

## **Technical Education Research: a Practical Tool for Self Reliance and Sustainable Development of the Third World**

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### **Abstract**

**N**o nation can develop beyond her research capability. A lot of hindrances oppose technical education research in third world countries, Nigeria, inclusive. These identified problems are: inadequate supply of suitable research personnel, poor funding, poor attitude to research, inadequate research facilities, and poor means of coordinating and disseminating research findings, enormous work load of academic and technical staff preventing them from publishing. These are the major problems that prompted this paper. The paper advocates that technical education research should be productivity oriented and for effective teaching. It suggests that applied research should be adopted in our tertiary institution because it is aimed at solving a particular problem of national needs or at adapting existing technologies to suite our local conditions. It is recommended among others that: (1) sufficient funds should be made available for research and adaptive technology (2) Research and teaching facilities should be adequately furnished to meet the demands of effective research and fabrication.

**Keywords:** *Self-reliance, Indigenous technology, Research, Generalization, Craftman, Innovation, Applied research, Basic research*

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### **Background to the Study**

Our standard of living today is far better than what it was 50 years ago, owing to advances in human knowledge made possible through the application of scientific research findings. Nations that accorded research activity the necessary priority it deserves are today receiving the fruits of their foresight. Examples of such nations are: USA, Germany, Japan, USSR, and China to mention but a few. On the other hand, nations that failed to accord research, the desired priority are the ones classified as the 'underdeveloped', the 'developing' or the 'third world' nations. They are still battling with problems of food, shelter, political and economic instability. Typical examples of such nations are Nigeria, Ghana,, Togo, Sierra Leone, Republic of Benin, Cameroon etc. In the developing countries, such as Nigeria, research has not progressed far beyond what might be described as the foundation level (Nworgu, 1991). This is due to constraints such as poor funding, poor attitude to research, inadequate research facilities, and poor means of coordinating and disseminating research findings.

### **What is Research?**

There are numerous definitions of research. Gay (1992) perceives research as a careful and purposeful investigation with a view to discover new fact and information about an entirely unknown phenomenon or discover new ways and techniques of going about or improving the existing practice. Adeyeri (1989) defined research as the systematic or objective analysis and recording of controlled observations that may lead to development of generalizations, principles, or theories resulting in the production and possibly ultimate control of events. It is a continuous search process to examine ideas and test their validity, facts to improve their accuracy, hypothesis, to determine their merits and generalization, to verify their application to noval situation and their reliability for repeated use, Eyibe (1990s) has observed that research is the bedrock of teaching effectiveness in the higher education. Research is an instrument of advancement in a developing country. Eyibe and others (1988) have 'observed that one of the major causes of brain drain in developing countries is the absence of adequate research facilities available to researchers in tertiary education'. In spite of these inadequacies we must forge ahead in our research activity. Again, research is not an activity designed to satisfy the individual researcher's curiosity; it is in fact, an engine of progress. This is because research can lead to new discoveries in raw materials, in disease prevention, solar options for rural dwellers in language reform, in population control measures, in new formulae, in longevity techniques or in better methods of teaching. Research is an inevitable tool for indigenou technology development. A lecturer in higher education cannot come up with any innovations or develop new ideas in a particular subject area, or identify particular academic and social problems and work out some strategies for their solutions without doing, research or prior investigations. Indeed, there is a lot to be discovered settled or ascertained about the sourceand nature of our peculiar problems in a technological age aimed at improvement of the quality of life of our people.

### **Concepts of Technical Education Research**

Research in technical education requires space in the form of buildings, equipments, libraries, and research oriented teachers. the inadequate supply of suitable research personnel has stood on the way of our research efforts in many collages. According to (Eyibe, 1990:b), such

teachers must give leadership in creativity, in design, in research and in product. The main characteristics of research-oriented teachers are accuracy of observation, quality of imagination, creativity, objectivity, versatility, teaching effectiveness, and patience. Eyibe (1990:a) also observed that many competent and research-oriented teachers are occupied with many responsibilities in their various schools to the extent that their research output suffer a decline. The basic element of an effective research is to use the knowledge acquired from research to the solution from the practical problems of our developing society. In the same vein, research in the technical education is also justified if it helps the teacher to teach more effectively and to acquire higher degrees (Adeyeri, 1989; Eyibe, 1990s). this paper, therefore consider the place of research in technical education in the tertiary institutions (Colleges of education, technical; polytechnics and universities). Technical education (FRN, 2004) is referred to as 'the study of technology and related sciences and the acquisition of practical skills, attitudes understanding and knowledge relating to occupations in various sectors of economic and social life' research is one major function which technical teachers in the tertiary institutions must carry out in order to improve the quality of technological education and scholarship in the third world and to make teaching and learning more problem-solving.

#### **Need for Research in Technical Education**

The essence of research in technical education should be to answer some basic questions of the society and industry. It is, indeed, through the commercialization and relevant application of research results that indigenous technology activity would directly influence national development (Mahea, 1970, Jacob, 1987, Eyibe, 1989). It should be recognized that the structure of the world of work undergoes constant changes. It would be disadvantageous for a developing country like Nigeria in train persons for jobs that would not exists or would soon become obsolete in skill or even a job that they cannot use. Therefore, there is need for extensive research in technical education order to monitor occupational trends. The standard of performance of technician according to (Okorie, 2001) is at the moment every low and there is no doubt that this retards any meaningful contributions to the overall productivity of the Nigerian economy. Hence, technical education research will need to be conducted regarding the poor performance of the technical cadre with a view enhancing productivity in all sectors of our economy. Specifically, efforts should be made to determine the appropriate role of research, evaluating, and experimentation in shaping the direction of technical education and in structuring its curricula, organization, and administration.

#### **Scope and Direction of Research in Technical Education**

If we apply the very broad definition research, the following technological practitioners should be engaged in one form of research or the other (Suleman, 1990)

1. Indigenous craftsman
2. Wayside mechanics
3. Craft school teachers
4. Technical college teachers
5. Teachers in colleges of education (Technical)
6. Teachers in research institutions and centres

Research in technical education should be problem-targeted, productivity-oriented, publication-inclined, and selectively funded in recognition of problems that we have on hand. Because of the scarce resources, which characterizes many developing countries of Africa, it is recommended that teachers in tertiary institutions of learning should focus their research on problems aimed at the solution to the fundamental questions of need. There are many problems to be solved through research endeavour, the aim of which should be to lift our people from the shackles of ignorance, diseases, poverty, and want. One basic question, which comes to the mind is: can the developing countries afford to commit huge scarce resource that could be tread to provide basic amenities such as food, shelter, clothing, infrastructure, modernization, etc, to research for the sake of research? This is why research in technical teacher education at this level of our national development must be problem targeted. Such a research should be focused on a particular problem of need, the result of which should contribute to national growth and development. The emphasis on other approaches to research should be limited in scope so that we can channel our ever dwelling scare resource to the provision of basic amenities and infrastructure and to fight the problems associated with poverty and low standard of living which characterize the developing countries of the world to which Nigeria belong. Therefore, technical education calls for men and women, who can employ a wide range of academic and professional skills to informs, motive, challenge, trained and stimulate the presence and future technological practitioner. Such teachers should help their students develop positive attitudes, which encompass working with others as well as working on one's own. We need to promote in them enterprise, technical ability, intellectual curiosity, innovation, productivity, applied research and constructive questioning alongside a facility for team work and co-operation. To be able to do this, the technical teacher must be well trained and research-oriented. (Modibbo, 1989, Ivowi, 1990, Eyibe, 1990:b)

### **Types of Research in Technical Education**

There are two types of research commonly carried out today. They include; basic research and applied research. Basic research refers to the 'work done by scientists and others who pursued their investigations without conscious goals apart from the desire to unravel the secrets of nature'. Basic research is directed towards the investigation newly discovered frontiers of technology that could tackle the problems of a particular industry. Applied research is concerned with production of knowledge for practical use to human beings; it however, uses the findings of basic research to solve a particular problem of need development. This connotes that applied research is the improvement of product by tasking concept in a real problem solution. The desire of the applied research is to create something new and useful to mankind. Needless to say that technical teacher should direct the attention to applied research as a way to fulfill their teaching effectiveness. But research in technical education should not be done at the detriment of teaching. Research in technical education should be industry-oriented and development-oriented (Eyibe, 1992). Jubril (1989) has observed that "research awareness is imperative". This can be buttressed by the establishment of sugar Company based at Numar, which was aimed at fabricating vital machine components (Modibbo, 1989) for use by the company, the institution and the general public. Indeed, applied research in technical education should be directed towards improving our technological base in order to develop our agricultural, industrial, and economic sectors.

However, research in the college of technical teacher education should involve action research Cohenih and Manion (1980) defined action research “as a situational research which is concerned with diagnosing a problem in a specific context and attempting to solve it in that context. Action research is collaborative because of teams of researchers and practitioners work together on a project in the workshop, laboratory, or classroom. The participating team members take part directly in doing the research and it is self-evaluative since modifications are continuously evaluated within the existing situations.

Therefore, the main feature of action research is basically an on-the-spot procedures designed to deal with an identified problem located in an immediate environment. We can employ action research in the following areas of work; teaching methods, learning strategies, development of teachers, especially technical teachers management and control of techniques, of behaviour as well as technology adaptation in our tertiary institutions because of the changing situations in which we have found ourselves' in this level of education. Besides, there are several others underlying factors, which demand that technical teachers or staff in higher education should direct their attention to research, and adaptation of techniques in fabrication and production for nation's building. Firstly, dedication to research effort should not only be seen as a fulfillment of the condition for promotions but also as a way of advancing knowledge as part of our call to duty. Secondly, research provides solution to the ever-increasing challenges posed by the current economic situation in the country. Indeed, the solution to such challenges could lead to the building of a self-reliant nation. Research in technical teachers education is justified if it helps the teachers to teach more effectively, if it improves the standard of production, or fabrication, if it enhances our maintenance ability or culture, it helps to produce the much needed technological literature and if it aids adaptation of the existing technologies to local use Eyibe (1992) defined fabrication or adaptation as an innovation or recreation of existing models or components to suit our local conditions and needs. A case in point of fabrication is seen in the department of technical teacher's education, Federal, Mubi where the institution developed ink between Savannah sugar company based at Numar and its aims at fabricating vital machine component (Modibbo 1989) for use by the company, the institution and the general public. indeed, applied research in technical education should be directed towards improving our technological base.

### **Technical Education Research and National Development**

Technical education research is an effective means of bringing about national development in the following areas: Acceleration of the rate of Economic Development. As a result of research in technical education, innovations in manufacturing process, creativity in design and production of goods are established. Similarly, more industries are established. Since the establishment of industries usually results in the transformation of a traditional society, by inculcating new values and introducing new habits, it may play a significant role in the process of development (Odu, 1995), thus, manufacturing which is the brain child of research finding has been the fastest growing sector of trade for the developing countries known as the Third World. Furthermore, the development of domestics manufacturing industry will reduce the amount of foreign exchange needed to finance the importation of manufactured goods and may well reduce the likelihood of balance of payment problems which are inimical to sustained economic growth.

### **Increase in Per Capita Income**

Research in technical education is often heralded with increase in the production of goods in the industries, this trend prepares technical education teachers and graduates of technical education for self-employment of self-reliance. Because every body is involved in independent production of goods, there will be a rise in per capita income of the citizenry of the developing countries (Third world) of which Nigeria is one. This advancement in technology is as a result of research findings, which leads to increase in the country's foreign exchange. There will be a rise in the standard of living of the people. This rise in the standard living of the society will be particularly welcomed by the third world countries. Nigeria inclusive (Maddison, 1971).

### **National Prestige**

Research in technical education brings extra-economic benefits like national prestige and self-sufficiency in certain critical products like arms.

### **Criteria for Selecting Articles for Academic Journals of Technical Education**

The major objective of technical education journal should be to provide a forum for technical education researchers, teachers and students to share their views on the broad field of vocational technical education and the related disciplines, Ross (1972) has described a journal as a medium by which problems may be discussed, objectives defined, ideas shared and strategies compared. This definition is not very satisfactory. Traditionally, a journal is defined as a print medium through which research works, informed comments and opinions of high scholastic quality may be published not only for the benefit of learners and all those seeking new information, but also for policy and decision-making (Dosunmu, 1989). Therefore, every article submitted to such a journal for publication must be presented to a knowledgeable reader or assessor in the field for comments. Such an assessor should be guided in his work of assessment by using some criterion outlined below. It is important that all accepted papers should further be referred to the editorial Board of the particular journal for final decision on the publication or otherwise each article should be selected based on the following criteria:

1. Original contribution relevant to vocational technical education
2. Evidence of scholarship
3. Content of subject – matter
4. Soundness in treatment
5. Clarity in presentation
6. Reference according to recent APA
7. Clear research methods for empirical research
8. Through documentation
9. Result and discussion (for empirical research)
10. Conclusions and recommendations

Finally, an academic paper should investigate a problem situation, offer solutions to such problems and crusade ideas within the articles to qualify for selection

## **Conclusion**

Research and teaching are the primary functions of various departments of our tertiary institutions. For these functions to be performed effectively, human and material resources should be put in place to make up a good atmosphere for the teaching and research. Research in technical teacher education should be productive and responsive to the needs of technology education and the economy. Again, we must discard the belief that research is expensive and accompanied with uncertain results because a well-conceived research hardly ends up in total failure. Important also is the criteria for selecting articles for academic journals of technical education.

## **Recommendations**

The following recommendations are made to move research in technical education forward.

1. Sufficient funds should be made available specifically for research and adaptive technology
2. Research and teaching facilities such as laboratories, workshop, libraries and studio should be adequately furnished to meet the demands of effective research and fabrication.
3. All serviceable and unserviceable machines and equipment that can be used for research and technology adaptation should be put into use and new ones bought if there is fund.
4. Staff development in technical teacher education should be extended to the doctorate level to enhance research capability of the academic staff
5. The workload of academic and technical staff should be reviewed to make room for efficient research work in technology adaptation
6. Definite schedules for seminars and progress reports on research activities, given on school basis, should be worked out to minimize the effects of personal satisfaction or idleness.
7. There should be a standing research committee (SRC) charged with the responsibility for the internal management and co-ordination of research activities in all tertiary institutions with particular emphasis on the judicious allocation and monitoring of research grants.
8. Academic staff who to publish standard textbooks with indigenous flavour for our technical education should be helped to fund the project for national good.
9. Equally important is the need for technical teachers in tertiary institutions to focus their attention on applied and adaptive research, the aim of which is to solve the fundamental problems of need, which abound everywhere in the third world countries including Nigeria

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