

# Technical Education Research: A Practical tool for Self Reliance and Sustainable Development of the Third World

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## ABSTRACT

No 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 an inadequate supply of suitable research personnel, poor funding, poor attitude to research, inadequate research facilities, and poor means of coordinating and disseminating research findings, the enormous teaching workload of academic and technical staff preventing them from research. 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 institutions because it is aimed at solving a particular national need or at adapting existing technologies to suit 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 provided to meet the demands of effective research and fabrication.

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

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## INTRODUCTION

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, United Kingdom, France 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 in Africa are Nigeria, Ghana, Togo, Sierra Leone, Republic of Benin, Cameroon, etc. In the developing countries, such as Nigeria, research

has not progressed 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. Research is a condition precedent for an improved standard of living, employment opportunities and advancement in all areas of human endeavours.

## WHAT IS RESEARCH?

There are numerous definitions of research. Gay, (1992) perceives research as a careful and a purposeful investigation to discover new facts 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 the 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 the novel situation and their reliability for repeated use. Eyibe, (1990a) has observed that research is the bedrock of teaching effectiveness in higher education. Research is an instrument of advancement in a developing country. It has been observed that one of the major causes of brain drain in developing countries is inadequate funding and research facilities (Eyibe et al., 1988; Olajire, 2017). 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 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 indigenous 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 source and nature of our peculiar problems in a technological age aimed at the 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, equipment, libraries, and research-oriented teachers. The inadequate supply of suitable research personnel has stood in the way of our research efforts in many institutions. According to (Eyibe, 1990b), such teachers must give leadership in creativity, in design, in research, and in the product. The main characteristics of research-oriented teachers are the accuracy of observation, a quality of imagination, creativity, objectivity, versatility, teaching effectiveness, and patience. Eyibe (1990a) 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 suffers a decline. The basic elements of effective research are to use the

knowledge acquired from research and provide practical solutions to the 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, 1990a). This paper, therefore, considers the place of research in technical education in the tertiary institutions (Colleges of education, polytechnics, and universities). Technical education (Federal Republic of Nigeria, 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 technical 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 (Machea, 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 to train persons for jobs that do not exist or would soon become obsolete or even a skill that they cannot use. Therefore, there is a need for extensive research in technical education to monitor occupational trends. In the 21<sup>st</sup> Century, women and children are still found in Nigeria breaking rocks into pebbles manually to sell and eke a living. This is because our technology and engineering faculties have failed to innovate. The standard of performance of technicians is at the moment very low, and there is no doubt that these retards any meaningful contributions to the overall productivity of the Nigerian economy (Okorie, 2001; Okoye and Arimonu, 2016). Hence, technical education research will need to be conducted regarding the poor performance of the technical cadre to enhancing productivity in all sectors of our economy. Specifically, efforts should be made to determine the appropriate role of research, evaluation, 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 of research, the

following technological practitioners should be engaged in one form of research or the other (Suleman, 1990).

- (a) Indigenous craftsmen
- (b) Wayside mechanics
- (c) Craft school teachers
- (d) Technical college teachers
- (e) Teachers in Colleges of Education (Technical)
- (f) Teachers in research institutions and centres

Research in technical education should be problem-targeted, productivity-oriented, publication-inclined, and selectively funded in recognition of the problems that we have on hand. Because of the scarce resources, which characterize 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 mind, is: can the developing countries afford to commit huge scarce resource that could be used 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 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 scarce resource for 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 inform, motivate, challenge, train and stimulate the present 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 teamwork and co-operation. To be able to do this, the technical teacher must be well trained and research-oriented. (Modibbo, 1989, Iwovi, 1990; Eyibe, 1990b).

### **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 pursue their investigations without conscious goals apart from the desire to unravel the secrets of nature'. Basic research is directed towards the investigation of newly discovered frontiers of technology that could tackle the problems of a particular industry. Applied research is concerned with the production of knowledge for practical use to human beings; it however, uses the findings of basic research to solve a particular problem or need in 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 education teachers, should direct their 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 technical teacher education should involve action research. Cohen and Manion, (1989) 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 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 procedure 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-building. Firstly, dedication to research effort should not only be seen as a fulfillment of the condition for

promotion by lecturers, 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 Polytechnic, Mubi where the institution developed a link 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 the 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 brainchild of research finding has been the fastest growing sector of trade for the developing countries known as the Third World. Furthermore, the development of the domestic 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 manifested in an increase in the production of goods in the industries; this trend prepares technical education teachers and graduates of technical education for self-employment or

self-reliance. When everybody is involved in the 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 lead 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 of living of the society will be particularly welcomed by the third world countries (Madison, 1971).

### **National Prestige**

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

### **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 studios 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.
- (4) Staff development in technical teacher education should be vigorously pursued to the highest level.
- (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 a school basis, should be worked out to minimize the effects of personal satisfaction or idleness.
- (7) There should be a standing research committee (SRC) in all tertiary institutions charged with the responsibility for the internal management and coordination of research activities in all tertiary institutions with particular emphasis on the judicious allocation and monitoring of research grants.
- (8) Junior faculty should be mentored on standard textbook publication with local content on Technical Education.
- (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.

## CONCLUSION

Research and teaching are the primary functions of various departments of 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 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 the uncertain result because well-conceived research hardly ends up in total failure.

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