ASSESSMENT OF RESOURCES FOR SUSTAINABLE DEVELOPMENT IN ENGINEERING AND TECHNOLOGY EDUCATION IN BAUCHI STATE, NIGERIA

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Abstract
This paper explored the relationship between resource availability and utilization for sustainable development in doing so, three purposes were formulated that lead to formation of three hypotheses tested at 0.05 level of significance. A questionnaire was used for collecting data on the opinions of respondents containing 45 items was developed and used to obtain data from a sample of 129 respondents using stratified random sampling making a population of 65 students, 38 teachers and 26 administrative staffs in eight technical colleges of the state. A reliability test was conducted using cronbach alpha and the instrument yields an internal consistency of 0.87. A computer special package was used in analysing the data, one way ANOVA tests were run to determine if differences exist among the respondents perception. The findings revealed among other things that; Utilization of resources should be made as a compulsory task for the sustenance of youth development and human capacity building and Engineering and Technology educational program should empower people to contribute to environmentally sound sustainable development through occupational areas of their life for human capacity building.

Keywords: assessment, resources, availability & utilization, sustainable development, engineering & technology education

INTRODUCTION
We live in a technological world were people have always adapted resources to meet their needs, from such fundamental, far-reaching innovation and invention in the use of engineering as the development of the say wheel, to innumerable and equally significant uses of resources such as shaping bone to create a hook for fishing, or pressing wool fibres’ into felt, or applying heat to make foods more edible. However, Shehu (2013) was of the view that, technological practice affects our environment, our standard of living, and our quality of life. And therefore this could be used for a sustainable development and human capacity in Bauchi state. Bello (2004) states that, it is believed that students of today need different skills to be able to learn, work and adapt in our changing environment, and this will be possible if the resources are available, harnessed and fully utilized. This is because resources comprise of all the necessary materials such as teaching aids of various kinds, the structural facilities (e.g. classrooms, library, workshops etc), relevant text books as well as individuals within the college that can be used to achieve successful learning and sustain development as well as human capacity building.

Resources according to Ogbodo in Dodo, Ajiki and Abimiku (2010) are those human and materials that facilitate teaching and learning of vocational and technical education subjects in our schools. To them, these include; teachers, laboratories, workshops, teaching aids and devices such as modern educational hardware and software in form of magnetic tapes, films and transparencies. Ehiamelator in Dodo, et al (2010) sees material resources as operational inputs of every instructional programme. That is to say, they are inputs which aid the teacher to achieve some level of instructional efficiency and effectiveness. Also, Federal Ministry of Education (F. M. O. E), Abuja, (2000) sees school material resources to include classrooms, libraries, laboratories, workshops, school buildings, playfields, school farms, garden, electrical fixtures, the school environment, toilet facilities and portable water while human resources to include among others teachers, workshop attendance as well as the school administrators. Likewise, Offorma (2005) sees instructional materials (material resources) as any material that facilitates teaching and learning activities and consequently the attainment of the lesson objectives. The relevance of instructional materials cannot be over emphasised in our technical colleges. Anything a teacher used to achieve instructional objectives is called instructional materials. By implication the availability of the resource make meaningful conclusion in the teaching and learning and hence sustain development and human capacity.

An assessment and identification of the workers needs is to be done in order to enhance and develop their inherent capabilities. This is done by the development of a high performance work system, availability and utilization of resources. According to Philbin, (2007) development is seen as ‘any learning activity which is directed towards future needs rather than present needs, and which is concerned more with career growth than immediate performance’. In this context the term sustainable
development from Wikipedia, “is an organizing principle for human life on finite planet. It posits a desirable future state for human societies in which living conditions and resources were used to meet human needs without undermining the sustainability of natural systems and the environment, so that future generation may also have their needs met. In tune with the above the researchers are of the view that, with resources in available and well utilized it can directly help students develop a broad range of knowledge, skills, attitudes and values that clearly contribute to the graduate’s employability which will be sustained for their entire life career. The United Nation Scientific and Cultural Organisation (UNESCO) and International Labour Organization (ILO), 2002 sees sustainable development as a systematic approach to growth and development and to manage natural, produce and social welfare of their own and future generations. According to Olaitan, Nwachukwu, Onyemachi, Igbo and Ekong (1999), effectiveness is an indication of the impact of a group of activities performed on the achievement of intended learning outcome. Likewise, Aronu (2004) makes an assertion that, specifically, effective teaching for human development is contingent on many factors, but unless a teacher is able to organize instructional materials into worthwhile educational experiences, may lose their potentials. Coker and Coker (1982) are of the view that, effective teaching and human development requires that students be offered the best possible chance to learn, regardless of the nature of their individual preferences. Coker and Coker further more states that, through extensive research, have identified certain key competencies, which they have determined to be prerequisites to effective teaching, development and capacity building at any level and the key to that are resources.

Many researchers like Emetarom (2003), Olulube (2006) and Kola (2007) have revealed that resources are potent tools which could be used to effectively communicate teaching concept of engineering and technology/technical subjects in most public schools in Nigeria. But it is found that in Bauchi state the resources are of concern as its availability and utilization will lead to a sustainable human development or not and therefore this motivates the researchers to look into relevance of resources for the development of youth in the state for their sustainability in life long career. Also the study was set in finding out what is actually obtained in Bauchi state technical colleges in order to make adjustment on the realization of objectives of technology education in the state so that where the resources could not meet the demand for sustainable development will be urged to made via availability and utilization of resources.

**PURPOSE OF THE STUDY**

The main purpose of this study is to assess the relationship of resources’ availability and utilization level for sustainable development of youth in the technical colleges of Bauchi State. The study intends to specifically determine:

- The relationship between the mean responses of administrators, students and teachers on the extent of availability of infrastructural resources for sustainable.
- The relationship between the mean responses of administrators, students and teachers on the availability of material (instructional) resources for sustainable development.
- The differences between the mean response of technical college administrators and teachers in Bauchi state on the utilization of material resources for sustainable development.

**HYPOTHESES**

For this research work the following hypotheses were stated and tested at a 0.05 level of significance:

**HO**<sub>1</sub>. There is no significant difference between the mean responses of administrators, students and teachers on the extent of availability of infrastructural resources for sustainable development.

**HO**<sub>2</sub>. There is no significant difference between the mean response of administrators, students and teachers on the availability of material (instructional) resources for sustainable development.

**HO**<sub>3</sub>. There is no significant different between the mean response of technical college administrators, students and teachers in Bauchi state on the utilization of material resources for sustainable development.

**SIGNIFICANCE OF THE STUDY/ LIMITATION**

The finding of this study provides statistical data which are useful to Bauchi state Ministry of Education towards improving infrastructural and material resources. The improved resources will benefit both staff and students toward effective teaching and learning of engineering and technology education. This study will be of use to students so as to build a state of resource utilization for their development in practical skills as well as retaining the learned aspect for their self development Technical college administrators would benefit from the finding on utilization of resource by bringing necessary changes towards school workshops for improvement in the teaching and learning process in technical colleges and this will result to effective practical conduct in the technical colleges for the development of the students. However, the study was limited to technical colleges in Bauchi state owned by the state government for sorting the opinion on the use of resources for developing youth in the state.

**CONCEPT OF TECHNOLOGY**

Technology is a creative, purposeful activity aimed at meeting needs and opportunities through the development of products, systems, or environments in which knowledge, skills and resources are combined to help solve practical problems, Nwoji, (2002). He further more stress that, technological practices take place within and are influence by social contexts which is seen as a scientific knowledge used in practical ways in engineering and industry or technology education in either designing new machine or maintaining standard. Technology according to Ngoka, (2001) is a universal
and age long human activity. We use technology in the workplace, at home, and in our sporting and leisure activities. Technology plays an increasingly important part in our health care, choices of food, transport, and the very functioning of our society. To his view, the technologies used today have built on the ingenuity, traditions, observation, and knowledge of people who, throughout history, have sought to improve their lives, solve problems, and satisfy their needs and wants. Likewise, technology makes use of knowledge developed in many other disciplines and, in turn, these draw on technological innovations and ideas for the development of youth.

This process of continuous incremental development and testing is essential for people to meet challenges and fulfill their expectations and sustained development. Nwafor, (2007) is of the view that, technology helps people make new connections and leaps of discovery both to create new ideas, products, and services, and to improve the quality and effectiveness of existing systems and products. Nigeria today find employment as engineers, technicians and technologists in many fields, including aviation, interior design, food, conservation, engineering, clothing, biotechnology, and city planning. In these jobs, they create products, environments, structures, and systems to enhance the quality of life in response to needs and opportunities both locally and overseas. Nwafor maintained that, men and women working in technological careers add value to traditional products and services and create new ones to improve people's quality of life, and help Nigerian’s continuing development as a successful nation. Nigeria today is rich in energy resources and primary products which can be processed into higher value products, through ideas and technologies yet to be developed. The inclusion of technology as an essential learning area in the Nigerian education curriculum provides exciting opportunities for all students to develop and extend their ideas and to explore creative solutions to practical problems. Technology is challenging and rewarding, and open to everyone for sustainable development.

METHODOLOGY
The design for this study is a descriptive survey. According to Saran (2000), the design is the one which a group of people or items considered to be representative of the entire group. The study involved the use of a structured questionnaire to elicit information from students, teachers and administrative staffs in technical colleges of Bauchi state. Results and recommendations were arrived at through a systematic description of data collected by the use of a structured questionnaire.

The geographical area of the study is Bauchi states’ technical college which are located between latitude 9°30’N and longitudes 8° 45’E of the Greenwich Meridian. The state lies within the Northeast region of Nigeria and occupies a total land area of about 35,267 with a total of 20 Local Government Areas. There are eight (8) government own Technical Colleges located in various towns and cities across the State.

Data were collected by the researchers with the help of research assistant from the population of 129 respondents using questionnaire. The questionnaire items were subjected to both content and face validation by two (2) experts in the department of Vocational Technical Education ATBU Bauchi. Reliability test using Cronbach alphas indicate the internal consistency of the item at 0.87. The responses were analysed using one way analysis of variance (ANOVA).

One way analysis of variance (ANOVA) was used to compare the total responses of teachers, students and administrative staff and test the null hypotheses at 0.05 level of significance. However, the decision was based that, if the calculated P value of the hypotheses is higher than the F critical at 0.05 level of significance, the null hypotheses were rejected. However, if the calculated P value is less than the F critical value, the null hypotheses were accepted.

RESULT PRESENTATION/TESTING
The results of data analysis for this study are presented in which one way analysis of variance (ANOVA) was used to test the hypotheses for this investigation. The findings and discussions of the findings were also interpreted in the tables below:

**HO1.** There is no significant difference between the mean responses of administrators, students and teachers on the extent of availability of infrastructural resources for sustainable development.

<table>
<thead>
<tr>
<th>Source</th>
<th>Df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
<th>Significance</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>5</td>
<td>3.739</td>
<td>1.246</td>
<td>7.37</td>
<td>0.000</td>
<td>Not signif</td>
<td>Accept HO1</td>
</tr>
<tr>
<td>Error</td>
<td>124</td>
<td>20.965</td>
<td>0.169</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>129</td>
<td>24.704</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From table 1, it is evidence that the total responses of teachers on availability of infrastructural resources, the calculated P value is less than the F - critical value at 0.05 level of significance, therefore, the null hypothesis is accepted. This shows that, there is no significant difference between the mean responses of teachers and administrators on the extent of availability of infrastructural resources for sustainable development and human capacity in Bauchi state.

**HO2.** There is no significant difference between the mean response of students, administrators and teachers on the availability of material (instructional) resources for sustainable development.
between the responses of administrators with that of teachers from Bauchi and Gombe on the availability of infrastructural resources for sustainable development and human capacity in the states’ owned technical colleges. Therefore the respondents showed similar perception regarding the extent of availability of infrastructural resources in the technical colleges of the state.

\[ \text{HO}_3 \]: There is no significant difference between the mean response of technical college students, administrators and teachers in Bauchi state on the utilization of material resources for sustainable development.

Table 2: Analysis of variance on the mean responses of students, administrators and teachers on the availability of material (instructional) resources

<table>
<thead>
<tr>
<th>Source</th>
<th>Df</th>
<th>SS</th>
<th>Ms</th>
<th>F</th>
<th>P</th>
<th>Significance</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>4</td>
<td>0.855</td>
<td>0.214</td>
<td>0.69</td>
<td>0.562</td>
<td>Not Signif</td>
<td>Accept HO1</td>
</tr>
<tr>
<td>Error</td>
<td>125</td>
<td>51.885</td>
<td>0.415</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>129</td>
<td>52.740</td>
<td></td>
<td></td>
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</tbody>
</table>

From table 2, the null hypotheses is accepted because the calculated P value of the total responses of teachers on material resource and that of administrators are less than the F- critical. The hypothesis is therefore accepted meaning that, there is no significance difference between the mean responses of teachers and administrative staff of Bauchi state technical colleges on the availability of material resources for sustainable development and human capacity in the states’ owned technical colleges.

FINDING OF THE STUDY

The three hypotheses tested indicate that, There is no significance difference between the teachers, students and administrative staffs of Bauchi state mean responses on the availability of infrastructural resources, material resources and level of utilization of material resources.

DISCUSSION OF THE FINDINGS

Data in table 1 of hypothesis one indicate the mean response of teachers and administrative staff on extent of availability of infrastructural resources. Since the calculated P value is less than the F - critical at 0.05 level of significance, the null hypothesis is accepted. This shows that, there is no significant difference between the mean responses teachers and administrative staff on the extent of availability of infrastructural resources for sustainable development. This is not supporting the findings of Ehiametalor (2001) “school facilities are the material resources considered as the operational inputs, which enable a teacher to achieve some level of instructional efficiency and effectiveness. Therefore sustainable development and capacity building in Bauchi state will be possible if there are availability, adequacy and utilization of resources in the technical colleges. The findings revealed that most of the resources both human and materials are to be revisited by the state government to enable the attainment of objectives of technical colleges education in the state. This is in line with United States Department of Education (2009) reports that school buildings that can adequately provide a learning environment and essential development for students’ success. Also, Adeogun (1999) affirmed that there is a direct bearing between a range of resources (human and material) and learning outcomes. Adequate and qualitative material resources are required for an effective learning and teaching to take place there by sustain students’ efficiency and effectiveness. Therefore sustainable development and capacity building in Bauchi state will be possible if there are availability, adequacy and utilization of resources in the technical colleges.

CONCLUSION

It is pertinent to note that, institutional training should aim to equip students with useful skills to improve their knowledge and capabilities in their chosen fields as this will help in sustainable development and human capacity.
in Bauchi state. As stipulated by the National Policy on Education (FRN, 2004). The realization of the objectives of engineering and technology education programmes and their ability to improve student achievement depends on a number of factors that rest on availability, adequacy and utilization of resources materials which will in turn help in production of human development and capacity building. From the finding of this study, it is clear and evident that in Bauchi state engineering and technology education is totally in shambles as inadequacies are the order of the day with material resources as well as the utilization of material resources. Therefore, sustainable development in Bauchi state for human capacity building could be achieved based on the following recommendations:

1. Material resources for engineering and technology education should be made available in all the states’ owned technical colleges for sustainable development of youth via effective teaching and learning for human capacity building.

2. Utilization of resources should be made as a compulsory task for the sustenance of youth development and human capacity building.

3. Engineering and Technological education program should lead to an understanding of the scientific and technological aspects of contemporary civilization in such a way that people comprehend their environment and are capable of acting upon it while taking a critical view of the social, political and environmental implications of scientific and technological changes for the sustainable development.

4. Engineering and Technology educational program should empower people to contribute to environmentally sound sustainable development through occupational areas of their life for human capacity building.

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