with survival value orientation as well as an objective view of society. The socio-economic development needs of contemporary Nigerian society puts more pressure on goals attainment. However in order to actualize the stated goals, the Nigerian Higher institutions must raise her head above the stormy waters. It must first survive in Nigeria notwithstanding the complexity of he goals and objectives. Undoubtedly, the importance of science and technology in the life of a developing nation can not be over emphasize, Baja (1995) testifies to this fact when he observed that science and technology contribute significantly to such an extent that their strong influences are observable both at home and at work. The importance of science and technology has brought many government both past and present to put up policies to sought this purpose but it is one thing to put up policies and another thing to implement the policies appropriately with the right materials and human resources needed. Over the years various medium of communication have been used to enlighten the citizen of the need for science and technology programmes in our schools and the government have spent so much on these programmes that by now one would expect that Nigeria would also be one of the world's producers and manufacturers, instead of importing technology and asking foreigners to run the machines. As earlier mentioned this paper will look into some of the factors that have hindered the progress of science and technology in Nigeria. Some of these factors to be looked at include Human Resources such as academic and none academic staff. Facilities, such as instructional aids, classrooms, laboratories, etc. Science according to Mumah 1997 is the search for new knowledge to work to make new things in new ways, while technology can be defined as the scientific Engineering and managerial knowledge which make possible the conception, design, development production and distribution of goods and services, together science and technology improve the well being of the society. In as much as we talk about science and Technology without the necessary gadgets to implement the programs. It will amount to waste of money, time, effort. Many higher institutions of science and technology run various programs. Even in the university department of vocational and technical education is established to run programs of skill acquisition. The aim of these programs is actually to impact skill on individuals willing to acquire skills to be a better person to himself and the society. It is imperative to note that nations that are economically powerful and self reliant such as the United States of America and Japan have their success from the wisdom in investing heavily in vocational education. The fact remains however, that all these goals may not be accomplished if students in such schools are not properly trained. Creating a conducive environment for teaching and learning by providing the right quality and quantity of teachers, well equipped workshops and laboratories with up-to=date materials, provision of adequate tools, machines and equipment. All of the products of the science and technology schools are half baked because of the theoretical training given to them. They lack sufficient practical skills to enable them perform successfully in the world of work after graduation. There is a major concern for the products of science and technology. There is no gain saying that curriculum without adequate human and material resources back-up would fail to produce the required results. Thus it could be concluded that the situation of human and material resources available for the teaching and learning of science and technological programs has a direct relationship with the quality of graduates, consequently, the apparent shortfall in these essential resources manifest in the higher rates of failure.

STATEMENT OF THE PROBLEM

The goals of science and technology is to produce manpower to foster technological development. The use of knowledge and skills acquired in science and technology to provide national needs and solve personal, societal and other problems. These laudable goals would be very difficult to achieve without adequate human and materials resources for the teaching and learning of science and technology. The expectation of all stakeholders is that the recipients of this programme are to be job creators and not job seekers, contrary to this expectation employers employ graduates only to re-train them again because of the deficiency in their performance at work. It is suspected that this trend could be as a result of inadequate human and material resources in its right quality and quantity for the teaching and learning process of the science and technological programmes in the nations' higher institutions. This is the problem this study is seeking to sort out.

PURPOSE OF THE STUDY

The major purpose is to assess the availability and adequacy of human and materials resources in the teaching and learning of the science and technological programmes. Specifically the study is designed to:

1. Determine the availability of human resources in the teaching and learning of science and technology.

2. Determine the availability of material resources for the teaching and learning of science and technology
3. Ascertain the adequacy of available human and materials resources using the minimum standard requirement of the national curriculum for teaching and learning of science and technology as a yardstick.

RESEARCH QUESTIONS

This study should be able to answer the following questions at the end of it.

1. How adequate are available human resources for the teaching and learning of science and technology programmes?
2. How adequate are available material resources for the teaching and learning of science and technological programmes?
3. To what extent do available human and material resources in science and technological programmes meet the minimum standard requirement for the teaching and learning of these programmes?

HYPOTHESES

H_{01}: There is no significant difference in the mean response of science and technology teachers and their students concerning the adequacy of human resources for the teaching and learning of science and technology in the higher institutions in the South East of Nigeria.

H_{02}: There is no significant difference in the mean response of science and technology teachers and their students concerning the adequacy of material resources for the teaching and learning of science and technology in the higher institutions in the South East of Nigeria.

H03: There is no significant difference between the available human and material resources in the schools and the minimum standard required for the teaching and learning of science and technology

LITERATURE REVIEW

For any nation to develop technologically, the human and material resources must be harnessed. In the National Policy of Education (NPE 2004) emphasis was laid on Science and Technology Education which generally is meant to develop a nation like Nigeria economically, socially and politically. These objectives mentioned earlier are wonderful but to actualize them, there must be human and material resources available and adequate in the schools offering the Science and Technology Programs.

HUMAN RESOURCES IN TEACHING AND LEARNING

No educational system rises above the quality of her teachers anywhere in the world. Thus the growth and development of science and technology in any country of the world largely depend on the quality and adequacy of teachers in this area of profession. The bedrock of adequate foundation and training of needed manpower in a country irrespective of area of specialization is a function of the sound products from the teacher education in that country. This is why Gidado (1995) said that the major problems of teacher education in Nigeria is that the teachers that are being trained are not sufficiently prepared to meet the complex demand of the teaching profession in Nigerian schools. It is an educational truism that a teacher can only teach what he knows. Tanner and Tanner (1975) said that the success of a curriculum largely depend on teachers handling it. In science and technology education as opposed to liberal education, teachers preparation is more compounded because of the practical skills and competencies that must be imparted (Ulinfun 1990). This implies that teachers' quality is more critical in science and technology, unfortunately availability and adequacy of qualified teachers is disturbingly absent in our institutions unless those that trained abroad but when they come back home to teach, the necessary materials are not available not to talk of being adequate. In (1997) a survey report by the National Education Research Development (NERD) of the state of demand and supply of science and technology teachers Nationwide indicated that about 320,000 representing 78% of the total need were not available in 23 different subjects. A similar survey by (NERD 2004) in respect of polytechnics indicated a shortfall of 78%, this is in line with Agbenten (1985) who maintained that shortage of qualified teachers is a world-wide phenomena but more obvious in the developing countries where educational system are constantly expanding without sufficient sources of qualified teachers. Aina (2000) states that the quality and quantity of teachers in the schools have contributed immensely to the high failure rates being experienced in the programmes run by National Business and Technical Education Board (NABTEB) certificate examinations. In support of this statement, Udofort (1994) lamented that insufficient qualified sciences and technology teachers in schools have often resulted in the employment of unqualified people and this de-motivates the students through bad teaching.

In a study carried out by Edobor (2007) the discoveries were in line with Odusanya (1999) Aina (2000) NERD (2004) regarding Inadequacy of human and material resources in the teaching and learning of Vocational Courses in the South-Eastern Parts of Nigeria.

Quality science and technology education requires not only facts and information but also involves in changing people's attitude. To achieve quality science and technology education qualified science and vocational teachers must be employed. The practical experience will make them more efficient, competent and up to date in their various fields. Teachers require constant training exposure and interaction with professional experts through seminars symposia, workshop and conferences, this will help to improve their competencies and professionalism. It is one thing to acquire knowledge and skills and quite another thing to be able to impact such experiences to someone else, says Parke (1977). Andreyka (1976) stressed that the prime requisite for a successful implementation of educational programs is qualified teachers who are occupationally competent and skilled in the use of teaching methods. However, doubt remain as to whether the schools preparing science and technology teachers have the knowledge of what it takes to be a science and technology teacher. Do these institutions know the professional competencies involved? In other words, teachers should be trained in a competency-based setting because according to Bereday, (1979) in Oladebo (1987) the strength of an educational system must largely depend on the quality of its teachers. In realization of the importance of science and technology, the Federal government of Nigeria encouraged polytechnics and universities to establish department of vocational and technical education which is a part of science and technology. Also, a register of graduated but unemployed technical teachers was compiled with a view of engaging them (Abdulahi 1995). In addition, the Technical Teacher Training Program (TTTP) was launched with the aim to produce technical teachers both in quality and quantity, but in spite of these efforts technical teachers production has been inadequate (Abdulah 1995). The problem was not just how to produce them but how to retain them, Majasan (1995) noted that if teachers are trained and are not well catered for, the problem of inadequacy remain unsolved because very many of these teachers find their way to a more lucrative jobs in industries and commerce. In support of Biose (2002) stated that for the survival and development of science and technology something serious has to be done. It was also agreed that for a nation to grow it must have people who are well skilled in technology and in the right number. Fafunwa 1994) said that the quality of students produced in institutions is a direct reflection of the caliber of teachers.

MATERIAL RESOURCES IN TEACHING AND LEARNING

The major purpose of science and technology is to develop skilled manpower for self sustenance, reliance, community and national development. In other words, when an individual is skilled he is useful to himself and the society he belongs and this will extend to the larger society. The key word here is "skill". For the students to acquire the desired skills to be able to function effectively, the necessary gadgets needs to be supplied to the teachers to teach these students. The workshops in schools must be adequately stocked with functional tools and machines in the right number and quality. In addition to quality tools, competent teachers and workshop attendants' demand, also to cope with new inventions and developments in the world development and constant changes, in the world of work. There is the need to update training facilities as may be needed and at the same time make training environment and replica of the industry. The state of workshops in most schools is such that cannot permit the stimulation of an industry for any worthwhile training. There are no workshop in many schools, in schools where there are workshops tools and materials are not forthcoming. Lack of equipment and necessary facilities hinder progress of science and technology education (Nweke, 1989; Nwokolo 1993, while Ibeneme, 1994) is of the opinion that the discrepancy between school workshop facilities and the actual work facilities may adequately account for the amount of retraining given to Nigerian technical college graduates before they can effectively perform in the industries. Okoro (1993) indicated that the major purposes of vocational education is not to give certificate but to train skilled workers who can actually function well in their places of employment. The tools and machines actually make education in this area unique. Such equipment and tools and materials in the workshop provide the children with worthwhile experiences and skills because these equipment are the initial things that stimulate learning among them. Fajemirokan (1999) observed that instructional materials are either inadequate in quantity or are obsolete in quality and use. Odusanya (1999) with the same opinion feels that teaching of vocational and technical education was more of a theory oriented rather than a practical oriented one. His reasons for this was that he discovered that tools and equipment are not adequately supplied to go round the students in the practical class. There is lack of textbooks and writing materials in Nigerian schools. This was noted by the report of the study group of funding education 1984). This shortage is more severed in science and technology subjects where there are fewer indigenous authors, vis-à-vis the arts and humanities. This study also found out that the school environment is not conducive for learning. Towe (2000) also reports that there is no evidence of practical work in a course which suppose to introduce students to various science and technological programmes. Even the workshop and laboratories where available are bereaved of functional essential tools, equipment and materials consequently programmes that are suppose to be practical are implemented on chalkboard. To ensure optimum teaching

and learning under the best of conditions, Vocational and technical departments in our schools re expected to be adequately provided with requisite instructional facilities and equipment where the requisite teaching and learning tools are non-existed or inadequate effective instruction will not take place. In recognition of the importance of the availability of standard equipment for this programme. The Federal Ministry of Education science and technology (1985) and the National Board for Technical Education (NBTE (1985) prescribed the minimum standard requirements of equipment and facilities needed for the teaching and leaning of science and technology courses in the school. Teaching facilities and equipment help to stimulate interest. Ali (2000) states that "The economic advancement of any nation does not necessarily depend on its natural resources endowment but increasingly on the level of technological innovations capabilities. Nigeria is blessed with abundant local raw materials which has played major roles in industrial development of this nation but to be able to properly harness this raw materials without having to invite foreigners to our field needs the expertise of science and technologists. Ali asserts that this is only achievable through a sound and well-grounded science and technology graduates.

SUMMARY OF PROBLEMS

The most acute problems of science and technology is shortage of qualified teachers, most of the serving technology teachers do not have industrial experience. The few that are qualified leave the service for a greener pasture Abdullah (1995). The introductory technology equipment installed in various schools are not being used because there are no trained personnel to use them. The teachers do not know how to operate the imported equipment. Orana (1995) noted that technicians trained in the formal system in professional courses, are not fully able to carry out the role expected of them in the modern industrial organization due to the fact that their background and the course defined for their training produce technicians without manipulative skills and the had less contact with physical circumstances of industry than craftsmen that are supposed to take instruction from. This great impediment is viewed by Adekola (2000) to be as a result of the fact that graduates of B.Sc. degree in science subjects are being used for what they are not qualified to do. Another major constraint are the problems of "Weak institution" industrial linkage" and no adequate plan for attracting and retaining qualified science and technology teachers. This finding is consisted with Oranu (1995), Aina (1998), Ezeji (1999) and Sofolahan (1988). Views that shortage of staff and equipment of science and technology education in Nigeria. The consequence of lack of staff is at present undertaken by untrained staff who learn on the job. The result is poor quality and lower productivity. Towe (1998) observed that a major problem facing technical and vocational education institutions is the epileptic nature of power supply. The blue print and master plan (2001 – 2010) reports that one of the problems facing these institutions is how to deliver the practical content of the curriculum, taking cognizance of the fact that the SIWES programme introduced since 1980 has not been satisfactory. They also report that technical colleges and polytechnics suffer from gross infrastructural dilapidation, staff shortage and inadequacies in facilities, books and instructional equipment. Polytechnic enrolment is below that of the university in spite of the National Policy of Education prescribed ratio of 1:4:30 for engineers.

METHODOLOGY OF RESEARCH

This study used the survey research design to access the availability and adequacy of human and material resources for the teaching and learning of science and technology in the South-East of Nigeria. All the final year students of the higher institutions within the South East of Nigeria offering science and technology courses and their teachers were used. Simple stratified sampling using ballot technique was used to select schools and respondents, a total number of ninety teachers and four hundred students were administered the questionnaire Titled 'Availabililty and adequacy of the human and material resources for the teaching and learning of science and technology programmes (AAHMRTLSTP), only eighty teachers and three hundred and twenty students returned their questionnaires.

INSTRUMENTATION

The four points scale questionnaire of very adequate, adequate inadequate and very inadequate was used, it had four sections A, B, C, D. Section A was about biodata, section B was questions on Availability and Adequancy of human resources, section C was on availability and adequacy of material resources and section D was on human and material resources on ground as compared to the basic minimum standard requirement for a teaching and learning of science and technology programs.

VALIDITY

Experts in the field of science and technology were used to construct the questionnaire.

RELIABILITY

A pilot group of 50 students was chosen from the targeted population but not used for the study. A split-half test was used to obtain the alpha coefficient 0.78 for the instrument. This showed the reliability of the instrument.

DATA ANALYSIS

The mean statistics was used to analyze the three research questions while t-test distribution was used to analyze the two hypotheses at 0.05 level of significance. Values assigned to the four-point scale as follows: 4, 3, 2, 1 respectively. Any mean that is 2.50 and above was accepted as being adequate while any mean that is below 2.50 was rejected and regarded as inadequate.

RESULTS

RESEARCH QUESTION I:

How adequate are available human resources for the teaching and learning of science and technology programmes.

TABLE 1

Mean and Standard deviation ratings of teachers and students about the adequacy of human resources.

		Teachers			Students			
S/N	ITEMS	N1	X1	SD1	N2	X2	SD2	Decision
1	Teachers' academic qualification to teach the subject	80	3.07	0.97	320	2.66	1.33	Adequate
2	Teachers' relevant industrial experience	80	2.53	1.09	320	2.84	1.03	Adequate
3	Teachers' students ratio	80	2.85	1.00	320	2.71	1.16	Adequate
4	Teachers' methodology for effective learning	80	2.73	1.06	320	2.73	1.08	Adequate
5	Workshop support staff for students' population	80	2.40	1.22	320	2.54	1.21	Inadequate
6	Teachers' psychomotor skill of science and technology courses	80	2.70	1.11	320	3.20	2.30	Adequate
7	Workshop attendants/students ratio	80	2.33	1.14	320	2.63	1.16	Inadequate
8	In service Industrial Training exposure of teachers in science and technology courses	80	2.05	1.13	320	2.56	1.06	Inadequate
9	Teacher's machine handling techniques in science and technology courses	80	2.23	1.03	320	2.53	1.08	Inadequate
10	Accessibility of science and technology courses teacher to latest technologies	80	1.90	0.98	320	2.57	1.09	Inadequate
11	Science and technology courses and practical skills possessed by workshop attendants	80	2.25	1.17	320	2.54	1.13	Inadequate
12	Minimum academic teachers qualification	80	2.45	1.18	320	2.58	1.10	Inadequate
13	Science and technology Teachers participation in service professional development programmes	80	2.10	1.15	320	2.46	1.10	Inadequate
14	Utilization of teaching materials by teachers	80	2.13	1.09	320	2.31	1.08	Inadequate
15	Teachers workshop organizational ability	80	1.98	1.07	320	2.38	1.13	Inadequate

A summary of table 1 indicates that the respondents agreed on a total of 5 items as adequate human resources for the teaching and learning science and technology programs while they disagreed with 10 items and adjourned not adequate. However, the overall mean score of all the items in question 1 was 2.45, which is less than 2.50. It showed that human resources were not adequate for the teaching and learning of science and technology in the higher institutions in the South East of Nigeria.

RESEARCH QUESTION 2

How adequate are available material resources for the Teaching and learning of science and technology programs.

Table 2
Mean rating and standard deviation of Teachers and Students about the adequacy of material resources.

		Teachers			Students			
S/N	ITEMS	N1	X1	SD1	N2	X2	SD2	Decision
1	Workshop space for teaching science and technology courses	80	3.03	1.05	320	2.94	1.19	Adequate
2	Natural and artificial ventilation in the workshop	80	2.75	1.15	320	2.76	1.04	Adequate
3	Workshop safety provision for students and teachers	80	2.85	1.02	320	2.46	1.14	Adequate
4	Hand tools available for students learning	80	2.40	1.06	320	2.32	1.09	Adequate
5	Quality of hand tools	80	2.55	1.13	320	2.24	1.09	Inadequate
6	Academic and administrative staff offices	80	2.60	1.22	320	2.73	1.18	Adequate
7	Provision of classrooms	80	2.83	1.08	320	2.84	1.13	Inadequate
8	Cloakrooms for students use after workshop practice	80	2.83	0.95	320	2.23	1.06	Inadequate
9	Provision of infrastructural facilities	80	2.28	1.01	320	2.22	1.15	Inadequate
10	Installation of machine tools	80	2.10	1.06	320	2.20	1.03	Inadequate
11	Regular maintenance of infrastructure	80	2.00	0.98	320	2.20	1.02	Inadequate
12	Maintenance of machines and equipment	80	1.93	1.05	320	2.19	1.08	Inadequate
13	Supply of training materials	80	1.88	1.02	320	2.27	1.18	Inadequate
14	Library facilities in the school	80	2.28	1.18	320	2.36	1.17	Inadequate
15	Stocks of relevant tests and journals	80	1.95	1.18	320	2.10	1.04	Inadequate
16	Accessibility of students to library	80	2.03	1.04	320	2.64	1.17	Inadequate
17	Functionality of Machines	80	1.85	1.03	320	2.09	1.08	Inadequate
18	Provision of technological items for practical training	80	1.78	0.95	320	2.03	1.12	Inadequate
19	Availability of lifting equipment	80	1.73	0.90	320	1.93	0.99	Inadequate
20	Installation of Diagnostic machines and equipment	80	1.88	1.04	320	1.90	1.04	Inadequate

Electronic Laboratories Equipment available

The summary of table 2 indicates that the respondents agreed on total of 4 items as adequate material resources while 16 items were adjourned as inadequate. The total mean score of all the items in questions 2 was 2.15, which is less than 2.50 for the decision. It showed that material resources are not adequate for the teaching and learning of science and technology in the higher institutions in the South East of Nigeria.

RESEARCH QUESTION 3:

To what extent do available human and material Resources in science and technology in the higher institutions of South East Nigeria meet the curriculum of Federal Ministry of Education minimum standard requirements?

Table 3
Mean rating and standard deviation of teachers and Students opinion about the human and material resources on ground as compared to the minimum standard requirements of human and material resources.

		Teachers			Students			
S N	ITEMS	N1	X1	SD1	N2	X	SD	Decision
1	How adequate are Senior Teachers on GL 10 – 14	80	2.80	1.04	320	2.74	1.08	Adequate
2	Senior teaching staff on GL07 – 09	80	2.45	1 15	320	2.89	1.07	Inadequate
3	Junior non-teaching staff GL01 – 06	80	2.68	1.12	320	2.54	1 13	Adequate
4	Workshop space for practical work.	80	2.68	1.14	320	2.95	1.10	Adequate
5	Classrooms for teaching	80	2.78	1.17	320	3.09	0.99	Inadequate
6	Office accommodation for staff	80	2.20	0.88	320	2 18	1.10	Inadequate
7	Measuring tools/equipment available	80	2.70	1.14	320	2.98	1.03	Adequate
8	Measuring tools/equipment available	80	2.03	1.03	320	2.43	1.07	Inadequate
9	Cutting tools available	80	2.3	1.07	320	2.18	1.09	Inadequate
10	Stacking (forming) tools	80	2.23	1.17	320	2.13	1.13	Inadequate
11	Assembly tools	80	2.28	1.15	320	2.16	1.10	Inadequate
12	Screw cutting tools	80	2.10	0.96	320	2.23	1.12	Inadequate
13	Drilling machines	80	2.00	0.96	320	2.26	1.06	Inadequate
14	Testing machine tools	80	2.40	1.08	320	2.11	1.12	Inadequate
15	Testing instruments	80	2.15	1.05	320	2.06	1.04	Inadequate
16	Joining tools/equipment	80	2.25	1.01	320	2.19	1.04	Inadequate
17	Battery charging equipment	80	2.15	1.03	320	2.28	1.13	Inadequate
18	Wheel balancing equipment	80	2.05	0.98	320	2.25	1.22	Inadequate
19	Fire prevention equipment	80	2.13	1.11	320	2.03	1.08	Inadequate
20	Audio visuals	80	2.08	0.99	320	1.98	0.99	Inadequate

A summary of table 3 indicates that the respondents agreed on a total of 4 items as adequate and meeting the curriculum minimum standard requirements of human and material resources for the teaching and learning of science and technology. While 16 items were not adequate and did not meet the curricular minimum standard requirements. The total mean score of all the items in question 3 was 2.37, which is less than 2.5 for it to be adequate. It shows that the human and material resources available in the higher institutions did not meet the curriculum minimum standard requirements for the teaching and learning of science and technology.

Ho1: There is no significant difference in the mean response of science and technology teachers and their students concerning the adequacy of human resources for the teaching and learning of science and technology: in the higher institution in the South East Nigeria.

Table 4
't'-test for the different in the mean response of teachers and students on the adequacy of human resources.

S/N	N1	X1	SD1	N2	X2	SD2	Calculated t-value	Table value	Decision
1	80	3.07	0.97	320	2.66	1.33	1.86	1.960	Retained
2	80	2.53	1.09	320	2.84	1.03	-1.69	1.960	Retained
3	80	2.85	1.00	320	2.71	1.16	0.70	1.960	Retained
4	80	2.73	1.06	320	2.73	1.08	0.00	1.960	Retained
5	80	2.40	1 22	320	2.54	1.21	-0.65	1.960	Retained
6	80	2.70	1.11	320	3.20	2.30	-1.35	1.960	Retained
7	80	2.33	1 14	320	2.63	1.16	-1.50	1.960	Retained
8	80	2.05	1.13	320	2.56	1.06	-2.56	1.960	Retained
9	80	2.23	1.03	320	2.53	1.08	-1.57	1.960	Retained
10	80	1.90	0.98	320	2.57	1.09	-3.52	1.960	Retained
11	80	2.25	1.17	320	2.54	1.13	-1.45	1.960	Retained
12	80	2.45	1 18	320	2.58	1.10	-0.66	1.960	Retained
13	80	2.10	1.15	320	2.46	1.10	-0.58	1.960	Retained
14	80	2.13	1.09	320	2 31	1.08	-0 95	1.960	Retained
15	80	1.98	1 07	320	2 38	1.13	-2 00	1 960	Retained

P< 0.05

The result in table 4 shows that the calculated t-value for each item is less than 1.960 table values for the rejection of the null hypothesis. Therefore, the null hypothesis is retained. It is concluded that there is no significant difference in the mean response of technical teachers and their students concerning the adequacy of human recourses for the teaching and learning of science and technology in the higher institution in South Each Nigeria.

Ho2 There is no significant difference in the mean response of science and technology teachers and their students concerning the adequacy of material resources for the teaching and learning of science and technology, in the higher institution in the South East Nigeria.

Table 5

't'-test for the difference in the mean response of science and technology teachers and their students on the adequacy of material resources.

	Teachers			Students					
S/N	N1	X1	SD1	N2	X2	SD2	Calculated t-value	Table value	Decision
1	80	3.03	1.05	320	2.94	1.19	0.45	1.960	Retained
2	80	2.75	1.15	320	2.76	1.04	-0.05	1.960	Retained
3	80	2.85	1.02	320	2.46	1.14	1.99	1.960	Rejected
4	80	2.40	1.06	320	2.32	1.09	0.42	1.960	Retained
5	80	2.55	1.13	320	2.24	1.09	1.63	1.960	Retained
6	80	2.60	1.22	320	2.74	1.18	-0.72	1.960	Retained
7	80	2.83	1.08	320	2.84	1.13	-0.05	1.960	Retained
8	80	1.98	0.95	320	2.25	1.06	-1.39	1.960	Retained
9	80	2.28	1.01	320	2.22	1.15	0.30	1.960	Retained
10	80	2.10	1.06	320	2.20	1.03	-0.56	1.960	Retained
11	80	2.00	0.95	320	2.20	1.02	-1.11	1.960	Retained
12	80	1.93	1.05	320	2.19	1.08	-0.44	1.960	Retained
13	80	1.88	1.02	320	2.27	1.18	-1.95	1.960	Retained
14	80	2.28	1.18	320	2.36	1.17	-0.38	1.960	Retained
15	80	1.95	1.04	320	2.10	1.04	-0.83	1.960	Retained
16	80	2.03	1.14	320	2.64	1.17	-3.45	1.960	Retained
17	80	1.85	1.03	320	2.09	1.08	-1.26	1.960	Retained
18	80	1.78	0.95	320	2.03	1.12	-1.32	1.960	Retained
19	80	1.73	1.90	320	1.93	0.99	-0.90	1.960	Retained
20	80	1.88	1.04	320	1.90	1.04	-2.73	1.960	Retained

$P < 0.05$

The result in table 5 shows that the calculated t-value for item 3 is 1.99 which is more than the table value of 1.96 therefore the item is rejected. All other items had t-calculated value less than the table value, therefore their null hypothesis was retained. It is concluded that there is no significant difference between the mean response of science and technology teachers and their students concerning the adequacy of material resources available in the teaching and learning of science and technology programmes.

DISCUSSION

There is shortfalls in the supply of facilities and equipment in the laboratories and workshops, which are the backbone of technology education. Technology education under this condition cannot in the word of Booster and Helgeson (1990) create citizens who understand ways that will enable them participate intelligently in critical thinking, problem solving and decision making about how science and technology are useful to change the society. The study also revealed that the available human and material resources in the higher institutions do not meet the Federal Ministry of Education curriculum minimum standard requirements for the proper teaching and learning of science and technology. The lack of qualified teachers in this area is viewed by Adekola (2000) as one of the factors resulting in the use of B.Sc. degree holders in Science subjects to teach vocational trades. The inadequacy in the number of qualified teachers coupled with shortfall in material resources affect the practical skill acquisition required of the graduates of science and technology. This seems to have created a vicious cycle in the teaching of technical trades and other related subjects (Bajah, 1975), Tanner and Tanner (1975), said that success of a curriculum largely depend on the teacher handling it. The study also revealed that teachers and materials could not do the work without the help of supporting staff. These staff is involved in the day to day activities of the institutions such as arrangement of tools, materials, machines and equipment in the workshop as well as students' supervision during the practical session. On this issue, FME (1985) submitted that it is highly imperative for successful implementation of vocational trades in schools that there has to be adequate qualified trained teachers as well as supporting staff. Consequently, the apparent shortfall in these essential resource is manifested in the high failure rate of up to 70% recorded in the year 2000 National Technical Certificate (NTC) Examination particularly in the technology based trades Aina (2000). In view of the above opinion the quality and

quantity of material resources available in schools fall short of the minimum standard required for the training of competent technicians and technologist that are expected to move the country forward technologically.

RECOMMENDATIONS

Science and technology education seek to expose students to the culture of the world of work, which is practical oriented and based on the findings and the conclusion of this study, the researcher recommends that:

1. None governmental organization, well meaning individuals must come to the government aids in the supply of science and technology materials.
2. Government should engaged the services of competent, trained and science and technology teachers in the various higher institutions.
3. In-service training of the existing teachers and workshop attendants should be encouraged in other to bring them abreast with latest technologies in their various trades.
4. Government should stock the school libraries with modern books, journals on science and technology and computer services.
5. Material resources should be supplied in the right quantity and quality, consumable-training materials must be provided on a regular basis.
6. Secondary school students must be encouraged to enter the field of science and technology
7. The exiting tools, machines and equipment should be given regular maintenance.
8. Policy makers must ensure that science and technology education addresses the need for self-employed workers in the formal economy and must facilitate access for training of workers.

EDUCATIONAL IMPLICATION(S) OF THE STUDY

This study has been able to discover that:

1. Inadequate supply of qualified competent trained technical teachers hinder student's mastery of theory and practical skills.
2. Materials, tools and equipment are vital for the training of students on the skill acquisition for self-employment and inadequacy of them hinder the students progress of practical knowledge.
3. The shortfall of the FME minimum standard requirements means that the programme could not be accredited and the certificate obtained will not be recognized.
4. In order to minimize the rate of human wastage in the schools funds should be made available for proper implementation of science and technology in the higher institutions programmes of our educational system.

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