

Nigerian students' perceptions regarding transferability of selected
aspects of U.S.A. technology education programs to Nigeria

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CHAPTER I. INTRODUCTION

Science and technology are some of the forces that have changed the world. The outlook of societies and the quality of lives of individuals living in them have changed over the years mainly because of the impact of science and technology. The differences in the levels of development seen in many countries, that have led to the classification of the world into first, second, third and fourth world countries, reflect largely the varying impacts of science and technology in these countries. But Matlock (1984) observes that although leaders in the less developed countries clearly see science and technology as major means of progress, they face a well-known problem in applying science and technology to achieve economic development. This problem arises from the fact that the less developed countries lack the necessary technology and therefore have to look for the technology available in the more developed countries. This brings in the issue of "technology transfer".

Technology, per se, has been defined in various and varied ways in the literature. Examples of definitions of 'technology' include:

1. Technology is tools, machines, power, instrumentation, process, techniques.
2. Technology is knowledge created and being created by humans.
3. Technology can be either physical or social; a new social organization is as much a technology as a new machine.

4. Technology is applied science; a technical method of achieving a practical purpose; the totality of the means employed to provide objects necessary for human sustenance and support.

Technology transfer, which is defined by Siggel (1986) as "the transmission of technical knowledge through commercial contracts involving the provisions for goods and services" (P. 231), has been tossed out, at one point or the other, as the recipe for remedying the developing countries' under-development. Vaghefi (1980) maintains that to achieve socioeconomic progress in a developing society, it is important that modern technology be imported and applied.

But the problem associated with transfer of technology between countries have also been elaborately discussed in the literature. Bachmann (1983) notes that the disastrous fact is that technology of the industrialized countries is in no way suited to satisfying the demands of the less developed countries. The technology of the industrialized countries was developed for them to solve their own problems, and not in any way to solve the problems of the less developed countries. It is, however, unfortunate, as noted by Bachmann himself, that the technology of the industrialized countries exerts an almost irresistible fascination for the people in the less developed countries despite the seeming unsuitability; and the industrialized nations keep pushing their technologies into the less developed ones. One of the ways industrialized countries do this is

through international exchange training programs. For example, International Congress on Science and Technology Education and National development sees intercooperation as an important element of optimizing the use of the resources that each country individually possesses. In 1981, the Congress recommended that UNESCO should provide opportunities for international program for the promotion of cooperation between member states in the field of science and technology, with special reference to the needs of developing countries. The scope of such program should include among other things, teacher education (UNESCO, 1981). Thus, one finds the rationale for the many international exchange training programs in vogue in different parts of the world, and for the growing number of foreign students in many developed countries like the United States of America (U.S.).

The U.S. is one developed country that has for many years now been involved in international training programs for many developing countries. This country does this through a number of agencies, the most noticeable one being the Agency for International Development (AID). The number of foreign students coming to study in U.S. has continued to increase. Patterson (1981) quoted the Institute of International Education census report for 1980-1981 as indicating 312,000 foreign students attending U.S. institutions at that time. Of this number, eighty percent (80%) were from third world countries. This report noted that the foreign students population could increase to more than one million by the early 1990s.

Many reasons have been deduced for this influx of foreign students into U.S. Spaulding and Flack (1976) observed in their study that the major reasons of these students coming to the U.S. are to get advanced education that is not available at home; to acquire prestige through degree from a U.S. institution; to take advantage of available scholarship funds; to escape unsettled political or economic conditions at home; and/or simply, to learn more about the U.S. A positive image of training and educational facilities available in U.S. institutions is one other reason deduced by the authors. These reasons are plausible, but some of them may apply only to individuals who come on their own to study. Previously, going abroad to study was exclusively a personal decision and responsibility of an individual, sometimes a reserve for elites (Hood, Reardon and Bray, 1979). At times, individuals got sponsorship from governments or other agencies but decided by themselves which country to go for study, and what area of specialization to study. In recent years, many countries have undertaken selecting and sending their students abroad, and specifying explicitly what the students should study, and sometimes, the specific time the students must return home. The reason, perhaps, is that the students would bring back what they learn to apply at home in the development of the home country. For an example, the country of Venezuela has been operating a scholarship program since 1974, and sending students to study in areas of national priority only. This is seen as a "great transfer of technology and research from the most

advanced universities and research centers to similar institutions in Venezuela" (Mauch, 1982, p.3).

Nigeria is another classic example of sending students abroad and specifying what to study and when to return. Since 1981, Nigeria has been sending her students annually to the U.S. to study technology education programs, as a part of the Technical Teacher Training Program (TTTP), and return home after acquiring the specified degrees. A similar training program has been going on in Canada (Leblanc and Cap, 1986). The aim of these programs is essentially to produce competent teachers to handle the country's technology education programs. Notably, this government policy came simultaneously with the introduction of new 6-3-3-4 system of education in the country which marked the introduction of industrial technology/vocational education courses in all secondary schools. Nigeria sends people to the U.S. to be trained as technical teachers with the intention, one would reason, that the students would tap the "technologies" within the U.S. technology education programs, and "transfer" these "technologies" to develop, improve and consolidate the technology education programs back home that are at an infancy stage. Thus, the concept of transfer of technology in Education, or what may be called "educational technology transfer" can be said to underlie the policy.

But Nigeria is not alone or a starter in this practice. International transfer of educational practice has a long and relatively well documented history. For example, while exploring the

pre-history of international and comparative studies in education, Fraser and Brickmam (1968) demonstrated how, from the eighteenth century, travelling educators began to study foreign education systems with increased rigor and purpose and to advocate enthusiastically the transfer of educational practices between nations. Crossley (1984) in a case study of school-centered innovation in Papua New Guinea points out in his report:

Educationalists, such as Horace Mann, visited Europe in search of ways of improving American education and, similarly, European personnel embarked upon international tours in the hope of finding solutions to their own educational problems. European and American models of education were also exported to colonial dependencies where they rapidly superseded traditional practices, became established as the 'superior' form of education for all, and retained a powerful and pervasive influence to the present day. (p. 75)

Thus, the transfer of educational practices or "educational borrowing" from one country to another is not a new phenomenon, and Nigeria's involvement in it is just a practice of the conventional. But as the literature has shown, the process of technology transfer generally is plagued with many issues and problems. Educational transfer, therefore, can not be an exception.

Problem of the Study

According to Crossley (1984), the wisdom of educational borrowing has been challenged repeatedly since the turn of the century, and the question of international transfer of educational innovations has emerged as a central issue within the field of comparative education.

He asserts that "it is widely accepted that simplistic, uncritical (or unrecognized) international transfer frequently leads to innovation failures or generates unwanted and unanticipated consequences" (p.75). One of the implications of Crossley's assertion is that the 'agents' involved in the transfer process should be selective in what they transfer from the donor country to the recipient country. In Nigeria's case, this means, the personnel involved in the educational technology transfer should be critical and selective in the educational innovations they take back home.

Another issue that touches on the phenomenon of educational technology transfer is the level of satisfaction of the foreign students that stream into developed countries with education they receive, or the extent they feel their needs - educational and professional - and the needs of their countries are being served by the education made available to them. Some studies are quite revealing. In a study on the needs of foreign students from developing nations at U.S. colleges, Lee, Abd-Ella and Burks (1981) found that not only have U.S. institutions of higher education been indifferent to the adjustment problems of foreign students, they have also given little attention to such issues as the relevancy of American educational programs for the developing world. The authors report that in every category of needs investigated, needs were not satisfied to the level of students' expectations. A few years earlier, in a study in which the authors reviewed, evaluated and condensed over 450 items of

literature on foreign students in U.S., Spaulding and Flack (1976) found the following hypotheses supported by the data available to them.

1. Only in relatively few cases have U.S. faculty members changed their teaching or benefited in major ways from the presence of foreign students in campus.
2. On the whole, universities and colleges are organized in traditional academic fashion, with little change being introduced as the structure, member, or the fields of interest of foreign students change.
3. There is probably no evidence in the physical and technological sciences and in the medical professions to show that academic programs have changed to include subject matter to the interest of international students (pp. 312-314).

Although the wording of these hypotheses are questionable, and this study was conducted about twelve years ago, these findings are quite revealing and should be of concern to the foreign students entering into the U.S. to study, and to the various governments sending them.

The implication of these findings, among others, is that the foreign student whose interests and needs are not met satisfactorily, and whose country's needs are not considered in the educational offerings provided him/her must make some selections from the totality of what is offered him/her. The task, onerous as it is, is that which

the student must face. Thus, from both the perspective of problems associated with technology transfer, and the perspective that the college he/she attends may not pay any closer attention to his/her personal and/or country's needs, the foreign student has to face the issue of selection. This is necessary because, as Hruza and Miller (1983) enjoins, national priorities must be considered in selecting and implementing technological advances.

In the case of Nigeria's teacher training program in the U.S., the student participants, who are distributed to various universities in the nation, are the agents in the process of transfer of educational innovations from the U.S. to Nigeria. It is expected that in the totality of their academic programs and exposures, the students would learn about the U.S. technology education programs, and the "technologies" within them. These may include the content, structure, delivery and administration of the programs, and the practices in the school systems that have made the U.S. programs a spectacle to other countries. And since the literature has shown that not all these "technologies" may be transferable to, or applicable in, Nigeria, considering the country's culture, economy and educational needs, the students face the problem of identifying those aspects of the U.S. programs that are transferable to Nigeria. That was essentially the problem of this study. Thus, the study was designed to investigate those aspects of U.S. technology education programs that could be transferred and applied in Nigeria's technology education programs.

The investigation focused on selected technical, administrative and professional components of the programs.

Purpose of the Study

The purpose of this study was four-fold:

1. To identify what Nigerian students studying technology education in the U.S. perceived as transferable to Nigeria from selected aspects of the U.S. technology education programs, taking into consideration Nigeria's culture, economy and educational needs.
2. To find out whether these perceptions varied with students' status (undergraduate or graduate), area of specialization, and previous employer categories.
3. To find out the factors that Nigerian students studying in the U.S. perceived as potential barriers to transferring to their work-places the acquired technologies from the U.S. technology education programs.
4. To identify what Nigerian students studying in the U.S. perceived as the most effective approach of addressing teacher preparation for Nigeria's technology education.

Need for the Study

Nigeria is at a crucial stage of her development, particularly in the educational sector. A new system of education that emphasizes

technology education has been adopted, huge sums of money have been expended to acquire machineries and to train personnel. The Government noted on the national policy on education that Nigeria will continue to devote a greater proportion of educational expenditure to technical education and to welcome international aid and cooperation (Federal Republic of Nigeria 1981). The government has tried to demonstrate this commitment to technical education, the most recent demonstration being the decision to set aside about ninety-four million Naira (N94,000000) for the training of technical teachers to meet the growing needs of the technology education programs (Nnadi, 1987).

Nigeria's commitment still shows in sending people abroad to be trained as technical teachers. The TTTP is operating in the U.S., and the participants are expected to come back and exert a measure of impact on the technology education programs at home. It is to be expected that the trained technical teachers will bring back many innovations and other kinds of technologies found in the U.S. education systems to enhance the status of the programs in Nigeria. The programs at home need these technologies or innovations because, as Fapohunda (1979) notes, technology has the capacity to increase productivity. A committee of governors in the U.S. has also noted that "technology can be used to help students move toward clearly defined goals, and thus it can play a role in improving the performance of schools" (Sununu, 1986, p. 221).

But Okoro (1979) observes that the present curricula of vocational teacher education in Nigeria were designed by American educators based upon a system that has been effective in the U.S. He points out that there is no proof that the present programs are effective in meeting the needs of Nigeria. Although Okoro's observation focuses on vocational teacher education, the same could be said about the entire technology education programs. In other words, what is effective in U.S. may not be effective in Nigeria. There is, therefore, a need to identify those aspects that are judged to be potentially effective and applicable from the many aspects exposed to those who study/observe them.

In the U.S., the National Governor's Association Task Force on Technology, which was set up to recommend to governors in the nation regarding policies and programs that focus on effective use of technology in the classroom, makes the following observation:

As a nation, we have not invested in research and development needed for technology to be useful to students and teachers. What little is spent for research and development is scattered and does not focus on the needs of students and teachers. As a result, we should not be surprised that there is not enough solid evidence about what works best. (Sununu, 1986, p. 220)

If such an observation is true, then there is a need for more research and development by those who try to imitate the practices in the U.S. to ascertain the extent such practices would serve the needs of the imitators. This study was seen as one area of such needed research to determine the extent of usefulness of some of the practices seen in U.S. to the educational needs of Nigeria.

Furthermore, the former structure of secondary school in Nigeria was copied from Britain (Fafunwa, 1974). The new structure with technology education programs introduced resembles the American system. It is therefore necessary that a study tries to identify those practices, that have made American system successful, that can be transferred and implemented in Nigeria to make the new system over there similarly successful. In specific terms, by examining the technical aspects (like the derivation and delivery of content), the professional aspects (like student, teacher and curriculum evaluation), the administrative aspects (like local control of school and participatory management), the findings of this study can form a resource for the trained teachers themselves when they are back to the country, and to educational policy makers and reformers in Nigeria. Nwoke (1986) in his study found that administrators of industrial teacher education programs in Nigeria do not consider follow-up studies as useful tools for program evaluation and improvement; and recently, it has been reported that "education in Nigeria has moved into the computer age with the setting up of a computer education" (Staff, 1988, p. 53). These are two definite examples of situations where the perceptions of those who are studying about or observing these practices in the U.S. are needed and should be fed as inputs to the implementation of such practices in Nigeria.

Thus, the need for this study was underscored, not only, because of the huge financial resources expended in training these Nigerian

students abroad, but also because of the ripeness in time for the use of such perceptions and recommendations for the improvement of Nigeria's educational endeavors.

Objectives of the Study

The following were the specific objectives of this study:

1. To identify those aspects of U.S. technology education program content derivation that Nigerian students perceived as transferable.
2. To identify, from the varied teaching techniques used with the U.S. technology education programs, those aspects perceived by Nigerian students as transferable.
3. To identify, from the varied techniques of teacher evaluation used in the U.S., those that Nigerian students perceived as transferable.
4. To identify those approaches of student evaluation used in the U.S. that Nigerian students perceived as transferable.
5. To identify, from the varied curriculum/program evaluation practices seen in U.S. technology education programs, those perceived by Nigerian students as transferable.
6. To identify, from the different issues involved in administration of U.S. technology education programs, those that were perceived by Nigerian students as transferable.

7. To identify what Nigerian students in the U.S. perceived as the potential factors that might hinder them transferring to their work-places in Nigeria those technologies acquired in the U.S.
8. To find out what Nigerian students in the U.S. perceived as the most effective way Nigerian government should adopt to address teacher preparation for the country's technology education programs.
9. To find out whether these perceptions studied varied with the students' status (undergraduate or graduate), area of specialization and previous employer categories.

Questions of the Study

The following are the questions that this study sought to answer.

1. What aspects of U.S. technology education programs do Nigerian students in the U.S. perceive as transferable to Nigeria?
2. Is there any difference between these perceptions of undergraduate students and those of graduate students?
3. Do the students' perceptions vary with students' areas of specialization?
4. Do the students' perceptions vary with the categories of students' previous employers?

5. What are the factors that Nigerian students perceive as having the potential of hindering them transferring to their work-places those technologies they acquire in the U.S.?
6. What is the approach that Nigerian students in the U.S. perceive as the most effective for addressing teacher preparation for technology education programs in Nigeria?

Hypotheses of the Study

The following (null) hypotheses were formulated and tested.

1. The Nigerian students studying in the U.S. are neutral in their perceptions on the transferability of selected aspects of U.S. technology education programs to Nigeria.
2. There is no significant difference between the perceptions of undergraduate students and those of graduate students on the transferability of selected aspects of U.S. technology education programs to Nigeria.
3. The perceptions of Nigerian students on the transferability of selected aspects of U.S. technology education programs to Nigeria do not vary significantly with the students' areas of specialization.
4. The perceptions of Nigerian students on the transferability of selected aspects of U.S. technology education programs to Nigeria do not vary significantly with the categories of students' previous employers.

5. There is no agreement among Nigerian students in the U.S. in their ranking on factors they perceive might hinder them transferring to their work-places those technologies they acquire in the U.S.
6. There is no agreement among Nigerian students in the U.S. in their ranking of the approach perceived to be the most effective for addressing teacher preparation for technology education in Nigeria.

Assumptions of the Study

The study was designed and carried out under these basic assumptions.

1. Nigerian students used for the study were knowledgeable enough in those aspects of the U.S. technology education programs addressed by the study to express an informed opinion.
2. Nigerian students sampled were knowledgeable enough to distinguish what was transferable to Nigeria from all they saw and studied in the U.S., taking into consideration Nigeria's culture, economy and educational needs.
3. The aspects of U.S. technology education programs identified and addressed on the questionnaire meant the same thing to all the respondents, irrespective of their student status (undergraduate or graduate) and the states and universities of their study.

4. Nigerian students in the TTTP were willing to participate in the study.
5. The respondents were objective in completing the questionnaire.
6. The sample used for the study was a good representation of Nigerian students studying technology education in the U.S.
7. The technology education programs in the geographical areas covered in the study were good representation of U.S. technology education programs.
8. The methods of data collection and analyses used in the study were appropriate for the study.
9. The study findings would be helpful to the personnel responsible for formulating and implementing technology education policies in Nigeria.

Delimitation of the Study

1. This study focused on only technology education at the secondary school level (which includes vocational training centers). It did not include technology education, engineering education, or such levels of education at four-year colleges and universities.
2. The study considered only selected aspects in the technical, professional and administrative components of U.S. technology education programs.

3. The geographical areas of the U.S. covered in the study were those that had the 1986 group of Nigerian students in the TTTP on their university campuses.

Limitation of the Study

The following conditions posed some limitations:

1. The Office of International Training of the Agency for International Development, Washington, D.C. was unable to release the list of the 1986 group of TTTP students to the researcher. The Nigerian Embassy at Washington D.C. gave no response also. The researcher resorted to enlisting the help of internship coordinators, department heads and other contact persons at the various universities in the data collection process. The level of willingness and cooperation of these contact persons affected the study in terms of the response rate of the questionnaire, and the duration of the study. However, the impact of this initial difficulty on the findings of the study is considered by the researcher to be minimal, if any.
2. Considering the data collection process adopted in this study, it was very difficult to identify non-respondents. So it was not possible to conduct and present the statistical demonstration that the respondents were different/not different from the non-respondents.

3. The data collection instrument was the questionnaire, distributed and collected back by mail. The study is therefore limited by the issues and problems associated with mail-questionnaire as discussed in the literature.

General Procedure of the Study

The following procedure was adopted in conducting this study:

1. The literature was reviewed on those aspects of U.S technology education programs the researcher judged as reflecting some differences between the practices in the U.S. and those in Nigeria; also on issues in technology transfer.
2. The names of U.S. universities where the 1986 group of TTTP students were studying, and the names of internship coordinators for these students at the universities were identified with the help of a list secured from TTTP internship coordinator at Iowa state University Ames, Iowa.
3. The proposal was written, and the instrument was developed.
4. Letters were written to the internship coordinators at the different universities requesting them to indicate their willingness or not to help distribute the questionnaires (that were to follow later) to the TTTP students in their schools.

5. Follow-up letters were written to non-respondents, and additional letters written to other contact persons in those universities where the coordinators had indicated their unwillingness.
6. The instrument was validated using the investigators' Graduate Committee members and other experts.
7. The instrument was revised based upon the recommendations of the experts.
8. The proposal was presented to the researchers' Graduate Committee and was approved.
9. The instrument was pilot-tested with a sample of technology education students from Nigeria and other foreign (third World) countries in Iowa State University, Ames.
10. The instrument was revised based upon the results of the pilot test.
11. Approval was obtained from the Iowa State University Committee on the Use of Human Subjects in Research.
12. The questionnaires were mailed to the contact persons at the different universities for them to distribute to TTTP students.
13. Follow-up with letters and several telephone calls was conducted, sometimes with additional questionnaires sent to where the first set were insufficient or could not be located.
14. The data were collected and coded.

15. The analysis was done using the Statistical packages for the Social Science (SPSSX) program of the Iowa State University Computation Center, Ames.
16. The final report was written and recommendations made based on the findings.
17. The completed study was again presented to the researcher's Graduate Committee for final examination and approval.

Definition of Terms

For this study, the following terms were used as they have been defined here.

Curriculum/Program: These two words are used synonymously. They refer to a general overall plan of the content or specific materials of instruction that the school should offer the student by way of qualifying him or her for graduation in a professional or vocational field (Good, 1973).

Educational Technology transfer: Can also be termed 'educational borrowing' - refers to the transfer of some educational innovations and practices from one society for implementation in another society.

Handicapped children: Mentally retarded, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, or other health impaired children or children with specific learning disabilities who, by reason thereof, require special education and related services (Gorton, 1983, p.376).

Naira: Is the legal tender in Nigeria, comparable illustratively to the U.S dollar.

Nigerian Students in the U.S.: The 1986 group of Nigerian students participating in the TTTP.

Perceptions: The average collections of professional judgements of those surveyed. Is represented by the mean score of the respondents to the questionnaire items.

Transferability: Having the potential to thrive when applied in a new environment; thus, 'transferable to Nigeria' means having the potential to succeed and improve the situation when applied in Nigerian environment.

Technical Teacher Training Program (TTTP): A teacher training program sponsored by the Nigerian Government and administered by the U.S. Agency for International Development (AID), in which selected Nigerians undergo training in U.S. universities as technical teachers to the bachelor's and (some) master's degree levels.

Technologies within U.S. technology education programs: Refer to the ways contents are derived, the varied teaching strategies, the student, teacher and curriculum/program evaluation approaches, and some administrative issues characterizing the technology education programs in the U.S.

Technology: The way in which society goes about solving its problems of providing the necessary or essential goods and services, and for accomplishing the other activities which it wishes to perform,

whatever these may be (Matlock, 1984). It is used in the study in the way it has been defined diversely in the literature. It includes processes, techniques and new knowledge, and is not limited to tools, machines and instrumentations as some people may be tempted to think at first impression.

Technology education: Used in this study in a generic manner to embody the industrial arts/technology, technology education, technical education, vocational education, and some aspects of career education, all as defined in the U.S.

Technical education: In Nigeria, it refers to that aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge (Federal Republic of Nigeria, 1981, p. 28).

Technical teachers: In Nigeria, these are teachers of industrial, vocational or technical subjects in Nigerian secondary schools or vocational centers.

Third world countries: One of the classifications of countries in the world. They refer to countries in the southern hemisphere and include majority of countries in Asia, Africa and Latin America. They are characterized by dependence, relatively low levels of industrialization, reliance on food and primary products for export (Wolansky, 1987). Nigeria is considered among them.

U.S.: Refers to United States of America.

Vocational education family: In U.S., it refers to a group of interrelated fields, programs and curricula, with the primary objective of preparation for gainful employment. The group comprises agricultural education, business and office education, distributive education, health occupations education, home economics education, trade and industrial education, industrial arts/technology education, and technical education (Calhoun and Finch, 1982).

CHAPTER II. REVIEW OF LITERATURE

In this chapter, a review of the literature highlighting characteristic features of U.S. technology education programs is reported. Since this study is related to technology transfer, the literature on issues in technology transfer is reviewed and reported. At the end, a summary of the review and its relatedness to the present study is presented.

With today's advancement in technology, particularly in the area of information storage and retrieval, there is an abundance of literature on any educational program chosen for consideration. Also, any educational program, like the technology education programs in the U.S., has many aspects that lend themselves to study. Thus, it is virtually impossible to study all aspects of a broad subject like "technology education programs in U.S." in one investigation with its characteristic limitations. The need for selection of particular aspects to consider becomes inevitable. Such selection is reflected in this review. Ary, Jacobs and Razavieh (1985) and Tuckman (1988) advise that the review should be organized around major hypotheses and/or variables of the study. With this as a guide, this review is organized under the following headings:

1. Derivation of content of technology education programs
2. Teaching methods in technology education programs
3. Teacher preparation and evaluation in technology education
4. Student evaluation in technology education
5. Curriculum/program evaluation in technology education

6. Issues in administration of schools
7. Issues in technology transfer
8. Nigeria and the TTTP
9. Relationship of the literature review to present study/summary

Derivation of Content of Technology Education Programs

One of the first questions raised about any new educational program or about a continuing program in a community has normally been on the content to be taught. 'What' is to be taught, and 'how' to derive this content are the issues frequently raised. Central to these issues is the concept of 'needs assessment'. Needs assessment, according to Bjorkquist and Murphy (1987), is an investigation process that results in a proposal to solve a problem. Hunt (1986) describes it as the process of determining the gap in results between 'what is' and 'what should be'. Thus, needs assessment is concerned with determining what are the present needs of an individual, organization, a community or government. It extends, sometimes, to examining the extent these needs are being met. It is concerned with determining goals and discrepancies between the goals and the status quo.

In the literature, many have advocated that needs assessment should precede and/or characterize every educational program, whether a formal educational program serving a community or a training program in an industry. Bjorkquist and Murphy (1987) have recommended that some

type of needs assessment should precede the development of any training program. Through this assessment, trainers identify problems that can be resolved through training as well as problems that require some other type of solutions. These authors have, therefore, pointed out one of the reasons for assessing the needs of the community before embarking on any training program. This is the fact that the training program might not be the solution to all or certain types of the community problems/needs. Providing effective training is another reason advocated by Braun (1979) for conducting a needs assessment for a training program. Effective training means relevance of the training to the recipients and to the community being served by the program or the institution doing the training. The importance for relevance of an educational/training program to the needs of the community requires no over-emphasis. The community and its institutions or establishments will normally be where the program graduates turn to after graduation. The needs, and sometimes the requirements, of the community and its establishments should therefore constitute the forces that should drive or even direct the training programs in the schools and other institutions within the area. Discussing ways to make training programs pay off, Clark (1986) identifies reasons why training programs fail at times. 'Mismatching courses and needs' is one such reason identified. The author recommends that programs should be systematically matched with the needs which might have been identified. Also, Young (1986) reports:

In directing studies for the establishment of over 50 new community colleges or technical institutes, for new and enlarged districts of existing community colleges, and for improvements of programs in existing colleges, public opinion has repeatedly been sought by the author usually from identifiable population segments of an area. (p. 12)

One can gather from Young's report that before some community colleges were established, the opinions of the people in the communities to be served were studied, and based on these, the colleges were established, or some existing programs were modified. But community colleges are not the only kind of institutions serving communities. Secondary schools, technical colleges, vocational training centers are some other kinds of institutions serving communities. Needs assessment is also necessary in establishing and running these institutions.

Where programs are not established or run based on verified needs of the community and its institutions, there is the tendency for a gap to exist between what the community needs and what the schools and training programs provide. In two separate studies, Vasek (1967) and Wright (1969) found disagreement between school and industrial representatives with respect to skills needed by beginning technicians. Thus, if the schools had gone ahead to do the training without finding out the expectations of the industries (the employers), such graduates would have been unemployable, and therefore not useful to the communities. This is probably the fate of any community which has a school or a vocational program that operates with no reference or semblance to the needs of the community.

The need for accountability on the available financial resources, normally limited, has underscored another reason for needs assessment for an educational program. Mitchell and Hyde (1979) have pointed out that needs assessment is extremely important for trainers in order to plan, manage and allocate program resources, and evaluate training program results. Swierczek and Carmichael (1985) have also reasoned that in public sector organizations, because training resources are limited through lack of funding, or through lack of organizational planning, there is a low level of training skills and unavailability of other training resources; and because of these, needs assessment is necessary to obtain the most from the training dollar. The point is particularly relevant to the less-developed countries where resources for training are not readily available. The few that are available should then be used judiciously; which implies that training in all levels of education and even those conducted abroad should be designed to meet the industrial, production and other diverse kinds of needs of the country in general, and those of the specific communities constituting the particular country.

Closely related to the concept of needs assessment as a basis for establishing or continuing an educational program is the concept of 'task analysis'. This is also seen as a basis for formulating the content or curriculum of a program to be offered. It entails identifying the competencies needed by people in a certain job and using these as the basis for formulating the content for a program

designed to produce workers for that job. Clark (1986) has recommended that training should flow from two primary sources: (1) a validated analysis of current job tasks and the skills required to perform them, and (2) a model of future technological directions of the organization. Conducting job analysis requires going to workers in that job and identifying what they do sequentially to perform on the job, according to Clark. However, in a world characterized by rapid technological changes, one has to note the caution that job analysis will only identify current skill needs and therefore one needs to identify new technological applications to supplement the job analysis. But the analysis is needed as a vital input to curriculum development. Hunt (1986) observes that armed with information on task analysis:

the instructional designer is provided with a set of specifications which detail the task characteristics and the points of focus for instructional intervention. The net result is an increased probability that more efficient training will take place. (p. 287)

The summary of all the points raised by these different authors is that the content taught in an educational program, for example, a vocational program, should be derived from the verified needs of the surrounding communities being served. It should also evolve from the identified competencies needed by the workers in that particular field. Needs assessment and job analysis are the major ways of identifying and verifying these needs and competencies. How they are done is another issue entirely, but the literature (for example, Young, 1986) has recommended the involvement of teachers, peers, students, advisory

committee members, parents, school graduates, community leaders, and other community resource people in conducting the assessment/analysis. Many studies to determine training needs of vocational programs have characterized many vocational programs in the U.S. These include those by Solomon and Gutcher (1987), Walls (1982), and Albright and Preskill (1981). Such practices could constitute one of the foci for an international student who studies in the U.S. with the intention of identifying those educational practices that could be adopted or adapted to his or her home country.

Teaching Methods in Technology Education Programs

When the content of any academic program has been formulated, one of the next concerns would be the way(s) the content would be delivered. Weston and Cranton (1986) define teaching method as the vehicle or technique for instructor-student communication, and state that the selection of teaching methods and materials is one of the most complex components of the process of curriculum design. The idea of 'selection' itself implies, among other things, that there are many ways of delivering content, and that not all the ways work similarly in all situations, at all times, and on all individuals.

Flammer (1987) has formulated a model of learning and learning efficiency in which he identifies seven different factors involved in learning and learning efficiency. These are learner, teacher, instructional method, instructional material, teaching environment,

learning environment, and meeting individual needs. If Flammer's model is accepted, one would then see how important teaching method is to the operation of any academic/training program. It should therefore constitute one of the foci for consideration to any person who studies academic programs with the intention of adapting some of the features.

There are many teaching methods that have been developed and tested, and that are available for training programs. Weston and Cranton (1986) have done a comprehensive review of literature on instructional methods and materials, and have categorized teaching methods in four groups. These are (1) instructor-centered (e.g., lecture and demonstration), (2) interactive (e.g., discussion and group projects), (3) individualized learning (e.g., modularized learning and programmed instruction), and (4) experiential learning (e.g., field/laboratory instruction and role playing). As it would be expected, these authors have noted that their classification is not exhaustive. There is just one of many other classifications found in the literature.

The research results on which teaching method is better than the other are conflicting. Some results would favor method A, others would favor method B, and still others would show no significant differences between or among methods. These non-conclusive results can probably be explained by many factors: in different subject areas, at different levels of instruction, and with different instructors (Weston and Cranton, 1986). However, one method that has been reported many times

to be more effective than others is 'individualized instruction'. Many studies have shown it to be more effective than the traditional lecture method found most of the time in classroom; more effective in areas like achievement gains, levels of satisfaction with the courses, and more positive attitudes toward the courses (Gray, Buerkel-Rothfuss, and Yerby, 1986; Tuckman and Waheed, 1981). However, some other studies have not shown these positive effects (Evans and Braby, 1983; Tatum and Lenel, 1985). It should be noted that these studies were done in different subject areas and with varied levels of instruction.

Individualized instruction has long been extolled as the ideal instructional strategy, particularly in a democratic education environment (Yang, 1987). It is based on the assumptions that students learn at different speeds, and that regular immediate feedback facilitates the learning process (Gray et al., 1986; Weston and Cranton, 1986). Bergan and Dunn (1976) suggest six attributes of it: (1) a broad array of educational objectives and extensive alternative content, (2) a variety of instructional procedures, settings, and contexts, (3) an extensive cross-indexing of these curricular objectives, materials, methods, and learning contexts, (4) an extensive data base regarding the individual student's interests, abilities, aspirations, optimum learning styles, long-range goals and ambitions, (5) an extensive cumulative record on each student regarding his or her past academic records and accomplishments, and (6) a file of information regarding the constraints being imposed upon planning both

for and by the student as a result of his or her peculiar circumstances. These attributes show that individualized instruction aims at accommodating the varying abilities and interests of the learners, and therefore matches the needs of technology education programs. Five parameters of individualized instruction have been identified. These are the individualization of (1) instructional amount, (2) display time, (3) instructional sequence, (4) personal attention, and (5) internal learning activities (Merrill, 1984; Tennyson et al., 1984). The promise of individualized instruction to the field of technology education is best expressed in Melmed's (1986) observation:

The analogous opportunity for applying science and technology to schooling lies in three key areas: (1) individualizing the learning curriculum, (2) revising the organization and practice of schooling to reduce the time dependence of student learning upon teacher's traditional classroom performance, and increasing the productivity of the student's time investment in learning, and (3) implementing a low-cost, capital-intensive delivery system and individualized learning curriculum for students. (p. 78)

In the U.S., like in other advanced countries, individualization of instruction has been implemented through computer-assisted instruction (CAI) (Yang, 1987). CAI "offers the teaching tool so essential to more effective efforts at adapting instruction to meet the learning needs of individual students" (Lockard, Abrams, and Many, 1987, p. 145). It is a term applied to a learning environment characterized by instructional interaction between computer and student. The teacher sets up the learning environment, ensures that

each student has the necessary skills to engage in a particular activity, and adjusts the learning activities according to students' needs (Wright and Forcier, 1985).

The use of computers to deliver the curriculum in the classroom has been one of the outcomes of modern advances in technology, particularly in developed countries. Becker (1983) reported that by January, 1983, 42 percent of all middle and junior high schools in the U.S. had one or more microcomputers. The current concern is not whether to use computers in classrooms, but how to use them. Therefore, anyone who closely studies educational programs in the U.S. can hardly overlook that aspect of instructional delivery - the use of computers, whether mainframe, mini- or micro-computers. But before one recommends the adoption of computer use in instructional delivery, one would necessarily seek to find out the effectiveness of CAI compared to other instructional modes.

Many factors come into consideration when defining "effectiveness" of CAI. Niemiec and Walberg (1987) have identified some of these to include 'enhanced achievement', 'positive attitudes of the students toward the course being taught', 'reduced learning time', 'course completion rates', 'knowledge retention (or knowledge/skill decay rate)', and 'cost effectiveness'. Many studies, however, often choose to focus on achievement gain and attitude. Research findings on these factors are not conclusive. Some studies show positive effects, and others give reports of no significance. Kulik and others (1980)

conducted one of the most comprehensive studies on the effectiveness of CAI. They examined 51 studies devoted to CAI in grades 6 to 12 using a meta-analysis technique. They found higher achievement gains in students using CAI compared to students using traditional instructional mode, although the gains were only in objective tests. They also found that CAI improved retention of learning, although the measurement of improvement did not show statistical significance. Similar results were obtained by Roblyer (1985) and Fisher (1983), except that on retention, Roblyer concluded that "current data lend little support to the belief that computer-based instruction enhances retention" (p. 24). Another integrative review of literature on CAI done by Niemiec and Walberg (1987) reports that researchers are getting positive results in 85 to 95 percent of their studies. Particularly, at the secondary school level, positive effects of CAI are also reported by Samson and others (1987).

In their meta-analysis, Kulik and others found that in 80 percent of the studies reviewed, student attitudes toward subject matter were more positive in the CAI classrooms. In only 30 percent of the studies, however, were the results statistically significant. Similar positive student attitudes when CAI is used is reported by Bracey (1987). CAI has also been reported to be useful in decreasing the time a student takes to learn a given material. Blaschke and Sweeney (1977) conducted a study in which they compared a simulation application of CAI in army electronics training with a similar type of program in

secondary education. They found a 10 percent reduction in electronics training time using CAI. Fisher (1983) reports how students successfully completed learning assignments on the computer as much as 40 percent faster than they did when not using computer. Bright (1983) reports similar positive results in learning time.

There are a few things to note about these results on the effectiveness of CAI. They do not hold across all grades and groupings. CAI is reported to be most effective in elementary grades and least effective at college level. The secondary grades fall in the middle (Bracey, 1987; Kulik, 1981). Also most of these studies were conducted prior to the availability of microcomputers. With the prevalence of microcomputers in the classrooms, thorough studies may show different results. Some concerns have also been raised about the thoroughness or methodology of some of these studies. While the influence of novelty or what is named 'Hawthorne effect' in the research community (Borg and Gall, 1983; Moore, 1983) may feature in these studies, the descriptions of some of them do not give sufficient information to determine if methodological flaws are present (Roblyer, 1985). Lockard et al. (1987) observe that much of what passes for 'research' in CAI are actually anecdotal reports of experiences that in no way resemble experimental research. They conclude that "there is a need for more and better research in the outcomes of computer intervention in the instructional process" (p. 171).

While such 'better research' is being awaited, one question that should be raised, perhaps by educators in developing countries who are yet to introduce computers into their instructional delivery systems, is: "do the reports so far documented about computer intervention in the instructional process justify the adoption of this 'instructional strategy' in their schools"? Perhaps, the question raises more concern when it is being considered vis-a-vis the economy of some of these countries. This brings in the issue of cost effectiveness. Although Spunk (1981) has reported that CAI can be a cost-effective alternative, as well as an effective supplement to more traditional modes of instruction, Melmed (1986) has highlighted some other issues that should concern people, including educators or planners in developing countries. He cautions:

Some broad considerations that must influence a decision on the rate and timing for the introduction of a new schooling model include: (1) is it technically feasible?, (2) what is the comparable cost per student?, and (3) how will it affect the affective and social development of students, and the development of their psychomotor skills? (p. 80)

These questions are particularly pertinent to a developing country like Nigeria when the adoption or introduction of CAI into the nation's schools, and particularly for the delivery of technology education programs, is being considered. Technical feasibility may include the availability of teachers trained to use CAI, to evaluate CAI software and write some themselves, and the responsiveness of the traditional environments in the schools to such 'new technology'. When the cost per student is worked out, the ailing economy of the country may make

the decision-making a relatively difficult task. The affective and social development of students with the introduction of CAI may also be an issue to grapple with. Perhaps, the summary of these findings is that though CAI has been shown to be more effective than the traditional instructional strategies, and though Nigerians (policy makers and students) may observe prevalence of CAI in schools in the U.S. and other countries, there are surely other factors to consider before one recommends the introduction of CAI in Nigerian schools.

Another aspect of instructional delivery in the U.S. which may draw the attention of a foreign observer from Nigeria or other developing countries is the particular attention given to handicapped and disadvantaged persons in the school system. The attention comes in the forms of laws, funding and special programs. The fact that there is enormous variability in the abilities and interests of the clientele of the school is, perhaps, not debatable. But not all the communities in the world have done equally well in recognizing, respecting and doing something substantial to address this 'natural' differences in the population of the world. Many a times, all persons are left to compete together as if all were of equal abilities, interests, values and aspirations (McNeil, 1987). In such cases, the handicapped and the disadvantaged may experience limited opportunities.

In the U.S., one such major attention directed at the handicapped and disadvantaged is the Public Law 94-142, passed in 1975 with subsequent amendments, the latest being in 1986. Gorton (1983) and

Latham (1987) explain that the intent of the 1975 law was that all handicapped persons of school age would have an opportunity for a free and appropriate public education in a setting that did not discriminate against them. The law provided for least restrictive educational placement and brought the hope that handicapped students who were not being served at all by the public schools would be given an opportunity for education within a public school setting by qualified teachers. The concept of 'mainstreaming', which refers to the placement of disabled students in education classes along with non-disable ones, was introduced. Introduced also was the development of individualized education programs (IEP) to suit the individual needs of the handicapped who may not fit into the regular programs of the schools (Gorton, 1983). Latham (1987) asserts that there is no question that handicapped students have benefitted from the passage of Public Law 94-142, that twelve years after the passage of the law, there has been 65 percent increase in the number of handicapped served in public school settings, and that "this remarkable statistics speaks eloquently to America's resolve to provide for its handicapped citizens, and to open society's doors to them" (p. 33). The given reports notwithstanding, there are still more calls for more attention to the handicapped in the American society (Schiffman, 1987), and Jordan and Erickson (1986) have expanded the group of people needing special attention to include the exceptional, the gifted or talented whom they found in their study as being currently under-served and under-achieving.

The situation is different in the Nigerian school system. Obiakor (1983) gives a brief description of what exists in the school system. He says traditionally many exceptional children are treated with no regard. It is a 'survival-of-the-fittest' kind of education for the handicapped. The gifted students are expelled from school because the question a lot. They drop out and become societal problems. The author sees vocational and career education as one of the ways to address the situation, and recommends that exceptional children be properly identified and recognized as people with potentials, and special classrooms be established for them.

This question should, perhaps, bounce back: should Nigeria go ahead and enact laws and prepare programs that open society's doors to the handicapped, disadvantaged, and gifted in the nation? Similarly, will those who have seen such laws and programs in American school system recommend such to the Nigerian educational planners? Persons responding to such questions would probably need to consider some of the factors that have prevented the U.S. from realizing completely the ideals about the handicapped, as discussed by Latham (1987). These include inadequate pre-service training of teachers, lack of teacher incentives, student/teacher ratios, and administrative and economic disincentives. But whether these factors are sufficient reasons to ignore the idea of providing for the 'special needs' people (so called in the U.S.) is a different matter.

There are really many issues involved in teaching methods in technology education programs. An observer of the situation in the U.S. cannot focus on all. It is, however, likely that some of the main foci would include individualized instruction, CAI and special education programs. The issues themselves are interwoven. For example, Niemiec and Walberg (1987) indicate that computers continue to be specially useful in aiding handicapped children, and Waks (1986) describes an attempt to teach electronics to disadvantaged high school students in Israel using individualized instruction, with success. Thus, addressing a particular situation, like providing individualized instruction, may call for another situation, like CAI, or may be a step toward addressing another situation, like serving the handicapped and the disadvantaged. The main issue is whether it is feasible or necessary to adopt any of these in the delivery of curriculums of Nigeria's technology education programs.

Teacher Preparation and Evaluation in Technology Education

Another probable area of interest in the American educational system, not just the technology education programs only, to a foreign national is the preparation, recruitment and evaluation of teachers. Teachers are down-the-line implementers of most educational policies. The focus on the way they are prepared, on the way they do their work, and on the way they develop professionally, is not and should not be a surprise. The Nigerian National Policy on Education notes emphatically

that "... no educational system can rise above the quality of its teachers" (Federal Republic of Nigeria, 1981, p. 38).

The focus on teacher evaluation in the U.S. is very elaborate, at least to other nationals who do not experience what they see in the U.S. in their countries. The whole area is really complex, but some of the issues are attention-catching. One of these is 'testing of teachers' before they are employed, and after they have been employed (to maintain their positions). Sometimes, students going into teacher training programs in colleges are tested before they are allowed to be trained as teachers.

Testing teachers before they begin to practice their profession is not a recent phenomenon in the U.S. Vold (1985) traces the history of the practice to the colonial era, and asserts that since then, various forms of teacher testing were commonplace up through the nineteenth century. A law for the development of normal schools, and the approval of teacher training programs by State Departments of Education were some of the main forces that succeeded in eliminating teacher testing in favor of proper and uniform preparation of teachers during their training years in colleges (Melville et al., 1987; Vold, 1985). But the American Council on Education went on to establish the National Teacher Examination in 1940. Although initially it was used by local school districts to help with teacher selection, recently it has been used for certification (Melville et al., 1987). These authors have cited three of the factors that brought the rebirth of testing teachers

for certification. These are declining test scores, an oversupply of teachers, and large scale press coverage given to a few letters containing errors in grammar and spelling written by teachers to parents. They report that "a majority of States currently test teachers for certification and more States plan to start" (p. 9).

Some reasons have been advanced for testing of teachers before they are hired. The premise is that people employed to teach and shape the lives of other human beings should possess and be able to exhibit certain minimum competencies. Minimum competency tests (as some of the tests are generally labeled) are designed to examine the possession of these minimum competencies. Making a call for a tough national teacher examination, Shanker (1985) opines that this would make teaching a genuine profession, convince the public to pay teachers what they are worth, empower teachers to make educational decisions, attract the best and brightest to the profession, and ensure high quality education. Popham (1985), one of the outspoken voices in educational measurement and evaluation, even calls for testing teachers for re-certification, not just for initial certification only. He says this may recapture public support for education which, he notes, has seriously eroded. Certification is intended to protect the public, so teachers should be tested for initial certification, as it is done in most other professions.

Perhaps, the reasons for testing teachers for certification are plausible, but of concern to a foreign observer could be what is being

tested, how are the tests carried out, and what are the results. Melville et al. (1987) have identified two trends in teacher testing; namely, the use of National Teachers Examination (NTE) from Educational Testing Service by the States, and the development by the States of their own teacher certification tests.

Some States use a combination of the two. For example, South Carolina uses a combination of three instruments to implement Act 187 of 1979 from its legislature which prescribed a fair and comprehensive program for the training, certification, initial employment, and evaluation of public educators in the State (Freeze et al., 1987). The instruments are (1) the Assessments of performance in teaching (APT) test which is designed to measure only minimal competencies of all student teachers, provisional (first year) teachers, and trades and industries (T and I) teachers; (2) the Education Entrance Examination (EEE) which is designed to measure competencies in three areas of basic knowledge - writing, reading and mathematics - and administered to all undergraduate college and university students seeking admission to a teacher education program; and (3) the National Teachers Examinations - for individuals applying for teacher certification. An industrial arts teacher, for an example, has to present a minimum score of 570 from Industrial Arts Education test component of the NTE, in addition to satisfying the APT and EEE requirements, to be certified, and therefore employed to teach in South Carolina.

Kentucky, another State in the U.S. prescribes similar, or perhaps more rigorous, requirements for prospective teachers. The State Legislature in 1984 demanded that with effect from January 1, 1985, all beginning teachers were required to successfully complete appropriate written tests before they could be certified. The tests, selected by the State Board of Education, measure communication skills, general knowledge, professional education concepts, and knowledge in the teaching subject of the applicant. In addition to these, all prospective teachers, and out-of-state teachers with less than five years of successful teaching experience would serve a one-year internship. Teacher certification would be granted only after the successful completion of the internship and other requirements (Kentucky State Department of Education, 1986). These kinds of trends, requirements, and rigors are prevalent in many other States of the U.S.

Closely related to teacher certification and re-certification, as seen in U.S. school systems, is 'teacher evaluation'. This is a periodic evaluation of the teacher's performance in his or her job. It is one of the areas that have been elaborately discussed in the literature. Issues of concern include the reasons/purposes for the evaluation, the factors that are incorporated, the people doing it, and the uses to which the results have been applied. There is no consensus found in the literature on any of these issues.

LeBrum (1986) contends that effective teacher evaluation is important and it influences the professional growth of the teacher. In

their report on the evaluation and professional improvement system in Florida State, Smith and others (1987) observe that learning is a product of teaching and it is the dependent variable against which teacher effectiveness is measured. They maintain that teachers should be held responsible for following valid methods of diagnosis and pedagogical procedures, although they also note that some of the factors that condition learning are beyond the teacher's control.

On the techniques of teacher evaluation, varied methods have been described in the literature. What is prevalent is that the States and Schools Districts that have mandated it develop their own techniques and their own instruments. On what is being evaluated, there is variety in content also. In Florida, for example, six domains of teaching behavior have been identified; namely: planning, management of student conduct, organization and development of instruction, presentation of subject matter, verbal and nonverbal communication, and testing of students. Evaluation focuses on these areas (Smith et al., 1987). Similarly, North Carolina evaluation system identifies and focuses on eight 'teaching functions', which are:

1. management of instructional time;
2. management of student behavior;
3. instructional presentation;
4. instructional monitoring of student performance;
5. instructional feedback;
6. facilitating instruction;
7. communicating within the educational environment; and

8. performing non-instructional duties (Holdzkom, 1987).

Other States and school systems adopt other classifications.

On who takes part in evaluation, the literature has shown many vigorous arguments. Principals, supervisors, peers, parents, and students have been identified as people involved or that should be involved. These arguments are interwoven with ones on the application of evaluation results. Smith and others (1987) maintain:

If a teacher is being observed to determine retention or promotion in position or salary, the teacher's principal may be a poor choice as the observer. If the purpose, on the other hand, is to determine where a teacher needs assistance, the principal's observations might be less questionable. (p. 19)

Darling-Hammond (1986) observes that involvement of peers in the evaluation process might be an important means of defining and enforcing professional standards in teaching. Mueller (1987) argues that parents can be partners with professional educators and share in the responsibility of improving the quality of education in the schools. If teacher evaluation leads to quality improvement, as many say, then parents' inputs to the evaluation process may be a necessity.

One group whose participation in the evaluation process has generated a lot of controversies is the students. Should students be involved in evaluating the teacher? If involved, for what purposes are the results of such evaluation used? These are some of the issues one find opposing views in the literature. Machina (1987) contends that good teaching requires that the instructor reaches the students, and student evaluation (of the teacher and of the instruction), if honestly

conducted, basically reports the extent to which the students have been reached. Therefore, the students' input is important in the evaluation process, whether the results are used for instructional improvement or for personnel purposes. But White and Ahmadi (1987) point out that many factors that influence an instructor's rating by students are not associated with learning. From their review of many other studies, they identified some of these factors to include instructor smiling or lack of it, instructor consideration, voluntarily having courses evaluated, the very wording of the evaluation questions, and the student's expectation of the grade to be received. Because of such correlations between non-educationally related variables and instructor evaluations, their validity has come into serious question, especially when the results are used to determine teacher's reward, pay or promotion. Sometimes, students are not involved directly in completing evaluative instrument, but their academic performance is taken as an indicator of the teacher's effectiveness. For example, in Farmington school community in Connecticut, this indicator is used solely to peg teachers' incentive awards (Streich, 1987). Whether this is acceptable, or not, is another expressed controversy in the literature.

The uses of teacher evaluation results are debated in the literature. Two approaches or models are prominent. These are the instructional improvement-oriented goal-setting model, and the accountability model. The former uses the outcome of the evaluation to design personnel development programs that help the teacher improve

professionally in his or her job. The latter uses the outcome of the evaluation for decisions on teacher salary, incentives, retention and/or promotion. During an interview with Brandt (1987), Tom McGreal, one of the leading voices in teacher evaluation noted that "unfortunately, many of the States - around 30 at this point - have mandated certain forms of teacher evaluation ... that are more accountability oriented" (p. 20). Some States use the results for combined purposes, for example, Florida (Smith et al., 1987).

Thorson, Miller, and Bellon (1987) describe the evaluation system that is in vogue in Hinsdale Township High School District in Chicago and report that the system is based on the following assumptions:

1. the primary purpose of evaluation is to improve performance;
2. the entire professional staff is responsible for instructional development;
3. people want to improve;
4. commitment to staff development is critical; and
5. instructional improvement processes are more important than forms and checklists.

With these assumptions, a system that everybody cooperates to implement is reportedly practiced. This report, coupled with the findings by Stiggins (1986) show that more cooperation is ensured, particularly from teachers themselves, when the aim of evaluation system is professional improvement than when the aim is for promotion, retention or incentive pay purposes.

The concluding question that one would probably ask on these issues of teacher certification and evaluation is 'what is the effect, in terms of student outcomes, of these practices when they are adopted in an educational system'? No results could be more disappointing as one obtained by Purser (1987) in a study of the relationship between teacher effectiveness and teacher evaluation and selected teacher demographic variables. This study involved a student population of 30,000 and certified staff of 1700. The findings supported the hypothesis that there was no statistical relationship between teacher effectiveness and variables of race, sex, level of certification, area of certification, or year of experience. Also there was no significant relationship found between the score on the traditional teacher evaluation summative report and teacher effectiveness. However, these results should be considered with caution as the study was conducted in an urban school district alone, and 70 percent of the student population were minority. The definition and measurement of variables are also issues to consider in interpreting these results (teacher effectiveness was measured by student outcomes - scores, and teacher evaluation was a principal's summative rating). But such results could be of concern to a foreign student or observer who becomes fascinated by the practices of teacher certification, re-certification, endorsement, evaluation, and such related phenomena, and is considering recommending them to the policy makers in his or her home country, if such practices are not in vogue already.

The U.S has come a long way on this issue of teacher evaluation/certification. After periods of opposition and controversy, new trends or what Buttram and Wilson (1987) call 'promising trends' have emerged. These are:

1. teacher evaluation has become part of the school reform movement;
2. districts are becoming more conscientious about relating evaluation criteria to research results on effective teaching;
3. training is being provided to ensure that evaluations are fair and reliable;
4. principals are increasingly accountable for implementing teacher evaluation systems;
5. districts are beginning to integrate evaluation and supervision and to tie evaluation findings to intervention-oriented staff development programs; and
6. administrators and teachers are collaborating more in the evaluation process. (Buttram and Wilson, 1987)

In the educational reforms that the new national policy on education in Nigeria sought to introduce in the school system, minimum competency test for teachers, teacher certification and re-certification, and teacher evaluation systems may contribute to the success of such reforms. The Nigerian students on the TTTP, majority of them being teachers before coming to study in the U.S., may be

observing with interest these practices in the U.S. school systems, and may opt to recommend them for implementation in Nigeria. However, the people making the recommendations may need to remember that implementing such practices would call for great investments of money and time (Holdzkom, 1987), among other things. At the same time, they may note too that "the return on the investment in terms of better educated children and more professional teachers will be greater" (Holdzkom, 1987. p. 44). The problems associated with the process of teacher testing, certification and evaluation are complex, but not unsolvable. Solutions are needed because "society can neither afford to have incompetent teachers teach our children, nor can it afford to deny competent persons the chance to practice their chosen profession" (Melville et al., 1987, p. 12).

Student Evaluation in Technology Education

Closely related to teacher evaluation as one of the strategies for educational or instructional improvement is 'student evaluation'. This is not evaluation of the teacher by the students, but the evaluation of students by the teacher. Ronda (1984) notes that one of the challenges of teaching is that of grading, and that some place down the the line in every course taught, there is an evaluation and report to the student and others regarding just how he or she stacks up in terms of course goals. Sometimes, this evaluation or grading is a major source of anxiety to students taking a particular course. The evaluation may

not only show the extent the student has mastered the objectives of the course, it may also form a major determinant in his or her progress toward another course, graduation, scholarship or any other incentive/award.

Evaluation of the student is very central in the educational systems of many countries. Arguments in the literature center not on whether evaluation should be done or not, but on the modalities of doing it. Dunham (1986) maintains:

evaluation is an integral aspect of the educational process because it provides the basis for determining the appropriateness of the curriculum, the effectiveness of instructional strategies, and the magnitude of student achievement. The significant role of evaluation is attested to by the fact all students in teacher preparation programs are required to take a course in testing, measurement, and/or evaluation. Furthermore, almost every textbook for courses on teaching, curriculum, and methods contains a section on evaluation. (p. 34)

Most teachers, whether in technology education or not, do student evaluation. The approaches adopted may vary not only with different teachers, but also with different subject areas, and with the purposes to be served by such evaluation. Dunham's view (cited above) has shown three distinct purposes of evaluating student progress in the classroom. These are determining (1) the appropriateness of the curriculum, (2) the effectiveness of instructional strategies, and (3) the magnitude of student achievement. Ahmann and Glock (1971) have added another dimension to the purposes of pupil evaluation (as they choose to call it). According to them, apart from helping the teacher to determine the degree to which educational objectives have been

achieved, pupil evaluation also helps or should help the teacher to know his or her pupils as individuals. This is based on the premise that if the teacher is intimately familiar with his pupils, he or she will be better able to plan educational experiences for them. Thus, student evaluation serves instructional purposes, apart from being a mandate from school administrations or something that has to be done to get the pupils to another level of their educational career, and create room for the incoming ones.

How then should student evaluation be carried out so that the results serve adequately the expected purposes? Are classroom tests and/or end of term examinations enough to do the job? How is it particularly carried out in technology education programs? These are some of the questions that have dominated the educational evaluation scene over the years. There have not been consensus on any of the issues in the literature, and there may not be one in the near future. However, there is preponderance of opinion that if teacher evaluation of the student is to adequately assess the magnitude of the student achievement, and if such achievement is to be of value to the teacher for instructional purposes, then the teacher must utilize a variety of assessment techniques in doing the evaluation, not just one technique.

In their study on ways of promoting excellence in the classroom, Sia and Sydnor (1987) examined many other studies on excellence in classroom, and from these, they have outlined the following as evaluation alternatives that have been used:

1. observation of student actual task performance;

2. documentation of student work samples;
3. use of rating scales;
4. assessment of work samples;
5. student workbooks;
6. student debriefing after a lesson;
7. role playing and simulation games;
8. performance checklists;
9. case studies and anecdotal records;
10. interviews; and
11. questionnaires and opinionnaires.

In addition to using a variety of techniques, the need to evaluate in the three domains of learning has also been expressed. In examining evaluation of student performance in vocational education, Wolansky (1986) maintains that teachers must evaluate not only cognitive and psychomotor skills, but also attitudes and perceptions; and they should base their evaluation framework on performance objectives. In describing the student evaluation system he has used with success for about nine years while teaching vocational subjects at Homer High School in Alaska, Ronda (1984) notes that vocational student grades are based on an appraisal of the students' attitudes, activities, achievements, and understanding. He notes further:

The important thing to be learned by the vocational student is that the successful employee or self-employed workman meets a variety of demands for excellence. He, or she, must successfully balance attitude with understanding, speed with quality, following instructions with independence, while meeting acceptable standards for punctuality, dependability, economy, and cleanliness. A glaring lack in any one area

can, and will negate even outstanding achievement in other areas. (p. 25)

Ronda's system is implemented with the intention that it would be of educational value to the student as well as a report to parents and a record of achievement for the school. The system is just one of the many systems that individual teachers and school systems in the U.S. have developed to evaluate students in their technology education programs.

Another aspect of student evaluation that has attracted elaborate discussion, and many a time controversies, in the literature is the kind of tests teachers do or should give in their classrooms. The targets at the opposite ends of the debate are 'norm-referenced tests' and 'criterion-referenced tests'. In norm-referenced approach, teachers score examinations and compare individuals' performances in terms of the relative positions they hold in some class or known group. Wolansky (1985) points out that such evaluation is very relativistic. An individual's achievement can still be very minimal, yet within a low performance class they could be in the top 25 percent of the class. He notes that "teachers have traditionally favored the norm-based evaluation" (p. 3). But Mehrens and Lehmann (1980) point out that:

In recent years, accountability, performance contracting, formative evaluation ... have spawned an interest in and need for new kinds of tests - criterion-referenced tests (CRTs), or, as some prefer to say, content-domain or objective-based tests. Test publishers are now paying more attention to the development of CRTs since many educators believe that norm-referenced tests (because they are concerned with making inter-individual comparisons) are inadequate for individualized instruction decision-making purposes" (p. 173).

Criterion-referenced approach focuses on how well an individual is performing in terms of a known standard or criterion, and reports the degree of proficiency achieved by an individual without reference to anyone else (Wolansky, 1985).

Closely linked with the concept of criterion-referenced evaluation are concepts of 'mastery learning', 'minimum competency testing', and 'competency-based curriculum or program'. Their meanings are interwoven. There have been recent calls in the educational scene for adoption of mastery learning as a learning approach in the U.S. schools. Benjamin Bloom (in Koerner, 1986) who is one of the proponents of mastery learning argues that the adoption of mastery learning is one of the ways to realize the effectiveness of the educational reforms proposed for the American schools. Walberg (1987) reviewed and synthesized 2575 studies and identified nine factors that contribute to educational productivity. He reports "that of all the instructional techniques investigated, the psychological components of mastery learning rank very high in their effects on educational outcomes" (p. 17). Another study took a review of more than 100 studies on mastery learning and concluded that the results indicated that mastery strategies indeed had moderate to strong effects on students learning when compared with conventional methods of instruction (Burns, 1979). Whiting and Render (1987) conducted a study to investigate the cognitive and affective student learning outcomes of 16 semesters of a mastery learning approach in teaching business and

distributive education courses. They concluded that mastery learning did produce successful learning experiences for at least 80 percent of the students. These results contribute to a large body of literature devoted to effects of mastery learning approach on student learning. Such body of knowledge was examined and synthesized by Guskey and Gates (1986). They gathered from these studies that group-based mastery learning programs have consistently positive effects on student learning outcomes - that include academic achievement, material generation, involvement in learning activities, and student attitudes. Some of these studies focused on elementary school students, some on high school students, and some on post-secondary students. Thus, the reported positive effects of mastery learning approach span through all levels of education.

Mastery learning is based on the premise that 90 percent of public school students can learn much of the curriculum at practically the same level of mastery, with the slower 20 percent of students in this 90 percent distribution needing 10-20 percent more time than the faster 20 percent (Ornstein, 1987). Bloom is quoted as saying: "... there are only fast and slow students instead of good and bad ones, and that all students can learn with time ..." (Shabat et al., 1981, p. 19). Mastery learning assumes or requires individualization of instruction, minimum competency testing, criterion-referenced testing, and 'formative-test, corrective-retake process', among other things (Hopkins and Antes, 1979; Ornstein, 1987; Shabat et al., 1981).

The implementation of mastery learning approach is also evident in U.S. technology education programs. Mastery learning, which goes hand-in-hand with competency-based learning/measurement, has been built into vocational education programs of many States. Massachusetts has what it calls 'competency-based vocational instructor approval process', and Florida owns the 'Florida State Student Assessment Test', which incorporates minimum competency testing (Beach, 1982; Maher and Thomas, 1982). In some States, the implementation is mandated by the legislature. Ferqueron (1984) notes that the minimum competency movement often becomes a testing movement because testing is the most immediate way for legislators to satisfy the public.

Implementation of mastery learning approach in technology education is not without problems. In it, modern course design that would utilize mastery approach requires five components, namely: task analysis, instructional objectives, criterion evaluation, taxonomies, and instructional systems (Shabat et al., 1981). The problems of implementation notwithstanding, mastery learning is "the wave of the future" in vocational education; it is "the state-of-the-art" (Shabat et al., 1981, p. 41). Five factors that contribute to improved testing in the schools, resembling the ones listed above, have been identified by Wolansky (1986). These are criterion-referenced evaluation, school effectiveness research, minimum competency testing, new concepts of student evaluation, and better teacher-made tests. These authors are just examples of many who have advocated or reported the adoption of

mastery learning, minimum competency, criterion-referenced testing, and other related concepts, as ways of improving the quality of education in American schools. Ornstein (1987) has warned, however, that the implementation of these concepts will not provide all the solutions to the problems apparently plaguing the American educational system.

One other phenomenon tossed out as a solution to the eroding quality of education in American schools is state-wide (standardized) graduation tests. They bear different names, the most common ones being 'minimum competency tests', 'high school graduation tests', 'diploma tests', 'exit tests', 'functional literacy tests', and 'survival skills tests'. The underlying idea behind these tests is that students (and teachers too) are thought, by the public, to be less well-prepared for academic and vocational activities than their counterparts of 15 and 20 years ago. The tests are, therefore, measures of assuring the public that the people passing out of public schools have possessed certain degrees of competencies or basic skills (Airasian, 1987). Airasian notes:

Tests have assumed new and important gatekeeping roles. By the end of 1984, 29 States required pupils to take so-called competency tests at selected points in the educational ladder. 17 States had passed, and more had pending, legislation that required high school students to demonstrate mastery on a State-mandated graduation test in order to receive a regular high school diploma. 8 States tied grade-to-grade promotion to pupils' performance on standardized tests. 32 States required teachers to pass standardized competency tests in order to obtain or maintain their certification to teach. (p. 55)

Airasian reports three characteristics of these tests used. The first is that they are mandated by State Legislatures or Boards of Education for all school districts in a State and for all or virtually all pupils in a district. The second is that these State-mandated testing programs eliminate most of the local district discretion in the selection, administration, content coverage, scoring, and interpretation of the tests. The third is that these tests have built-in sanctions or rewards associated with specific levels of test performance.

Apart from the seeming contradiction in the purposes to be served by standardized State-wide testings and teacher-made testing programs as ways to focus instruction to pupil needs, other concerns or 'problems' have been predicted for massive State-wide standardized testing programs. It is predicted that they will lead to tests, and the need to do well on them, becoming the driving force for instruction, thus making the content to be tested to dictate the material to be taught. The importance of non-tested subjects would also diminish in the curriculum since they would not be part of the path to a high school diploma. Also, it is feared the minimum acceptable test performance would become the academic goal of many students and teachers, thus, "the minimum would become the maximum" (Airasian, 1987, p. 59).

These fears notwithstanding, the practice continues in many States. Students are being tested to ensure that they possess certain

competencies as they graduate from high school to society/college, or as they progress from one grade to another. The tests cover general academic and vocational subjects. Many States have also developed and used competency-based vocational education which incorporates the same set of concepts. Presently, this researcher is aware of an effort of a doctoral student in Iowa State University, Ames at developing a standardized test of technological literacy.

What do all these practices mean to a foreign student who does not have all these phenomena going on in his or her country? What meanings are they to Nigerian students who are supposedly studying in the U.S. with the aim of going back to improve the educational system at home? The Nigerian government plans on a number of measures to implement the national policy on education, including the fact that "educational assessment and evaluation will be liberalized by basing them in whole or in part on continuous assessment of the progress of the individual" (Federal Republic of Nigeria, 1981, p. 8). This assessment, however, is yet to make use of a variety of techniques apart from written tests and examinations. The analysis of test results for instructional purposes is yet to appeal sufficiently to teachers. Mastery learning, minimum competency testing, criterion-referenced testing, State-wide standardized testing are innovations yet to strike the doors of the educational system. Whether Nigerian students would recommend these innovations as they observed them in U.S. for practice at home was the issue at focus.

Curriculum/Program Evaluation

Another phenomenon found in the American school system, and one often shown as having the potential of improving the system, is curriculum/program evaluation. This is the periodic evaluation of the curriculums and/or programs offered by the school, school district, local council, State Department of Education, or Federal Department of Education. Evaluation of school programs, as seen in the U.S., cuts across all disciplines and all levels of education. Technology education, therefore, shares similar treatments as other educational programs, with reference to evaluation. 'Curriculum evaluation' and 'program evaluation' are used in a generic way in this review as referring to the same thing or having the same purpose. They are used interchangeably, although there are minor differences between them.

Program evaluation has been defined in various ways and by various authors. There is a large volume of literature on program evaluation, and educational evaluation itself has evolved as a discipline and profession in education (Madaus, Scriven and Stufflebeam, 1983). Worthen and Sanders (1973) define evaluation as the determination of the worth of a curriculum (or portion of it), and that it includes gathering of information for use in judging the worth of the curriculum, program, or curriculum materials. Popham (1975) noted that "systematic educational evaluation consists of a formal assesment of the worth of educational phenomena" (p. 8). Narrowing it down to 'occupational education', Wentling (1980) defines evaluation as "the

collection of information and judgements to facilitate planning, to aid in the improvement of programs, and to meet accountability demands" (p. 19). These definitions have commonalities; mainly that information or data are gathered about programs, and decisions or judgements are made based on these information/data. Wentling's definition highlights three purposes of evaluation: planning, program improvement, and accountability.

Like other phenomena, educational evaluation has a history. Although Madaus et al. (1983) say a definitive one is yet to be written, they have traced this to the period of industrial revolution, the revolution that brought several economic and technological changes. But Wentling goes earlier than that. He reports that "formally documented systems of evaluation date back to 2200 B.C., to the elaborate system of competitive examinations used in the Civil Service Testing System of China" (p. 6). Evaluation of social agencies and functions featured in Great Britain throughout the nineteenth century, though these evaluation practices were informal and impressionistic. They represented attempts to 'reform education, the poor laws, hospitals, orphanages, and public health (Madaus et al., 1983, p. 4). The practices took the form of government-appointed commissions set up to investigate aspects of the area under consideration. The system of maintaining an external inspectorate to examine and evaluate the work of the schools was another approach to evaluation found in Great Britain, Ireland and the U.S. during the nineteenth century, according to Madaus et al. (1983).

In the U.S. in particular, Joseph Rice's comparative study on the value of drill in spelling instruction across a number of school districts between 1887 and 1898 has been generally recognized as "the first formal educational program evaluation in America" (Madaus et al., 1983, p. 6). From this initial beginning, educational evaluation has evolved through many stages, including the 'tylerian age' when Ralph Tyler, often referred to as the father of educational evaluation, conducted his famous eight-year study and first made the call that evaluation should focus on the measurement of behaviorally defined objectives of the course or curriculum. Today, educational evaluation is at the 'age of professionalization' when the field has emerged as a profession with better communication amongst practitioners, training and certification of evaluators, establishment of and cooperation among professional organizations, emergence of many journals in the field, and the promise of meta-analysis as a means of assuring and checking the quality of evaluations (Madaus et al., 1983). That is the brief history of educational evaluation in the U.S.

On the role of program evaluation, Saracho (1982) maintains that it is to encourage modifications to improve a program. Stake (1976) identifies three goals of educational evaluation, namely;

1. to foster an understanding of the current status of the educational system;
2. to provide data for the reward of merit and for the correction of shortcoming; and

3. to move the never-ending evolution of the curriculum toward a better balance among the rational, the intuitive, and the humane.

Combining Stake's views with Dunham's, who opines that evaluation provides the basis for determining the appropriateness of the curriculum, the effectiveness of instructional strategies, and the magnitude of student achievement, it is concluded that evaluation serves many functions in the educational enterprise.

Discussing why we evaluate in occupational education, Wentling (1980) notes that the Vocational Education Act of 1963 and its subsequent amendment of 1968, the Elementary and Secondary Education Act of 1965, and many more pieces of legislations have stressed evaluation of the public educational programs. He goes on to identify five reasons for evaluation in occupational education programs. These are (1) to aid in planning, (2) to aid in decision making, (3) to upgrade program personnel, (4) to improve programs for students, and (5) to insure the accountability of expenditures. Wentling's reasons agree with those advanced by Cronbach (in Madaus et al., 1983). Although Cronbach has not directly referred to them as reasons why we evaluate, he specifies them as "three types of decisions for which evaluation is used" (p. 102). These are:

1. Course improvement: deciding what instructional materials and methods are satisfactory and where change is needed;

2. Decisions about individuals: identifying the needs of the pupil for the sake of planning, and acquainting the pupil with his or her own progress and deficiencies;
3. Administrative regulation: judging how good the school system is, and how good individual teachers are, etc.

Cronbach is noted in the field of educational evaluation as the first person to argue that analysis and reporting of test scores would likely prove more useful to teachers than the reporting of average/total scores. He first coined the phrase 'evaluation for course improvement' (Madaus et al., 1983).

On the topic of what should be evaluated, many things have been suggested. Some of these are reflected in statements of roles, goals or purposes cited above. But Tyler (in Madaus et al., 1983) has identified six different aspects to evaluate, or six sources of information when evaluation in education is being carried out. Tyler chooses to call them "changes in conceptualization" of the evaluation concept (p. 77). These are:

1. There is the evaluation of a proposed educational program made by comparing the conception of the program with whatever relevant information or generalizations are appropriate to judge the soundness and practicality of the plan;
2. There is the testing out of curriculum units and their modifications in the light of the test results, often given a special label of formative evaluation;
3. There is the evaluation of implementation of a program;
4. There is evaluation in the continuous monitoring of programs to identify significant changes, either improvements or deterioration;

5. There is evaluation of the unintended outcomes of a program, as well as the effort to identify the extent to which the intended results are being achieved;
6. There is "follow-up" evaluation to ascertain the long-term effects as learners live and work in different environments, some of which are supportive and some otherwise. (p. 77)

Pointing out what to evaluate in vocational or occupational education programs, Finch and Crunkilton (1984) and Wentling (1980) have independently proposed the same model which include:

1. Context evaluation, which deals with whether or not to offer a curriculum and, if so, what its parameters will be including focus, goals, and objectives;
2. Input evaluation, which relates to deciding what resources and strategies will be used to achieve curriculum goals and objectives;
3. Process evaluation, which focuses on determining what effect the curriculum has on students in school;
4. Product evaluation, which deals with examining the effects of the curriculum on former students.

With this proposal, these authors have endorsed the Context, Input, Process and Product (CIPP) model of program evaluation developed by Stufflebeam (1969) as the appropriate model for vocational education programs. There are many other evaluation models proposed, discussed and criticized in the literature. These include Steinmetz's Discrepancy Evaluation Model, Airasian's Societal Experimentation, Wolf's Judicial Evaluation Model, Stake's Responsive Evaluation and Case Study methods, Eisner's Educational Connoisseurship, Guba's and Lincoln's Naturalistic Inquiry, Koppelman's Explication Model, Scriven's Goal-free Evaluation Model, Tyler's Behavioral-objective

Model, and the North Central Association's Accreditation method (Madaus et al., 1983; Sarapin, 1977; Steele, 1977). There are some commonalities and differences among the models. The main thesis of each model reflects what its proponent believes to be the meaning and mission of evaluation in a social phenomenon like education. However, Finch and Crunkilton (1984) and Wentling (1980) agree that the CIPP model has provided an excellent conceptual base for structuring evaluation and answering the question 'what should be evaluated?' in vocational education or training programs. The model helps to provide information for dealing with four distinct decision situations in education or training, which are "planning, programming, implementing, and recycling" (Wentling, 1980, p. 30-31).

Answering the question, 'what should be evaluated?' in the specifics, Wentling (1980) outlines the following as areas of concern for program evaluation: (1) administrative or management organization, (2) personnel, (3) objectives, (4) evaluation system, (5) content, (6) learners being served, (7) utilization of resources, (8) guidance, personnel counseling, placement, and other ancillary services of the program. For course evaluation, the concerns, according to Wentling, change slightly to: (1) students served, (2) goals and objectives, (3) organization, (4) personnel, (5) content, (6) teaching methods, (7) learning assignments, and (8) supplies, equipment, and facilities. The scope varies depending on whether an overall course is being evaluated or just a segment of it, says the author. While discussing evaluation

of programs, curriculums, courses, and materials, Finch and Crunkilton (1984) have distinguished between 'formative' and 'summative' evaluations. Formative is conducted while the program, curriculum, course or material is at developmental or implementation stage, and the results are used to improve the process. Summative, on the other hand, involves the examination of a completed item or product to determine its impact on the consumer. The results are used to make decisions regarding whether to retain, adopt or drop the item being evaluated (Finch and Crunkilton, 1984; Popham, 1975). Both types of evaluation have their places in the educational enterprise, and in technology education in particular.

Another issue in evaluation is the techniques that are used or should be used in carrying it out. This also has a direct link with who should be involved in the evaluation of a school program, curriculum, course or material. A variety of techniques and groups of people have been discussed in the literature as having inputs to make to the evaluation exercise. The guiding point, according to Wentling (1980), is that the design of an evaluation system should be "specific to the needs of the local education or training organization, and no design will be universal for all situations" (p. 38). The following are some of the techniques used in technology education programs.

Learner assessment

This is probably the most widely used evaluative technique. But as Cronbach has pointed out, the reporting of precise and average scores only does not help in improving the course. He says "the greatest service evaluation can perform is to identify aspects of the course where revision is desirable" (Madaus et al., 1983, p. 105). Test scores and other student data should be analyzed so that areas of program weaknesses could be gleaned from them. Student perceptions and attitudes should also be assessed and used as input in the evaluation exercise.

Follow-up of former students

Student follow-up studies provide delayed measures of learner performance, and can provide placement information, post-program activities, perception of the quality of the education or training received, the strengths and weaknesses of the program, and suggestions on ways of improving the program (Saracho, 1982; Wentling, 1980).

Employer-survey

This provides performance ratings of program graduates, and the employer's perceptions of the program's strengths and weaknesses. Such surveys, normally conducted through interviews or questionnaires, could gather suggestions on the needs of the employers and on the direction the school curriculum/program should follow (Paris, 1985; Wentling, 1980).

Consultative-team/Accreditation

A team of experts, internal personnel, community business and industrial personnel, and other types of individuals can be invited to review the organization, objectives, evaluation procedures, content, personnel, and other program/course components. The program's strengths and weaknesses, and recommendations of improvement strategies are highlighted at the end of evaluation exercise (Wentling, 1980). Raulf and Ayres (1987) add that "extensive self-study reports that are required by the accrediting agency can form the basis for program evaluation" (p. 22). Accreditation brings national recognition to the school and staff, and makes parents feel an increased sense of trust and assurance that their children are getting the right kind of education/training (Staff, 1987b).

On who should be involved in evaluating school programs/curriculums, Wentling (1980) outlines the following: administrative personnel, instructional personnel, learners, ancillary personnel (like counselors), advisory committee members, and external experts. Saracho (1982) adds 'parents' to the list, and suggests parents-teachers conference as one of the techniques. Supporting the involvement of program advisory committee members in evaluation exercise, Miller (1987) writes:

In concept, an advisory committee seems particularly well suited to assume an active role in program evaluation. The advisory function is in part, evaluative in that advisory committee members are expected to make judgements about program strengths, weaknesses, and directions and advise program staff members accordingly. Committee members are also expected to ground their judgements and related

suggestions in knowledge of program goals, methods, and accomplishments, as well as in the background of experience they bring with them to their roles. (p. 281-282)

Raulf and Ayres (1987) have also stressed the need to involve advisory committee members in program evaluation.

As a summary on the mechanics of program/curriculum evaluation, Saracho's report while examining 'new dimensions in evaluating the worth of a program' suffices:

illuminative evaluation employs a combination of methodological strategies to explain problems, issues and significant program features. These strategies include observation, interviews with participants (such as students, instructors, administrators and others), questionnaires and an analysis of documents and background information. A thorough evaluation surveys the educational goals including knowledge, attitudes, motivations and skills. The evaluator uses several methods to collect data from a variety of sources such as teachers, parents, students and any others who can provide pertinent information. (Saracho, 1982, p. 75)

As the review of literature has shown, the practice of program/curriculum evaluation is entrenched in the American school system, technology education programs inclusive. This could be another focus of observation and appreciation to a foreign national in the U.S. To a Nigerian in particular, some noticeable differences do appear in this area of program evaluation. An example is the issue of 'accreditation'. This difference is highlighted by Shirer (1987) in his report for the Committee on Research of the North Central Association (NCA) Commission on Schools, the NCA being the oldest and largest of the six voluntary accrediting agencies in the U.S. Shirer asserts that the original purpose of accreditation was to certify to

colleges that students had graduated from high schools which had adequate curricula and employed trained teachers. By late 1960s, the NCA had implemented its cyclical evaluation requirement which many schools adopted to meet public demands for accountability. Then, in the 1970s, the NCA began to accredit junior high schools, middle schools, and elementary schools, "thereby recognizing the importance of a student's experience from kindergarten through high school graduation" (p. 401). Accreditation programs for college preparatory schools, optional and special function schools, and vocational schools were also expanded during this period. Today, the scope has widened to include schools at all levels of education.

A typical format of accreditation involves the participating school conducting self-evaluation using criteria drawn by the accrediting agency. The school will then have the results of its self-evaluation verified by an outside evaluation team. The school has the obligation of meeting the standards set forth by the agency for it to continue in the evaluation exercise. It is the involvement of high schools and vocational schools in the accreditation exercise that constitutes a new experience to a Nigerian observer. Stoodley (1987) points out another difference:

The uniqueness of the American system is that it is nongovernmental, unlike systems in the many countries that have established ministries of education to oversee and supervise offerings. Voluntary in nature, the accreditation system is based on the work of various accrediting associations, which are responsible for establishing criteria for accreditation, arranging site visits, evaluating institutions that desire accredited status, and publishing lists of institutions and programs that meet certain minimum standards established by the criteria. (p. 35)

The practice of accreditation is not totally new to the Nigerian educational system. The National Board for Technical Education is a body that accredits programs in the Polytechnics and Colleges of Technology in the country. Recently, the Board has warned:

As from the next academic session, no polytechnic or college of technology will be allowed to admit students for courses not accredited by the National Board for Technical Education (NBTE), the chairman of the board, Alhaji Balarabe Ismail, has announced....The chairman said that in spite of the large turnout of graduates from polytechnics in all fields of endeavours, when put to the test some were found to be grossly deficient, adding that the board had a responsibility to the nation to ensure that proper manpower was produced for the advancement of the country's technology. (Staff, 1987a, p. 2230)

The experience of accreditation by Nigerian school system notwithstanding, the two noticeable differences when compared with the American system still stand out. These are (1) the involvement of high schools and vocational schools in the system, and (2) the voluntary participation on the part of the accredited schools. These have their own implications. Whether Nigerian students in the U.S. who witness the American system of accreditation would recommend similar practices for Nigerian school system is one of the aspects this study would unravel. Carvell Education Management Planning (1986), Doyle (1987) and Haney (1986) have reported on some of the States/schools in the U.S. that have formal evaluation of their vocational/high school/college programs, those that conduct follow-up of their graduates with positive results, and those that use analyses of student evaluation data to improve their school programs.

Issues in Administration of Schools

Effective administration is one of the factors that come into play in the implementation of any educational policy or law. The Nigerian national policy on education document stresses this point clearly:

The success of any system of education is hinged on proper planning, efficient administration and adequate financing. Administration includes organization and structure, proprietorship and control, inspection and supervision. (Federal Republic of Nigeria, 1981, p. 31)

Thus the successful implementation of the new 6-3-3-4 system of education in Nigeria which marks the introduction of technology education courses into the nation's secondary schools depends, in part, on effective administration. Administration is very generic and connotes many things to different people. As the Nigeria's national policy on education shows, administration includes organization, structure, proprietorship, control, inspection, and supervision of the educational enterprise, among other things. However, the specific areas chosen for consideration, perhaps, because of the seeming differences in the practices in U.S. and Nigeria, are government control of schools, school-industry/business partnership, advisory committees, student organizations, and vocational guidance.

Government control of schools

Education is one of the social services that most governments in the world try to give to their citizens. And since schools form one dominant set of agencies providing education, there is the

understandable tendency for the governments to control the schools.

The Nigerian government notes:

Education in Nigeria is no more a private enterprise, but a huge Government venture that has witnessed a progressive evolution of Government's complete and dynamic intervention and active participation. The Federal Government of Nigeria has adopted education as an instrument par excellence for effecting national development Not only is education the greatest force that can be used to bring about redress, it is also the greatest investment that the nation can make for quick development of its economic, political, sociological and human resources. (Federal Republic of Nigeria, 1981, p. 3-5)

Perhaps, there is no, or there should be no, question about whether governments should control or have a say on what their nation's schools are teaching their citizens, or on the types of citizens that are being prepared in the schools. Perhaps, the question should be, 'to what extent should this control be?', and 'which tier of government controls what aspect of education'? The educational responsibilities in Nigeria are shared by three tiers of government; the Federal government, the State governments, and the Local government councils. With the importance attached to education by the Nigerian Federal government, highlighted above, to what extent should it go in controlling or directing the educational systems in the country? In the statement of introduction to its national policy on education, the Nigerian Federal government points out that "it is the Government's wish that any existing contradictions, ambiguities, and lack of uniformity in educational practices in the different parts of the Federation should be removed to ensure an even and orderly development

of the country" (p. 1). Although there may be many interpretations to this statement, one of them could be that the government desires to see the same sort of educational practices or programs implemented in all the communities making up the twenty-one States in the country. In its policy on Secondary Education, the Federal government says:

Government will take over all secondary schools as soon as possible; but schools take-over will be without prejudice to community involvement and participation. Many States have already taken over secondary schools under their jurisdiction and States which have not yet taken over will be encouraged to do so. Such States are in fact already exercising effective control over all secondary schools under them. (Federal Republic of Nigeria, 1981, p. 11)

Explaining the meaning of this government take-over of schools, the policy statement elaborates:

Government control of secondary schools will involve regulating the opening of schools, supervising and inspecting all schools regularly, and ensuring the provision of well qualified teaching staff, and generally ensuring that all schools follow government approved curricula and conform to the national policy on education. (Federal Republic of Nigeria, 1981, p. 11)

Such control extends to include "the selection of persons of the right caliber for principalship of schools, ... and prompt disciplinary steps to deal with principals who misuse their powers or prove inefficient" (p. 13), the policy statement continues. Similar forms of control do extend to the colleges and universities in the country. Thus, the responsibilities of establishing (or approving for establishment of) secondary schools, recruitment and discipline of principals and teachers, overseeing and approving the curriculums/programs implemented in the schools are vested in the State governments. These are in

addition to funding. Little or no participation is open for the Local government councils and the local communities in such decisions as the kinds of programs the school should offer to serve their needs, who should be employed to teach in and/or administer the schools, among others. With the introduction of technology education programs in the secondary schools, the trend (of government control) will likely continue.

But the practice is different in the U.S. Discussing the organization of Occupational Education in the U.S., Finch and McGough (1982) report that local-level administration in U.S. is more student-centered, facility-oriented, and focuses on community needs and desires. They point out, however, that the local occupational education organizations have role to adhere to State and Federal regulations and guidelines, but they also meet the mandate of educational and political realities within the community. Giving reasons why local control of occupational education is widely practiced in the U.S., Finch and McGough explain that:

1. regulations and guidelines provided by federal and state agencies are sometimes out of focus with the educational needs of the local community,
2. local directors must be responsive to the needs and desires of the local community - that may be in conflict with the State and Federal guidelines, and

3. the philosophy of local control is a historical legacy in the country.

According to Finch and McGough (1982), local administrators strongly believe that they generally know what is best for their community, and State and Federal regulations/guidelines are respected and abided by only when they do not interfere with local program control and options. The local community usually reserves the right to protest, ignore, or reinterpret those State and Federal guidelines, regulations, and policies which they believe to be in conflict with their historic right to control education within their community. This local control is prevalent throughout the U.S. and has resulted in different communities in different States operating different programs with different modalities, all structured to serve the needs of the communities, while trying to meet Federal and State guidelines (Calhoun and Finch, 1982).

In his review of literature, Shirer (1987) reports that many research studies and national reports have shown that students can learn more effectively when local school people work together to implement their version of the principles of quality education. Although the Nigerian national policy on education recognizes the need of involving local communities in the operation of the schools, one wonders whether the implementation of such could reach the level of the 'American way', and whether the Nigerian nationals studying in U.S. and presumably observing the American way of local control of schools would

recommend same to the Nigerian educational system. Invariably, this would imply the local government councils sharing substantially in the running of secondary, technical and vocational schools in the country.

School-Industry/Business partnership

Another characteristic of technology education programs in the U.S. is the involvement of industry and business community in the affairs of the school. Calhoun and Finch (1982) reports:

A closer relationship is developing between the business and academic communities. Vocational educators are finding that many of the problems and techniques discussed in the classroom have reality in business, and they are looking more to business and industry for counsel and advice. On the other hand, business leaders are recognizing their responsibility to schools and colleges as sources of educated labor, scientific knowledge, a more favorable business climate, instructional materials, and on-the-job instruction. (p. 254)

The above report seem to summarize the reasons for a close working relationship between the schools (at all levels) on the one end, and business and industry on the other end. Both groups stand to gain from such a relationship. But in a study on business involvement and public school improvement in 23 large cities and 85 public school districts in U.S., Mann (1987) reports that "as often as not, the impetus for involving business in the work of the schools has come from school leaders, not business people" (p. 124). This involvement comes in the way of projects from which funds accrue to the schools. There is enthusiasm on the part of the business community also, according to Mann. Many businesses are eager to help the schools turn out well-

prepared citizens. It is estimated that 60,000 business-sponsored projects are currently underway in U.S. public elementary and secondary schools. Some business establishments also donate cash, equipment, instructional materials, and other kinds of facilities (Mann, 1987).

What are the benefits derived from the schools and business/industry communities working together? That is the question that any foreign observer in U.S. would be probably interested in. The cost of education seems to go up all the time, and everywhere. Schools, whether public or private, can not by themselves alone meet the financial challenges that come every school year. The involvement of business and industry helps in a significant way in this direction. Helping to bring down the drop-out rate in high schools is another benefit of business/industry partnership. Justiz and Kameen (1987) report how Rich's Academy in Atlanta and Peninsula Academics in California, both model programs and examples of business-school partnership, have helped many at-risk youths from dropping out, thereby keeping valuable human resources from being squandered. Industries and businesses also contribute by offering summer employment to students and also offering opportunities for internship (Justiz and Kameen, 1987; Mann, 1987). Calhoun and Finch (1982) and Martin (1987) place much of the responsibility of developing and maintaining school-business partnership on the vocational education teacher and administrator. Martin believes that by going out to mix with the community, joining and participating actively in their clubs and

associations, the teacher can attract much attention from the community to the school and school programs. Calhoun and Finch maintain that the partnership helps the school to adjust its curriculum to meet the needs of its employing community and of its graduates, and can bring into proper focus the school, the student, and the business and industrial community. Thus the teacher's and/or administrator's acumen in public relations is reported to play a substantial role in establishing, maintaining and deriving benefits from school-business/industry partnerships.

Not that business/industry is completely left out in the Nigerian school system. The national policy on education education maintains, with reference to technical education, that "in the designing of courses, industry and government will be consulted with a view to giving such courses greater practical relevance" (Federal Republic of Nigeria, 1981, p. 20). That is the extent of the involvement of business and industry in the affairs of the Nigerian schools. Comparing the two countries, Nigeria and the U.S., one sees a glaring difference in the extent and amount of support the business and industry community is providing the schools, particularly the secondary schools that now run vocational programs. The Nigerian students in U.S. presumably observing the nature of U.S. school-business partnership do have a basis to recommend the same to the home country, if their basis warrants such recommendation.

Advisory committees

Closely related to the issue of school-business/industry partnership is existence of advisory committees for schools and school programs. Advisory committees have been cited as one of the ways of implementing school-business partnership (Federal Republic of Nigeria, 1981; Martin, 1987). Finch and McGough (1982) define occupational advisory committee as "a group of knowledgeable and concerned citizens, organized to provide guidance for the organization, operation, and improvement of occupational education" (p. 161). Historically, the American public has participated in educational change at the local level through membership in citizen advisory committees, report Whaley and Sutphin (1987). A review of legislative history reveals that action regarding advisory committees in vocational education in U.S. dates back to the Smith-Hughes Act of 1917. Since then, the law has placed a demand for National Advisory Council to advise the president and congress on vocational education matters, State Advisory Councils to advise the state governors and legislatures, and Local Advisory Councils to advise the local councils and districts. In most of the cases, these requirements are among those that must be met to qualify for government funding (O'Neal, 1981; Watson, 1982).

There are three types of advisory committees in U.S., or three levels at which advisory committees operate. These are:

1. Occupational program advisory committee - which serves particular school programs like electronics, and automobile mechanics;

2. Occupational school advisory committee - which operates at the school level and serves the entire programs in a particular one school; and
3. Administrative unit advisory committee - which serves all the schools and programs within a certain administrative unit. The unit can be a district, county, multi-county, state, or the entire nation (Finch and McGough, 1982).

Of these, program advisory committee is reported to have the greatest impact at the level of the occupational teacher and student. Calhoun and Finch (1982) and Finch and McGough (1982) outline the following as some of the functions performed by occupational advisory committees:

1. aiding in the determination of present and future labor market needs;
2. aiding in the identification of community occupational education needs;
3. aiding in determining the need for establishing and continuing occupational programs;
4. providing advice related to the occupational curriculum, including content, focus, facilities, equipment, and materials;
5. assisting in evaluating program effectiveness;
6. participating in the development of school community relations;
7. assisting in identifying community resources that will aid the occupational education program; and
8. assisting with the placement of program graduates.

These authors emphasize that the committees exist only to provide advice, and not to dictate to the school or program director what must be done.

What are the results of establishing advisory committees for school programs? In a study on the status and influence of agricultural advisory committees in California which involved all the head teachers of all California vocational agricultural programs, Whaley and Sutphin (1987) conclude, among other things, that advisory committees provide a worthwhile function and are used in a majority of the programs. They also found that effective committees in California focus most of their attention on curriculum development, management of teaching facilities, equipment selection and use, program evaluation, and articulation with the school science curriculum. The authors, who report 78.9 percent response of their questionnaire, recommend that advisory committees should be established and maintained for all vocational agricultural programs. Although this study focused on one vocational program in just one State of the nation, the results can be generalized to other situations. The results do underscore, again, the importance of advisory committees for school programs. Although the Nigeria national policy on education has recognized the need for advisory committees by specifying that "increased use will be made of Advisory Boards for each group of courses and trades" (Federal Republic of Nigeria, 1981, p. 20), the recognition has hardly gone beyond such statement on paper. Perhaps, the Nigerian students in U.S. observing the working of advisory committees in U.S. school system may have a different view.

Student organizations

The functioning, recognition and active involvement of student organizations in vocational education programs is another characteristic of technology education programs in the U.S. Explaining what they call 'participatory involvement in the planning process', Finch and McGough (1982) maintain that planning occupational education requires the involvement of several special groups; from professional educators and experts to community members, parents and students. They conclude:

Organized groups of special students are very effective as sources of input to occupational leaders and controlling boards of education. Creative use of organized parent associations and student organizations will provide support for the planning and delivery of services to students. (p. 125)

Vocational Student Organizations is the generic name given to the various student organizations in the U.S. technology education programs. They serve as an integral part of the instructional program, and they "significantly help secondary, post-secondary, and college students develop vocational/career competencies and leadership skills" (Calhoun and Finch, 1982, p. 333). These authors have also outlined the names of various student organizations officially recognized by the U.S. Department of Education. Notably, each subdivision in the 'vocational education family' has a government-recognized student organization.

In more specific ways, Baker, Erickson and Good (1985) give some of the benefits of integrating vocational student organizations into school programs as the following:

1. help in instructional process and preparation or improvisation of instructional materials;
2. help in improving students' attitudes toward the instructional program;
3. enhancing and expanding the content of the instructional program - helping students relate content to the real world;
4. giving students recognition and improved self-esteem;
5. students tutoring and helping one another in a more organized pattern; and
6. playing active role in the school public relations by drawing more to the schools, parents, business and former students to share in their activities.

Both the students and teachers/administrators are the beneficiaries in such organizations that staff members get actively involved as advisers. Baker et al. conclude: "Ultimately, AIASA will influence and upgrade industrial arts programs across the nation. The activities can be vehicles that attract the best talent to the profession" (p. 14). Although the authors cited are reporting about American Industrial Arts Students Association (AIASA) which is the recognized student organization for industrial arts/technology programs in U.S., these benefits apply in other student organizations. Nigerian technology education programs may find similar benefits if a system of coordinated student organizations are recognized and encouraged in the schools, depending on whether those observing these practices in the U.S. would consider them transferable.

Vocational guidance

Frank Parsons proposed a theory of vocational choice at the beginning of the twentieth century. The theory has continued to influence vocational guidance to the present day. According to Parsons, the wise choice of a vocation involves three factors:

(a) a clear understanding of yourself, your aptitudes, abilities, interests, ambitions, resources, limitations, and their causes; (b) a knowledge of the requirements and conditions of success, advantages and disadvantages, compensations, opportunities, and prospects in different lines of work; (c) true reasoning on the relations of these two groups of facts. (Parsons, 1908, p. 5)

Using Parsons's theory, the implication for vocational education was the evolution of vocational (or career) guidance, and the emphasis was the matching of an individual to an occupation that was the most suitable. Early work on vocational/career guidance led to the development of several popular instruments used to provide this guidance in some cases. These include the Strong Vocational Interest Bank, the Kuder Preference Record, the Differential Aptitude Test, and the Guilford-Zimmerman Aptitude Survey (Calhoun and Finch, 1982).

Perhaps, there is no doubt, both in Nigeria and in the U.S., about the importance of vocational guidance to the teeming population of vocational education students. But in the U.S., "guidance and counseling is often a major component of some institutions" (Finch and McGough, 1982, p. 217). There are guidance counselors on the staff of the schools, and their duty, among others, is to counsel students on career, emotional, psychological, employment, academic and other needs.

Although frictions do exist at times with the classroom teachers (Herr, 1987), the practice is reported to help teachers, students, administrators and the nation. Nigeria can borrow a leaf from U.S. if the Nigerian students in U.S. perceive such practice to be transferable.

Issues in Technology Transfer

Basis, dimensions and model of technology transfer

Kindra (1983) has demonstrated that less developed countries are highly dependent on technology from developed countries. He gives the following as factors contributing to this technological dependence (1) a high illiteracy rate, (2) lack of capital (accounting for 75 percent of the world population, but only 20 percent of its income), (3) lack of incentive, (4) lack of skills, and (5) lack of means of production. Emmanuel (1983) is more emphatic in maintaining that technology transfer is a shortcut to third world development. But Samli (1985) adds that technology transfer is a shortcut not only for third world countries, but also for all the countries of the world. It is important to developed countries as it is to less developed ones. It is important not only for world understanding, but also for taking advantage of progress in different parts of the world in applying modern science to economic activity. Explaining the basis for technology transfer, Samli continues:

Just because nations are not endowed equally in terms of natural resources as well as people's temperaments or talents, technological advances have been uneven. This

unevenness of technological progress throughout the world provides the basis for technology transfer. (Samli, 1985. p. 3)

The author maintains that technology transfer will, among other things, lead to narrowing the gap between the rich and the poor countries (not eliminating the gap completely, he emphasizes). Better utilization of resources, fast industrial progress, and elimination of economic underdevelopment are other feasible outcomes of successful technology transfer identified by Samli.

Singh (1983) reports that "the technology transfer process is immensely complex, and depends on a multitude of variables, many of them often hard to identify and harder still to quantify" (p. 1). The complexity of the process necessitates modelling this process, according to Samli (1985). Such a model can help explain the process itself and also the hurdles or hindrances it has to overcome. Developing such a model is extremely important to find better ways of transferring the total knowledge and processes that technology commands, says Samli. He identifies SIX dimensions of technology transfer as geography, culture, economy, people, business, and government, and discusses the role each dimension has to play in the technology transfer process, emphasizing that each dimension is very important.

Samli has also proposed and discussed what he calls 'the basic model of technology transfer', which is shown as Figure 1 in this report. This model has FIVE components, namely: the sender, the

technology, the receiver, the aftermath, and the assessment. According to Samli, the sender must have enough knowledge and sensitivity as to the receiver's background and needs, and must have the willingness to send the technology. The technology itself which embraces a lot of things including hardware, software, supporting activity, and application of science to economic activity, must be appropriate to the receiver's needs. This appropriateness must be assessed on the basis of numerous factors including market, raw materials, economics of scale, labor, and machinery (Teitel, 1978). The receiver's needs, readiness and background are at least three factors that must be considered in the transfer process. Each country has different needs, resources, values, and cultures, and successful transfer involves the sender understanding not only the receiver's needs, but also the priority ordering of these needs. The receiver also has the responsibility of considering the proper adaptation of the transferred technology to its peculiar needs, based on the uniqueness of its resources and the prevailing economic conditions. The aftermath and the assessment are two steps involved in the total outcome of technology transfer. Aftermath is related to the immediate and mostly the direct impact of the transferred technology. Assessment relates to the longer-run and far-reaching outcomes. These two are very important so that "future attempts will be more successful" (Samli, 1985, p. 13). Hetman (1978) identifies SIX main areas used as key criteria for technology assessment studies. These are technology, economy, society,

the individual, the environment, and the value system. Thus, these authors and many others have expressed both the indispensability and the complex nature of technology transfer.

Conditions, problems, and barriers of technology transfer

With the consensus in the literature on the complexity of technology transfer process, some authors have moved a step further to identify the conditions that would necessitate or guarantee a successful transfer process, and also the problems and the barriers that more often than not characterize such transfer process. In an elaborate study of models and practices of technology transfer and economic development for developing countries, Singh (1983) identified and reported FIVE conditions of technology transfer. These were:

1. willingness of transferee and transferor,
2. stable and efficient government,
3. research and development,
4. appropriate education system, and
5. proper planning and financing.

Stewart and Nihei (1987) add 'absorptive capacity' to the list. It is noteworthy to see appropriate education system and proper planning and financing as some of the major conditions of technology transfer. The implications of this is that when these conditions are not satisfied, the transfer has the tendency of facing serious problems.

Discussing multinational corporations and the management of technology transfers, Cavusgil (1985) has highlighted the following as some of the basic problem areas in technology transfer:

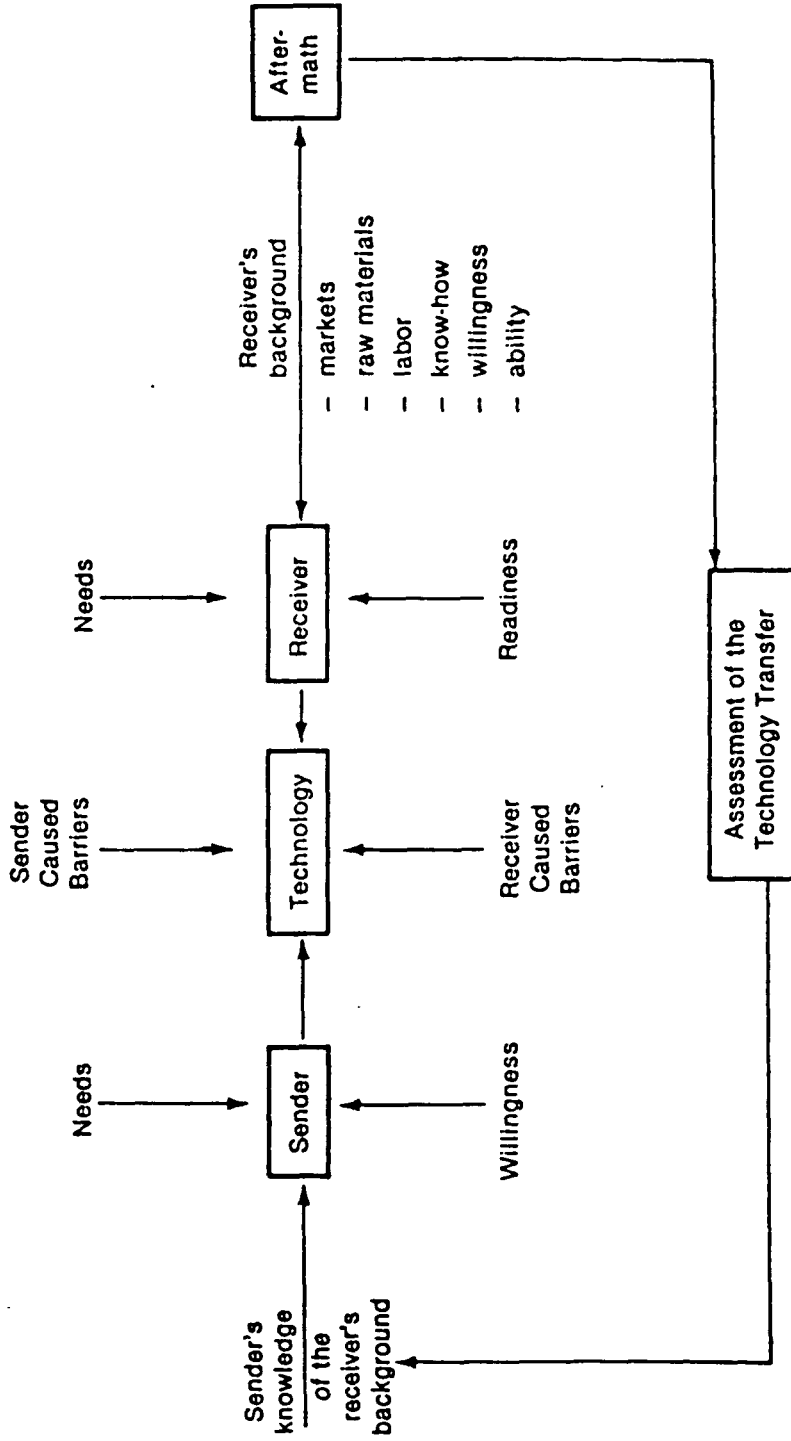


Figure 1. The basic model of technology transfer (adapted)

1. the technology transferred does not take into account the social costs that may be incurred,
2. the technology transferred is not suited to local needs,
3. the technology transferred is a lemon - the failure of technology in a new environment, probably because of faulty application, inadequate transfer, untested processes, or just plain inefficiency, and
4. there is a lack of understanding in the transfer process.

Cavusgil's listing bears some similarity with that of Matlock (1984). Matlock presents, in order of seriousness, the following as the problems of technology transfer:

1. misunderstanding of user's problems,
2. lack of developers/adapters of new technology,
3. ignorance and lack of awareness of new technology,
4. failure of change agents and facilitators, and
5. possessive and restrictive attitude toward new technology.

Others have still identified what they call 'barriers' of technology transfer. In their study of China's four modernization programs, Kosenko and Samli (1985) report that education (intellectual skill), industrialization, culture, availability of natural resources, political structure, state of urbanization, and extensiveness of infrastructure, are some of the major factors that can impede or promote any technology transfer efforts. The authors label them "barriers of technology transfer" (pp. 119-126). It is the

availability or lack of these factors that constitute a barrier. Gwiasda (1984) elaborates more on one of these factors - cultural barriers. He observes that resistance to modernization, seen in some societies, brings a consciousness that sociocultural conditions cannot be ignored in instances of technology transfer. He presents two views about the role of cultural values (of the recipients of technology) in the transfer process. One is that cultural values are a barrier to development, and they must be altered to permit adoption of the advanced technology. The other is that cultural values are something to be preserved, and therefore, what is needed is a technology that is shaped to fit the cultural values of its intended users, and thereby introducing the concept of 'appropriate technology'.

There may not be categorical distinctions among what the authors have chosen to label 'conditions', 'problems' and 'barriers' of technology transfer; but the works of these authors have brought to focus the role each of these factors has to play in the process of technology transfer, and why each one should not be taken for granted.

Channels/Agents of technology transfer

The discussants of the problems of technology transfer have pointed in the direction of 'change agents', 'facilitators' and 'adapters' as some of the potential spots of problem in the transfer process. But who/what are these agents? In his study, Singh (1983) identified the following as 'channels' of technology transfer: (1) direct foreign investment, (2) foreign collaborations, (3) personnel

transfers, (4) exchanges and missions, and (5) the military. On personnel transfers, Singh opines that purposeful employment of foreign technicians by a developing country is a means to circumvent the shortage of technically trained manpower. He explains why some countries take to that, namely: "... educating native personnel in science and technology presents special problems of education, training, and cost in an area where funds and training experts may be scarce" (p. 59).

In a related discussion, Shayo (1986) has identified FIVE ways of transferring science and technology from developed to developing societies. These, according to him, are:

1. voluntary expatriates (brain drain),
2. expatriates on special missions to their home countries,
3. personnel training in the developed country,
4. importation of technology, and
5. inter-institutional cooperation.

Of these five ways, personnel training in the developed countries seems to be the one favored by both parties (developed and developing countries). This is reflected in the number of exchange training programs throughout the world, and in the number of foreign students streaming into the developed nations to study.

Contributing still to the discussion on technology transfer agents, Stewart and Nihei (1987) report:

Technology transfer may be accomplished by a diversity of agents, and through a variety of mechanisms. Agents may be organizations in the receiving country, such as business

firms, government agencies, or universities. Agents may also be foreign organizations, including universities; international organizations such as the World Bank, and the Asian Developing Bank; and government organizations, such as the United States' Agency for International Development (AID) and Japan International Cooperation Agency (JICA). (p. 8)

To be noted in these discussions on channels and agents of technology transfer is the point that a variety of approaches are involved in the transfer process. The participants in the process choose the approach(es) they consider appropriate to their needs. In the case Nigeria, one of the approaches adopted in the 'educational technology transfer' is one of the five identified by Shayo (1986), namely, 'personnel training in the developed countries'. The countries having the technology (in technology education programs, in particular) that are chosen are the U.S. and Canada. The literature has shown other approaches that can be adopted, such as inviting the experts from abroad to come and train the people in Nigeria. The literature has also shown that the personnel undergoing the training are the agents that, with other agents, have predominant roles to play in the technology transfer process. One of these roles may be deciding on the appropriateness, transferability or applicability of the training experiences or technologies to which they have been exposed. They can also decide on the appropriateness of the channels or approaches adopted so far by Nigeria to address the challenges of technology education.

Nigeria and the TTTP

Grouped in the category labelled 'third world countries', Nigeria is a vast and diverse country. It is a federation of twenty-one (21) States and an area called the 'Federal Capital Territory'. It lies in the tropics, between latitude 4 degrees and 14 degrees North of the equator, and between longitudes 3 degrees and 15 degrees East of Greenwich. It occupies an area of 924,000 square kilometers (356,669 square miles). The population as at 1963 census was 55,670,000, but is recently estimated at 100 million (Williams-Russel, (no date), distributed into about 250 cultural and linguistic groups. It is about three-and-a-half times the size of the United Kingdom, and occupies one-seventh of the total mainland area of West Africa. It is the most populous country in Africa. Its population is greater than that of all the other West African countries put together. It is an agricultural country, producing cattle, goats, poultry, fish and a variety of food and cash crops (Iloeje, 1972; Taiwo, 1980).

Nigeria gained political independence from Britain in October, 1960. Shortly after this, the relevance of the educational system in the country began to be questioned vis-a-vis national, economic and social needs. For example, the graduates of secondary schools had no employable skills, and, therefore, while unemployment was spreading, the nation's industries were suffering from shortages of skilled labor. Part of the reason was that the voluntary agencies which pioneered Western education in Nigeria were unable to increase or popularize

technical and vocational education on the same scale as literary education since the former is much more expensive in terms of staff and equipment (Fafunwa, 1974).

The response to the growing public displeasure with the prevailing educational system was the holding of a national curriculum conference in 1969 sponsored by Nigeria Educational Research Council. The conference formulated a draft of 'A Philosophy for Nigerian Education', a document that formed the basis for the Federal Government's publication of a 'National Policy on Education' (Nwoke, 1986; Taiwo, 1980). One of the prominent features of the new policy (first published in 1977 and reviewed in 1981) was the extension of secondary school education from five to six years, consisting of three years of junior secondary and three years of senior secondary education. The Policy outlines, among other things:

The junior secondary school will be both pre-vocational and academic.... Students who leave school at junior high school stage may then go on to an apprenticeship system or some other scheme of out-of-school vocational training. The implementation of the 3-year senior secondary school system will mean ... the inclusion of technical, commercial and other vocational courses in order to make senior secondary school leavers immediately employable. (Federal Republic of Nigeria, 1981, p. 18)

Thus, the implementation of the new policy, which began in 1982, marked a new dimension in Nigeria's educational endeavors.

But such implementation came with challenges, one of the serious ones being the lack of qualified technical teachers for the vocational courses. In anticipation of this problem, the policy document had

stated: "Crash and emergency programmes will be mounted to produce a large number of science, commercial, technical and craft teachers" (Federal Republic of Nigeria, 1981, p. 20). One of these emergency programs was the sending of Nigerians to overseas institutions to be trained as technical teachers. This measure, like previous and similar 'emergency programs', has its limitations (the measure is currently in operation). As pointed out by Nwoke (1986), the number of teachers that could be trained by this method is limited because of scarce foreign reserves; and, perhaps, more importantly, the training acquired overseas by these teachers may find little local application. The government is, perhaps, convinced that stopping the 'emergency programs' would not help the situation either.

The TTTP

Under an agreement signed in September, 1981 by Nigerian (then) Vice-president Alex Ekweme and the U.S. Vice-president George Bush, the governments of the Federal Republic of Nigeria and the United States of America embarked on a cooperative program through which Nigerian Vocational/technical teachers and prospective teachers have been receiving training in U.S. universities leading to bachelor's and (few) master's degrees in vocational, industrial, technical, technology, agricultural, home economic, and business education. The program, called the (Nigerian) Technical Teacher Training Program (TTTP), is fully funded by the Federal government of Nigeria, and is administered in the U.S. by the Agency for International Development (AID), Office

of International Training. Although seen as one of the 'emergency programs', the TTTP was a result of an initiative on the part of Nigeria to emphasize professional and technical development of vocational teachers. It was initiated to address the serious impediment to Nigeria's sustained industrial and technological development posed by the inability of its institutions to keep pace with demands for well-trained middle-level technical manpower; such demands of the newly adopted educational policy (Agency for International Development, 1986; Federal Ministry of Education, 1986).

The background of the TTTP participants is somewhat varied, but most of them have had teaching experience in their subject areas before coming to the U.S. Some have taught at secondary/technical school level, some have taught at post-secondary level (in colleges and polytechnics), some have worked in industries, and some have worked in State or Federal ministries or departments. A primary objective of the program is in-service training to upgrade the teaching skills of participants, and provide, in few cases, pre-service training to persons who have had no previous teaching experience. The selected candidates are those expected to be able to complete their degree requirements in U.S. within a maximum of two years, including summers (Agency for International Development, 1986; Federal Ministry of Education, 1986).

The Federal Government envisaged that the TTTP training would enable the participants to contribute to the development of Nigeria on

returning home (Federal Ministry of Education, 1986). One expects that in making such contributions, the participants would draw from their experiences and the 'technologies' they had been exposed to while studying in the U.S. The transferability or applicability of some of these 'technologies', particularly those that relate directly to technology education programs in U.S. was the focus of this study.

Relationship of the Literature Review to Present Study/Summary

There are several aspects of any academic program or sets of programs that require attention, or that have been given attention in the literature. Each aspect has had an elaborate treatment. Thus, it would be very difficult to focus on all aspects of any program in a particular study. There arises the need for selecting some aspects to consider. With technology education programs in the U.S. at the focus, the study, and hence, the literature review, have considered six different aspects; namely: content, teaching methods, teacher preparation and evaluation, student evaluation, curriculum/program evaluation, and administration. Each of these aspects has had an elaborate coverage in the literature. However, greater attention was given to those characteristics, under each aspect, that bore a difference, in the researcher's judgement, with the corresponding characteristics in Nigeria's technology education programs.

The literature has shown that the content taught in the U.S. technology education programs has a basis from which it evolves. Needs

assessment is shown to be one of the techniques often used to identify the needs, perceptions and concerns of the different parties that have a share in the development of any vocational program. Task analysis is also shown to be the technique used to identify the competencies needed by people in a particular field, and these competencies are then used as guiding factors in formulating a new content for a vocational program, or revising an old one. The content selected has to be delivered, and the review has identified individualized instruction as one of the techniques used in the delivery of vocational programs - the reason being that it takes into consideration the needs of the student. Computers have been used to facilitate instruction and a particular attention has been paid to handicapped and disadvantaged learners in the U.S. school system.

The literature has shown some differences in the U.S. school system on the issue of teacher preparation and evaluation (as compared to Nigerian system). In addition to acquiring diplomas/degrees, prospective teachers go through the process of certification, re-certification, endorsement, and minimum competency testing. The teacher goes through different forms of evaluation by different people - principals, the students, peers, parents-teachers associations, and professional organizations. Different techniques of assessing students' academic progress have also been pointed out in the literature. Cases for and against mastery learning, minimum competency and school test standardization have been discussed.

The need for and practice of periodic evaluation of the school curriculum/program have been highlighted. The reason for evaluation which Cronbach (in Madaus et al., 1983) emphasizes as improvement of instruction has been identified in relation to other outcomes of evaluation. The literature has shown some of the main approaches that have been used to evaluate vocational programs. Students' evaluation, follow-up of program graduates, studies of employers' appraisal, and use of advisory committees and parents-teachers associations as evaluation approaches have been discussed with the highlights of their merits. The place of accreditation in vocational programs in the U.S. has also been discussed.

Some characteristic features in the administration of U.S technology education programs have been highlighted. The extensive involvement of local councils or districts in the operation of elementary, secondary and vocational schools, the establishment and maintenance of close working relationships between school and business/industry, the establishment of advisory committees for vocational programs/schools, the utilization of student organizations for instructional purposes in the schools, and the maintenance of guidance and counseling staff, separate from the teachers, in schools are some of the unique features in the U.S. education programs that have been identified and reviewed in the literature.

The last aspect of the review centered on issues in technology transfer. The basis, dimensions, model, conditions, problems,

barriers, and agents of technology transfer have been highlighted in the literature. The different approaches that developing countries can adopt in addressing their development problems have also been highlighted.

This study was essentially one on technology transfer. The literature review helped to identify some of the 'technologies' prevalent in the U.S. technology education programs. It also helped to identify some of the problems and/or conditions that underlie the transfer of any form of technology. The review gave the present researcher insight and direction in drawing up the survey instrument, selecting the appropriate statistics for data analysis, and designing the general methodology of the study, all in an effort to identify and catalog the perceptions of Nigerian students who were observers of these 'technologies' in the U.S. on the transferability or applicability of these 'technologies' in Nigeria.

CHAPTER III. METHODOLOGY

In this chapter, the methods and procedures used in carrying out this study are described. They are reported under five sections:

1. Description of population and sample for the study.
2. Development of the data collection instrument.
3. Validation and pilot-testing of the instrument.
4. Data collection method.
5. Research design and data analysis methods.

Description of Population and Sample for the Study

Population

The population for this study as suggested in its topic includes all the Nigerian students studying technology education programs in various universities across the entire United States of America. But since it was difficult to locate and reach such a population, and since the Nigerian Federal Government has been intentionally and specifically placing her students in U.S. to study technology education under the TTTP for the past seven years, it was the researcher's judgement that a group of these government sponsored students would constitute an appropriate population for use with the research problem under consideration. The population, therefore, selected for this study was the group of Nigerian students who came to the U.S. in 1986 under the Technical Teacher Training Program (TTTP) sponsored by the Nigerian Federal Government, and administered in the U.S. by Office of

International Training, Agency for International Development (AID). The number of these students were approximately 220. They were studying at about 23 universities in different parts of the U.S. Some of them studied for bachelor's degrees, some for master's degrees, and some for both. They came from varied backgrounds and from different areas of specialization. Although selected and sent by the Federal Government, the students came from different employers - State teaching commissions, post-secondary institutions, State and Federal civil service, and industries. They studied for degrees in Industrial/Technology/Vocational/Technical Education (the name varied with the university).

Sample

It was the decision of the researcher and his graduate committee that the population was not too large to warrant picking a sample from it. So, all the students in the 1986 group of TTTP students were used for the study. However, it was not possible to identify all of these students. As a result of procedural and logistic issues, the AID office in Washington, DC did not release the list of the students to the researcher. The office of Nigerian Embassy in Washington, DC also did not respond to the researcher's request. Some other way was devised.

A list of universities and coordinators of internship programs for the TTTP students at each participating university was secured from the Internship Coordinator at Iowa State University, Ames. Letters were

sent to these coordinators and they were requested to indicate the number of 1986 group of TTTP students in their schools, and also their (coordinators') willingness to assist the researcher in reaching the students with the questionnaire that was to follow. Where no response was received after follow-up letters and telephone calls, direct appeals were made to the chairpersons of the departments where the students studied. From this rather indirect and difficult approach, 208 students from the defined group were identified (about 95 percent of the people in the defined group). However, 4 students at Iowa State University, Ames who belonged to the defined group were excluded from providing data for the analyses reported in Chapter Four. One of them was the researcher (the executor of the study), and the other three were among the group that was selected for pilot-testing of the instrument. Therefore, the sample used for the study consisted of 204 TTTP students of the 1986 group that studied at 22 universities in different parts of U.S. The number of students identified at each university is shown in a table under the section of data collection method.

Development of Data Collection Instrument

The instrument used for data collection for this study was a Questionnaire. It was developed by the investigator who derived inputs from the review of the literature. The questionnaire items were designed around the three issues addressed by the study. Under the

first issue dealing with aspects of U.S. technology education programs, the items were organized under the SIX units selected by the researcher for consideration. The units were content taught, teaching methods, teacher preparation and evaluation, student evaluation, curriculum/program evaluation, and administration. A total of 34 items, with Likert-type response categories, were constructed and distributed with 2, 3, 10, 5, 8, 6 items respectively under the six units. Each item addressed a certain aspect of U.S. education programs, and the respondents were asked to choose one of the five responses provided by circling the numerical number attached to the choice. The responses and the numerical numbers (weights) attached were:

- Strongly recommended 5
- Recommended 4
- Neutral 3
- Not recommended 2
- Strongly not recommended ... 1

There was no formula followed in distributing the items per unit. The distribution was determined by the extent the researcher felt the items were sufficient to address the content questions within each unit.

The second issue for consideration was a group of factors that might hinder transfer of technology in education. One item was constructed to address this issue. From the literature, six factors that had the potential to hinder transfer and application of acquired

technologies were identified, and the respondents were asked to rank order them. They were asked to assign '1' to the factor they felt would hinder transfer most, and move down to '6' to the factor they felt would hinder transfer least (they were to move to '7' if they supplied another factor - in the space provided - that was not among those listed on the instrument).

The third issue was a group of approaches Nigeria could adopt to address teacher preparation for the country's technology education programs. One item was constructed for this issue. In it, the three approaches (and a space for the respondent to add to them) were listed, and the respondents were asked to rank them in the order they perceived them to be effective, and hence, would recommend for the Nigerian government. '1' was to be assigned to the perceived most effective approach, and '3' was to be assigned to the perceived least effective approach (or '4' if the respondent provided a fourth approach).

At the end of the questionnaire was an open-ended item in which the respondents were asked to list the different aspects of U.S. technology education programs they would recommend for transfer to Nigeria that were not covered on the instrument. The questionnaire, therefore, consisted of 37 items. However, items on demographics preceded the 37 items. These items asked the respondent to indicate his or her gender, status (undergraduate or graduate), university location, current major, initial area of specialization, and previous employer in Nigeria. Instructions on how to complete the questionnaire were also added.

Validation and Pilot-testing of the Instrument

The initial draft of the questionnaire was given to three Nigerian graduate students in the Department of Industrial Education and Technology of Iowa State University, Ames to comment on the readability of the instrument and the extent the items were measuring what they purported to measure, and to make their own suggestions for improving the instrument. Revision was made based on these suggestions and another draft was produced which was presented to the three professors constituting the researcher's graduate committee. Based on the recommendations of this committee, the instrument was revised many times before a final draft was produced.

The final draft of the instrument was pilot-tested with a group of 14 students from Nigeria and some other third world countries at Iowa State University, Ames. Some of these students specialized in industrial education and technology, some in agricultural education, and some in home economics education. This diverse background of the pilot-test sample was intentionally selected to reflect the expected diverse background of the actual sample used for the study.

Data from the pilot-test were analyzed using the reliability program of the Statistical Packages for Social Sciences (SPSSx) of Iowa State University Computation Center, Ames. The analysis showed a reliability index (alpha) for the major part of the instrument (the 34 Likert-type items) to be 0.72. The item-total correlations indicated that some items needed more revisions. These were done under the

guidance of the graduate committee members. A copy of the instrument used for the study was eventually produced.

It is a requirement at Iowa State University, Ames that the proposal and instrument of a research that involves human subjects be reviewed and approved by the University Committee on the Use of Human Subjects in Research. This is to ensure that the proposal conforms to stated guidelines, and that the rights and welfare of the human subjects involved are properly protected when the study is eventually carried out. The proposal and instrument for this study were approved by that committee.

Data Collection Method

The questionnaires were sent to and collected from the respondents by mail. The method of identifying the respondents has already been discussed under the section on 'description of population and sample for the study'. It showed that the investigator did not have direct contact with the respondents. The contact persons at the different universities were the internship coordinators and department chairpersons in charge of the TTTP students (and the TTTP students themselves in few cases). There were two groups of these contact persons. There were those who agreed to distribute the questionnaires to the students under them, collect the completed copies and send them en bloc to the researcher. Also, there were those who agreed only to give out the questionnaires to the students under them, and the

students themselves were to return the completed copies directly to the researcher. The researcher had to respect each person's term of agreement and correspond with him or her accordingly.

The questionnaires were mailed to the contact persons and the respondents were instructed to either return their completed copies to their internship coordinators/department chairpersons, or mail them directly to the researcher, depending on the contact person's earlier agreement. After series of follow-up letters and several telephone calls, 143 questionnaires were received out of the expected 204 (giving a 70.1 percent return). However, only 140 copies were usable. The questionnaires were first mailed out on October 07, 1987, and the last copy was received in December, 1987. Each questionnaire was sent out with a pre-paid return envelope. The distribution of respondents in different universities and the questionnaire returns are shown in Table 1

Research Design and Data Analysis Method

This study was principally an exploratory survey research, using mailed-questionnaire approach, in which respondents' opinions were sought and collected on what they were assumed to know. The main variables in the study are described below.

Table 1. Distribution of respondents in universities and questionnaire returns

University	Number sent ^a	Number returned	Percent return
1. Tuskegee Univ., Alabama	8	5	62.5
2. Arizona St Univ., Tempe	2	2	100.0
3. North. Arizona Univ., Flagstaff	8	7	87.5
4. Univ. of Arizona, Tucson	3	1	33.3
5. Univ. of South. Colorado, Pueblo	11	7	63.6
6. Ball State Univ., Muncie, IN	8	7	87.5
7. Indiana State Univ., Terre Haute	16	14	87.5
8. Pittsburg St Univ., Pittsburg, KS	14	9	64.3
9. Grambling St Univ., Grambling, LA	6	5	83.3
10. Michigan State Univ., East Lansing	5	3	60.0
11. Western Michigan Univ., Kalamazoo	25	10	40.0
12. Univ. of Missouri, Columbia	10	6	60.0
13. Lincoln Univ., Jefferson City, MO	8	8	100.0
14. C/Missouri St Univ., Warrensburg	6	6	100.0
15. NC A & T St Univ., Greensboro, NC	12	5	41.7
16. Kent State Univ., Kent, OH	5	5	100.0
17. Bowling Green St Univ., B/G, OH	7	7	100.0
18. Univ. of Toledo, Toledo, OH	5	4	80.0
19. Univ. of Pittsburgh, Pittsburgh, PA	2	1	50.0
20. Tennessee State Univ., Nashville	4	3	75.0
21. Norfolk State Univ., Norfolk, VA	19	14	73.7
22. Univ. of Wisconsin-Stout	20	14	70.0
Total	204	143	70.1

^aNumber sent also shows the number of students reported to be in that school.

Independent variables

There were three variables classified as independent in the study. Although not directly manipulated by the researcher, variations in the

respondents' scores on these independent variables were the object of study. These variables were (1) student status (undergraduate or graduate), (2) previous employer (State teaching service, Federal teaching service, post-secondary institution, State/Federal ministry, others), and (3) area of specialization (electrical/electronics engineering, mechanical/automobile engineering, building/civil engineering, others).

Dependent variables

Dependent variables were 'perceptions' of the students surveyed on the transferability of the 34 aspects of U.S. technology education programs identified on the questionnaire. The ranks assigned by the students to the factors that might hinder transfer of technology, and the ranks assigned to the approaches of addressing teacher preparation for Nigeria's technology education were other dependent variables in the study. Specifically, under the section on transferability of selected aspects of U.S. education programs, there were 34 variables represented by the 34 items on the questionnaire. A measure of each one was the mean of the respondents' scores on the item related to it. The titles of these variables are outlined in chapter four.

Under factors that might hinder transfer of technology, each of the six factors identified on the instrument constituted a variable. The mean of the respondents' ranking of each factor was a measure of that variable. Similarly, each of the three approaches of teacher preparation identified on the questionnaire constituted a variable. A

measure of each was represented by the mean of the respondents' ranking of the approach. The titles of these other variables are also outlined in chapter four.

In summary, therefore, there were 43 (34+6+3) variables classified as dependent when all stages of data analyses are considered together.

Research questions and hypotheses

The study sought to provide answers to the following questions:

1. What aspects of U.S. technology education programs do Nigerian students studying in U.S. perceive as transferable to Nigeria?
2. Is there any difference between these perceptions of undergraduate students and those of graduate students?
3. Do the students' perceptions vary with students' areas of specialization?
4. Do the students' perceptions vary with students' previous employer categories?
5. What factors do Nigerian students studying in U.S. perceive as having the potential of critically hindering them transferring to their work-places those technologies acquired in U.S.?
6. What approach do Nigerian students in U.S. perceive as the most effective for addressing teacher preparation for technology education in Nigeria?

These research questions resulted in the formulation of the following (null) hypotheses. Method of data analysis is reported under each one.

Hypothesis 1

The Nigerian students studying in U.S. would be neutral in their perceptions on the transferability of selected aspects of U.S. technology education programs to Nigeria. Stated statistically, the hypothesis became

The mean score of the respondents' perceptions (μ) on the transferability of each of the identified aspects would not be significantly greater than 3.00. ($H_0: \mu = 3.00$)

It was the researcher's judgement that for an aspect to be considered as transferable or recommended by the respondents for application in Nigerian environment, the threshold mean score of the respondents' perceptions should be significantly greater than 3.00 which was the numerical value for the middle response (neutral) on the response scale.

The returned questionnaires were coded by the researcher and submitted to the Iowa State University Computation Center for key-punching, file creation and submission to the researcher's account. A t-test program of the Statistical Packages for the Social Sciences (SPSSx) was used to analyze the data, and test the significance of the mean of the respondents' perceptions on each of the 34 aspects (whether each was significantly greater than 3.00). The alpha level of .05 was selected. The variables that had significant means scores were taken

to represent those aspects perceived as transferable by Nigerian students.

Hypothesis 2

There would be no significant difference between the perceptions of undergraduate students and those of graduate students on the transferability of selected aspects of U.S. technology education programs to Nigeria. Stated statistically, the hypothesis became:

The mean score of the undergraduate students' perceptions (μ_1) on any aspects considered would be equal to the mean score of the graduate students' perceptions (μ_2) on the same aspect. ($H_0: \mu_1 = \mu_2$)

A t-test of independent samples program on SPSSx was used to analyze scores for each of the 34 variables representing the different aspects of U.S. technology education programs. Alpha level of .05 was selected.

Hypothesis 3

The perceptions of Nigerian students in U.S. on the transferability of selected aspects of U.S. technology education programs to Nigeria would not vary with the students' areas of specialization. Stated statistically, the hypothesis became:

When respondents would be grouped according to their areas of specialization, the group mean scores of their perceptions on each of the aspects considered would be equal. ($H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$)

A one-way analysis of variance (ANOVA) program on SPSSx was used on the respondents' scores on each of the 34 variables. A post-hoc analysis using Scheffé's multi range test was carried out whenever significant results occurred. Where tests of homogeneity of variance among the groups showed significance - meaning a violation of one of the assumptions of ANOVA - the nonparametric equivalent (Kruskal-Wallis one-way ANOVA) was carried out. The alpha level used was .05.

Hypothesis 4

The perceptions of Nigerian students in the U.S. on the transferability of selected aspects of U.S. technology education programs to Nigeria would not vary with the students' previous employer categories. Stated statistically, this hypothesis became:

When respondents would be grouped according to the categories of their previous employers, the group mean scores of the respondents' perceptions on each of the aspects considered would be equal. ($H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$)

The same analysis procedure for hypothesis 3 was adopted for the above hypothesis.

Hypothesis 5

There would be no agreement among Nigerian students in U.S. in their ranking on the factors that might hinder them transferring to their work-places those technologies acquired in the U.S. Stated statistically, this hypothesis became:

The calculated coefficient of concordance (Kendall's W) for the means of respondents' ranks on factors that might hinder transfer would not be significantly greater than zero. ($H_0: W = 0$)

Kendall's coefficient of concordance is a nonparametric test that examines whether there is an agreement among judges on the ranks they assign to variables. The coefficient (Kendall's W) ranges between 0 and 1, with 0 signifying no agreement, and 1 signifying complete agreement (Norusis, 1983; Siegel, 1956).

The nonparametric program on SPSSx was used to analyze the ranks assigned by the respondents to the six factors (variables) identified on the questionnaire. The test of significance involved was a chi-square statistic. Alpha level of .05 was selected.

Hypothesis 6

There would be no agreement among Nigerian students in U.S. in their ranking on what they perceived as the most effective approach for addressing teacher preparation for technology education in Nigeria. Stated statistically, this hypothesis became:

The calculated coefficient of concordance (Kendall's W) for the means of respondents' ranks on approaches of teacher preparation would not be significantly greater than zero. ($H_0: W = 0$)

The same analysis procedure for hypothesis 5 was adopted for this hypothesis.

Hypothesis 7

The perceptions of Nigerian students in U.S. on factors that might hinder transfer of technology, and on approaches for addressing teacher preparation for technology education programs in Nigeria, would not vary with the students' status (undergraduate or graduate), areas of specialization, and previous employer categories.

This is a composite of six different hypotheses. The issues addressed in them were not part of the major concern of this study. However, the researcher was curious to find out whether any difference existed in the ranking of these factors and approaches by the respondents when the respondents were, in each case, grouped according to their (1) student status, (2) areas of specialization, and (3) previous employer categories. Incidentally, the researcher was not aware of any statistical program (from both the literature and consultations with some professors of educational statistics) that could be used to test each of the hypotheses within the composite. In other words, no test was found that could compare Kendall's coefficient of concordance for two or more groups. What the researcher did was to compute mean ranks for the two sets of variables (factors and approaches) for the different group classifications, and to report descriptively on them, comparing the ranks between and among groups. These are treated fully in Chapter Four.

CHAPTER IV. ANALYSES AND FINDINGS

In this chapter, the statistical analysis of the data collected for the study is reported. The major findings of the study are also reported. The chapter is sub-divided into three sections: (1) results of descriptive statistical analyses of some characteristics of the sample (demographics), (2) results of statistical tests of the main hypotheses of the study, and (3) other results.

Some Characteristics of the Sample

As reported in Chapter Three, one hundred and forty (140) respondents provided the usable data for this study. In this section, the description of these respondents in terms of their gender, student status, present major in U.S. studies, initial area of specialization (or teaching subject), and previous employer in Nigeria, is reported.

Gender of respondents

The distribution of the 140 respondents by gender is shown in Table 2. The table shows that 8 (5.7%) of the respondents were female, 128 (91.4 %) were male, and 4 (2.9%) omitted to indicate their gender on the instrument.

Student status of respondents

The distribution of student status of the respondents at the time they provided data for this study is shown in Table 3. This table indicates that 80 (57.1%) of the respondents were undergraduate

Table 2. Distribution of respondents by gender

Gender	Number	Percent
Female	8	5.7
Male	128	91.4
Unspecified	4	2.9
Total	140	100.0

students, and 50 (35.7%) were graduate students. Ten (7.1%) of them omitted to indicate their status.

Table 3. Distribution of respondents by student status

Student status	Number	Percent
Undergraduate	80	57.1
Graduate	50	35.7
Unspecified	10	7.1
Total	140	100.0

Present academic major of respondents

The academic majors pursued by the respondents are indicated on Table 4. The table shows that 86.6% of respondents were majoring in industrial/vocational/technology/technical education, 2.9% each in business education and professional studies in education (like

educational media), and 6.4% in other areas. 4.3% Of them omitted this item.

Table 4. Distribution of respondents by academic major

Present major in the U.S.	Number	Percent
Industrial/Vocational/Technology/ Technical education	117	83.6
Business education	4	2.9
Professional studies in education	4	2.9
Other areas	9	6.4
Unspecified	<u>6</u>	<u>4.3</u>
Total	140	100.0

Initial areas of specialization (teaching subjects) of respondents

The areas of specialization or teaching subject areas of the respondents are shown in Table 5. It is shown in the table that 24 (17.1%) of the respondents were in the area of electrical/electronics engineering, 37 (26.4%) in mechanical/automobile engineering, 44 (31.4%) in building/civil engineering, and 29 (20.7%) in other areas (like computers, graphic arts, educational media, and agricultural, business and home economics education). Six (4.3%) of them omitted this item.

Table 5. Distribution of respondents by area of specialization

Area of specialization	Number	Percent
Electrical/Electronics engineering	24	17.1
Mechanical/Automobile engineering	37	26.4
Building/Civil engineering	44	31.4
Other areas	29	20.7
Unspecified	6	4.3
Total	140	100.0

Previous employers of respondents in Nigeria

The distribution of the respondents by the categories of their employers in Nigeria is shown in Table 6. As indicated in this table, 57 (40.7%) of them were teaching in State secondary, vocational or technical schools, 12 (8.6%) had taught in Federal secondary schools, 33 (23.6%) had taught in polytechnics, colleges and other post-secondary institutions, 30 (21.4%) had worked in government ministries and departments (not teaching), and 5 (3.6%) had worked at other places (like industries). Three (2.1%) of them omitted this item.

The concluded major section shows some general characteristics of the TTTP participants in the U.S. institutions as represented by the sample that participated in this study. It shows that the majority of them are male, undergraduate students, and employees of different State teaching commissions. Only very few majored in areas other than industrial, vocational, technology or technical education, depending on the name adopted by each university.

Table 6. Distribution of respondents by employer categories in Nigeria

Employer in Nigeria	Number	Percent
State teaching service (secondary)	57	40.7
Federal teaching service (secondary)	12	8.6
Post-secondary schools (State & Federal)	33	23.6
State/Federal ministries (not teaching)	30	21.4
Other employers	5	3.6
Unspecified	3	2.1
Total	140	100.0

Testing of Major Research Hypotheses

Hypothesis 1

It was hypothesized that Nigerian students in U.S. institutions would be neutral in their perceptions on the transferability of each of the 34 selected aspects of U.S. technology education programs to Nigeria. 'Neutrality' meant nonsignificant mean score of the respondents' perceptions. It was the researcher's judgement that for any of the selected aspects of U.S. technology education programs to be regarded as being recommended by the respondents for transfer to Nigeria, the overall mean of the respondents' perceptions on that aspect should be significantly greater than the score for "neutral" which was 3.00. Thus, 'neutrality' among the respondents on any aspect meant the overall mean score of respondents' perceptions on that particular aspect was not significantly greater than 3.00. The

statistical (null) hypothesis for research (null) Hypothesis 1, therefore, was:

The mean score (μ) of the respondents' perceptions on the transferability of each of the 34 selected aspects of U.S. technology education programs to Nigeria would not be significantly different from 3.00. ($H_0: \mu = 3.00$)

A t-test was carried out on the overall mean of the respondents' perceptions on each of the 34 selected aspects of U.S. technology education programs. Table 7 shows the overall mean, the standard deviation and the t-value for each of the 34 selected aspects. The table shows that all but two of the 34 aspects had the means of the respondents' perceptions significantly greater than 3.00. In other words, Nigerian students in U.S. constituting the sample perceived that those 32 aspects of U.S. technology education programs as shown in Table 7 were transferable to Nigeria, and they did recommend those practices or 'technologies' should be adopted in Nigeria's technology education programs. The 'strength' of their recommendations for each aspect could be assessed using the size of the mean perception score. As Table 7 shows, five aspects received means of above 4.50, and these could be regarded as those with strongest recommendations. However, two aspects received mean scores that were not significantly greater than 3.00. Hence, there was neutrality among the respondents in recommending these two aspects for transfer. The mean of respondents' perceptions on Aspect 13 (parents-teachers associations should be

involved in the evaluation of the teacher) and on Aspect 29 (local government councils should control all secondary, technical and other vocational schools) were not significant as hypothesized. So the null hypothesis (H_0) on thirty-two (32) aspects were rejected. It was retained on two (2) aspects.

Hypothesis 2

It was hypothesized that there would be no significant difference between the perceptions of undergraduate students and those of graduate students on the transferability of each of the 34 selected aspects of U.S. technology education programs to Nigeria. In other words, when the respondents would be split into two groups based on their student status, no significant difference in the perceptions of these two groups on each aspect considered would be found. Stated statistically, Hypothesis 2, in the null form, became:

The mean score of the undergraduate students' perceptions (μ_1) on each of the 34 aspects considered would not be significantly different from the mean score of the graduate students' perceptions (μ_2) on the corresponding aspect. ($H_0: \mu_1 = \mu_2$; 1 = undergraduate, 2 = graduate)

A t-test of independent samples was carried out on the scores of respondents' perceptions on each of the 34 aspects. Table 8 shows the results of that analysis. The identification number for each aspect in Table 8 corresponds with those in Table 7.

Table 7. Means, standard deviations, and testing of the means of perceptions of respondents on the transferability of selected aspects of U.S. technology education programs to Nigeria.

ID NO ^a	Selected aspects of U.S. technology education programs for transfer to Nigeria	Mean	SD ^b	t-value
1.	The content taught in a vocational program should be derived from verified industrial/production needs of the surrounding community	4.38	0.85	19.08*
2.	The content taught should evolve from the identified competencies needed by most people in that trade	4.24	0.96	14.95*
3.	Instruction should be tailored to individual student needs (individualized instruction)	3.74	1.13	7.79*
4.	Use of computers in the schools to facilitate instruction (computer-assisted instruction) should be adopted	3.66	1.15	6.81*
5.	Special attention should be given to special needs (handicapped) students in the school system	4.17	0.84	16.27*
6.	Prospective teacher should be required to pass minimum competency test in his/her subject before being employed	4.22	1.00	14.41*
7.	Evaluation of beginning teachers by the principal should be carried out	3.48	1.20	4.67*
8.	Specified minimum and relevant industrial experience should be required before one is employed to teach a vocational program	4.32	0.88	17.77*

^aIdentification number of each aspect (used in other tables).

^bDenotes Standard deviation.

* Significant at .05 level.

Table 7 (continued)

ID NO ^a	Selected aspects of U.S technology education programs for transfer to Nigeria	Mean	SD ^b	t- value
9.	Besides the school diploma/degree, certification/endorsement to teach a particular subject at a particular school level should be required of every prospective teacher	3.86	1.13	8.98*
10.	Periodic updating requirements (to maintain one's position) should be prescribed for every teacher	4.23	0.80	18.20*
11.	Students should be given the opportunity to evaluate the teacher at the end of each term/year	4.23	0.96	15.11*
12.	Student evaluation of the teacher (as well as other data) should be used for teacher evaluation and promotion	3.91	1.14	9.39*
13.	Parents-teachers associations should be involved in the evaluation of the teacher	2.83	1.17	1.74
14.	A comprehensive program of periodic evaluation of the teacher (to improve quality of service, determine teacher promotion, etc.) should be in practice	4.19	0.84	16.58*
15.	Every teacher should belong to and be actively involved in professional association(s)	4.21	0.82	17.36*
16.	Teacher should use a variety of assessment techniques to evaluate a student's academic progress, not just written examinations	4.75	0.58	35.90*

Table 7 (continued)

ID NO ^a	Selected aspects of U.S. technology education programs for transfer to Nigeria	Mean	SD ^b	t- value
17.	A student should meet specified minimum performance standard before being promoted or allowed to progress to the next learning unit/task (testing for 'Mastery' as opposed to 'Norming')	4.42	0.78	21.44*
18.	Students' exam/test performance should be analyzed, and the results used to improve students learning	4.61	0.55	34.85*
19.	Statewide standardized test(s) should be developed for each vocational program	4.21	0.97	14.74*
20.	Nationwide standardized test(s) should be developed for each vocational program	4.08	1.02	12.45*
21.	Accreditation boards should be established to periodically accredit every secondary school	4.38	0.78	20.87*
22.	Accreditation boards should be established to periodically accredit every technical/vocational school	4.53	0.64	28.21*
23.	Students should be given the opportunity to evaluate instruction at the end of each term/year	4.01	1.02	11.79*
24.	Data from student evaluation of instruction should be used systematically to improve instruction	4.12	1.01	13.18*
25.	Follow-up of program graduates soliciting their evaluation of the school program and other suggestions from alumni should be practiced	4.15	0.72	18.93*

Table 7 (continued)

ID NO ^a	Selected aspects of U.S. technology education programs for transfer to Nigeria	Mean	SD ^b	t- value
26.	Studies of employers' appraisal of the program graduates and their suggestions should be conducted periodically	4.12	0.78	16.97*
27.	Use of advisory committees to evaluate school programs should be practiced	4.35	0.71	22.53*
28.	Use of parents-teachers associations to evaluate school programs should be practiced	3.50	1.03	5.72*
29.	Local government councils should control all secondary, technical and other vocational schools (as opposed to State control of schools)	2.28	1.31	6.49*
30.	Close working relationship (partnership) between school and business/industry should be to plan the educational programs for the community	4.56	0.64	28.89*
31.	Advisory committees should be established for each vocational program/school	4.36	0.74	21.70*
32.	Vocational student organizations should be encouraged, and utilized for instructional purposes	4.28	0.68	22.27*
33.	Each school should have a full-time guidance counselor to advise on career, emotional, psychological, and other needs	4.60	0.59	32.35*
34.	Universities, polytechnics, and other institutions/agencies should be involved in the evaluation of public school programs	4.31	0.92	16.87*

Table 8 indicates that the means of the two groups of respondents were significantly different on only two of the 34 aspects considered. This means that there was no difference in the perceptions of undergraduate students and those of graduate students on the transferability of 32 of the 34 aspects of U.S. technology education programs to Nigeria. The two aspects that featured difference in opinion between the two groups were Aspect 4 (use of computers in the schools to facilitate instruction - computer-assisted instruction - should be adopted), and Aspect 29 (local government councils should control all secondary, technical and other vocational schools - as opposed to State control of schools). Apart from these two aspects, the two groups of respondents were not different in their perceptions. They were together in recommending 31 of the aspects for transfer, and they were together in not recommending one aspect (Aspect 13 - parents-teachers associations should be involved in the evaluation of the teacher). Although the mean scores of the two groups were significantly different on Aspect 4 and Aspect 29, there was no significant difference in the opinions of the groups in recommending Aspect 4 for transfer, and in not recommending Aspect 29 for transfer. For Aspect 4, the two group mean scores were each significantly greater than 3.00, the cutoff point (see Hypothesis 1). Also, for Aspect 29, the two group mean scores were each significantly less than 3.00. The significant results in the test only suggested that one group was more conservative in recommending or not recommending that aspect for transfer.

Table 8. Means, standard deviations, and testing of the means of perceptions of respondents on the transferability of selected aspects of U.S. technology education programs to Nigeria, according to respondent student status

Aspect ID NO ^a	Undergraduate			Graduate			t- value
	# ^b	Mean	SD ^c	# ^b	Mean	SD ^c	
1.	80	4.29	0.90	48	4.52	0.77	1.49
2.	78	4.32	0.89	46	4.06	1.10	1.41
3.	80	3.66	1.15	50	3.88	1.06	1.08*
4.	80	3.81	1.05	50	3.40	1.25	2.03
5.	79	4.22	0.83	49	4.16	0.85	0.34
6.	79	4.33	0.97	50	4.06	1.08	1.47
7.	79	3.46	1.13	50	3.60	1.29	0.67
8.	79	4.27	0.97	50	4.42	0.79	0.94
9.	80	4.03	1.08	50	3.74	1.10	1.45
10.	79	4.19	0.80	49	4.45	0.68	1.88
11.	80	4.26	1.00	50	4.22	0.98	0.24
12.	80	3.96	1.15	50	3.84	1.15	0.59
13.	80	2.83	1.17	50	2.88	1.21	0.26
14.	80	4.23	0.73	48	4.21	0.92	0.11
15.	80	4.13	0.85	49	4.31	0.80	1.21
16.	80	4.74	0.65	50	4.78	0.47	0.40
17.	79	4.43	0.78	50	4.44	0.73	0.07
18.	80	4.61	0.54	50	4.70	0.54	0.90
19.	79	4.18	1.00	50	4.22	1.00	0.24
20.	78	4.03	1.02	50	4.16	1.00	0.73
21.	80	4.40	0.72	50	4.38	0.88	0.14
22.	80	4.56	0.57	50	4.50	0.74	0.54
23.	80	3.95	1.03	50	4.16	1.00	1.14
24.	80	4.04	1.08	50	4.28	0.90	1.32
25.	80	4.13	0.68	50	4.26	0.72	1.07

^aNumbers correspond to those in Table 7.

^bNumber in each group for each analysis.

^cDenotes Standard deviation.

*Significant at .05 level.

Table 8 (continued)

Aspect ID NO ^a	Undergraduate			Graduate			t- value
	# ^b	Mean	SD ^c	# ^b	Mean	SD ^c	
26.	80	4.04	0.77	50	4.28	0.78	1.73
27.	80	4.38	0.75	50	4.38	0.60	0.04
28.	80	3.43	1.05	47	3.72	0.99	1.57*
29.	79	1.96	1.12	50	2.66	1.42	3.11
30.	80	4.50	0.69	50	4.66	0.52	1.40
31.	80	4.33	0.76	50	4.48	0.61	1.22
32.	80	4.28	0.60	50	4.34	0.69	0.57
33.	80	4.60	0.59	50	4.58	0.61	0.19
34.	80	4.30	0.97	50	4.36	0.83	0.36

Hypothesis 3

It was hypothesized that the perceptions of Nigerian students on the transferability of each of the 34 aspects of U.S. technology education programs to Nigeria would not vary with the students' areas of specialization. Area of specialization in this context refers to the teaching subject area of a respondent. When the respondents were split into groups based on their areas of specialization, no significant difference in the perceptions of these groups on each of the aspects considered was hypothesized. Stated statistically,

Hypothesis 3 became:

When the respondents would be grouped according to their areas of specialization, the group mean scores of their perceptions on each of the 34 aspects considered would not be significantly different from one another. ($H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$)

The statistical technique used for testing this hypothesis was one-way analysis of variance (ANOVA). ANOVA, with the accompanying F-test, is the statistical technique used to examine whether there is any significant difference among group means. There are assumptions underlying the use of ANOVA, and one of them (homogeneity of the group variances) was not met in the testing of the above hypothesis on 11 of the 34 variables (aspects) considered. In other words, in 11 of the 34 cases, "Bartlett's Test for Homogeneity of Variance" (Hinkle, Wiersma, and Jurs, 1979, p. 261) on the data showed significance. ANOVA is known to be "robust with respect to the violations of the assumptions except in the case of unequal variances with unequal sizes" (Hinkle et al., 1979, p. 262). When there are such violations, a nonparametric equivalent of ANOVA known as Kruskal-Wallis one-way ANOVA is recommended (Hinkle et al., 1979; Minium, 1978). Since this analysis involved unequal group sizes, the researcher decided to report the nonparametric Kruskal-Wallis (K-W) ANOVA results on those 11 variables that showed significance in the tests of homogeneity of variance. This was in addition to the general report of ANOVA (parametric) of all variables, and it was done in the interest of readers of this study report who might be interested in either of the analyses. However, there was no difference in the results of both analyses on each of the 11 variables (aspects). Table 9 shows the ANOVA results for Hypothesis 3, and Table 10 shows the K-W ANOVA results on those 11 variables mentioned. As a reminder to the reader (from Table 5), the groups

(areas of specialization) and the sizes used for the testing of Hypothesis 3 were electrical/electronics engineering (24), mechanical/automobile engineering (37), building/civil engineering (44), and other areas (29). There were, however, few cases where group sizes dropped by one or two for reason of 'missing data' on some of the 34 dependent variables. Again, the identification numbers of the aspects considered, used in Table 9 and Table 10, correspond to the numbers in Table 7.

Table 9. Means, standard deviations, and ANOVA of perceptions of respondents on the transferability of selected aspects of U.S. technology education programs to Nigeria, according to areas of specialization of respondents

Aspect ID NO ^a	Group 1		Group 2		Group 3		Group 4		F-value
	Mean	SD ^b	Mean	SD ^b	Mean	SD ^b	Mean	SD ^b	
1 ^c	4.73	0.46	4.35	0.98	4.32	0.80	4.21	0.98	1.70
2	4.52	0.98	4.17	1.06	4.09	1.01	4.32	0.77	1.07
3	4.04	1.08	3.57	1.26	3.72	1.11	3.69	1.04	0.87
4	3.79	1.22	3.32	1.13	3.93	1.07	3.45	1.24	2.28
5	4.46	0.83	4.26	0.82	4.16	0.81	3.86	0.88	2.43
6	4.33	1.13	4.19	1.00	4.23	0.92	4.07	1.10	0.31
7	3.50	1.47	3.38	1.09	3.65	1.02	3.35	1.29	0.51
8 ^c	4.25	1.07	4.56	0.61	4.16	1.06	4.45	0.63	1.59
9	3.75	1.19	4.05	1.18	3.77	1.03	3.72	1.22	0.63
10 ^c	4.17	1.03	4.30	0.70	4.19	0.82	4.28	0.59	0.20
11 ^c	3.88	1.39	4.19	0.94	4.46	0.69	4.24	0.91	1.91
12	3.71	1.49	3.89	1.13	3.96	0.94	4.00	1.17	0.33
13	2.79	1.47	3.03	1.21	2.59	0.95	2.93	1.10	1.06
14 ^c	4.58	0.50	4.03	0.91	4.16	0.82	4.14	0.88	2.42
15	4.42	0.78	4.14	0.92	4.05	0.84	4.28	0.70	1.20
16	4.75	0.68	4.73	0.61	4.73	0.59	4.83	0.47	0.20
17 ^c	4.50	0.78	4.43	0.60	4.30	0.98	4.50	0.69	0.54
18	4.67	0.57	4.70	0.46	4.64	0.53	4.38	0.62	2.24
19	4.25	0.94	4.14	1.08	4.19	0.98	4.24	0.91	0.09

20 ^C	4.04	1.08	3.94	1.33	4.11	0.95	4.17	0.66	0.30
21 ^C	4.42	0.65	4.43	0.73	4.41	0.69	4.17	1.04	0.76
22	4.63	0.50	4.54	0.65	4.56	0.63	4.38	0.78	0.72
23	4.00	1.06	3.78	1.21	4.16	0.94	4.00	0.89	0.89
24	4.25	1.23	4.03	1.07	4.16	0.96	4.07	0.92	0.27
25	4.33	0.57	4.19	0.74	4.11	0.75	4.04	0.73	0.85
26	4.17	0.76	4.30	0.81	4.00	0.78	4.00	0.80	1.21
27	4.50	0.59	4.46	0.65	4.18	0.79	4.28	0.75	1.56
28	3.42	0.97	3.47	1.03	3.31	1.02	3.86	0.99	1.81
29	2.38	1.50	2.16	1.28	2.07	1.08	2.69	1.54	1.43
30	4.67	0.76	4.62	0.55	4.52	0.63	4.41	0.68	0.87
31 ^C	4.58	0.50	4.49	0.73	4.36	0.61	3.93	0.96	4.58*
32	4.38	0.71	4.11	0.84	4.30	0.55	4.31	0.60	0.93
33 ^C	4.50	0.66	4.43	0.73	4.73	0.45	4.69	0.47	2.19
34 ^C	4.42	0.78	4.24	1.12	4.21	1.05	4.41	0.57	0.46

^aNumbers correspond with those in Table 7.

^bDenotes standard deviation.

^cThose showing significance at .05 level in Bartlett's test for homogeneity of group variances (see Table 10).

* Significant at .05 level.

Table 10. Nonparametric Kruskal-Wallis ANOVA of perceptions of respondents on the transferability of eleven aspects of U.S. technology education programs to Nigeria, according to areas of specialization of respondents

Aspect ID NO ^a	<u>Group 1</u> Mean Rank	<u>Group 2</u> Mean Rank	<u>Group 3</u> Mean Rank	<u>Group 4</u> Mean Rank	Chi-square value
1	81.14	68.08	62.06	60.12	5.883
8	67.23	73.83	60.70	67.88	2.888
10	67.83	68.49	64.70	65.59	0.292
11	61.29	64.34	73.92	66.93	2.473
14	82.75	59.92	64.43	64.29	6.734
17	71.69	64.24	65.03	69.71	1.017
20	66.96	67.57	67.55	65.50	0.070
21	67.92	70.31	68.26	62.41	0.883
31	77.50	75.34	66.16	51.26	10.061 *
33	62.67	59.89	73.91	71.48	4.692
34	70.56	68.34	65.61	66.76	0.344

^aNumbers correspond with those in Table 7.

* Significant at .05 level.

The analysis in Table 9 (and the one in Table 10) show that there was no significant difference among the group mean scores of the respondents' perceptions on all variables but one. Only on Aspect 31 (advisory committees should be established for each vocational program/school) did the analysis show significance among the four group means. A post-hoc comparison test (Scheffé) on the data showed that the mean of Group 4 (other areas) was significantly different from the other three group means. However, there was no major implication for

this result because each of the four group means was significantly greater than the cutoff point of 3.00 (see Hypothesis 1). It only showed that the respondents in the other areas of specialization (like business education, agricultural education, and home economics education) were a bit more conservative in recommending that aspect for transfer (their mean was the smallest). The overall results indicate that the respondents' perceptions did not vary significantly with the respondents' areas of specialization. They were together in opinion in recommending 32 aspects, and in not recommending 2 aspects for transfer. The null hypothesis was retained on 33 of the 34 variables (aspects of U.S. technology education programs) considered.

Hypothesis 4

It was hypothesized that the perceptions of Nigerian students in the U.S. on the transferability of each of the 34 aspects of U.S. technology education programs to Nigeria would not vary with the students' categories of employers in Nigeria. In other words, when the respondents would be grouped on the basis of their previous employer categories in Nigeria, it was hypothesized that the perceptions of these groups on each aspect considered would not be significantly different from one another. Stated statistically, therefore, Hypothesis 4 became:

When respondents would be grouped according to their employer categories in Nigeria, the group mean scores of their perceptions on each of the 34 aspects considered would not be significantly different from one another. ($H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$)

The statistical technique used for testing this hypothesis was one-way analysis of variance (ANOVA) with the accompanying F-test. This analysis was carried out on each of the 34 variables (representing 34 aspects of U.S. technology education programs selected for study). As was the case with testing Hypothesis 3, Bartlett's test of homogeneity of variance showed significance in 8 out of the 34 variables. The ANOVA results on all the variables are shown in Table 11. The nonparametric Kruskal-Wallis one-way ANOVA results (see Hypothesis 3) on those 8 variables that featured significance in the test of homogeneity of group variances are reported on Table 12 for the interest of readers who may care to review such data. For these analyses in Table 11 and Table 12, the following groups and their sizes apply (recalled from Table 6). State teaching service - secondary (57), Federal teaching service - secondary (12), post-secondary institutions - State and Federal (33), State/Federal ministries - not teaching (30), and other employers (5). There were cases of group sizes dropping by one or two for reasons of 'missing data'.

Table 11. Means, standard deviations, and ANOVA of perceptions of respondents on the transferability of selected aspects of U.S. technology education programs to Nigeria, according to previous employer categories of respondents

Aspect ID NO ^a	Group 1		Group 2		Group 3		Group 4		Group 5		F-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1 ^b	4.46	0.84	4.33	0.65	4.52	0.67	4.07	1.11	4.60	0.55	1.43
2	4.13	0.96	4.00	1.13	4.28	0.96	4.35	0.97	4.80	0.45	0.86
3	3.83	1.12	3.50	1.38	3.73	1.13	3.67	1.12	4.20	0.45	0.45
4	3.70	1.10	3.08	1.38	3.55	1.06	3.87	1.22	3.40	1.14	1.15
5	4.23	0.71	4.00	0.89	3.91	1.01	4.37	0.81	4.40	0.89	1.50
6	4.18	0.98	4.50	0.67	4.00	1.22	4.43	0.86	4.00	1.23	1.04
7	3.49	1.20	3.67	0.78	3.13	1.26	3.73	1.20	4.20	0.84	1.61
8 ^b	4.21	1.05	4.46	0.52	4.42	0.71	4.50	0.73	4.00	1.23	0.86
9	3.93	1.10	3.75	1.49	3.91	1.01	3.90	1.09	2.80	1.64	1.20
10 ^b	4.23	0.93	4.25	0.45	4.28	0.63	4.21	0.77	4.60	0.55	0.29
11	4.19	1.04	4.42	0.67	4.18	0.88	4.33	1.03	4.40	0.55	0.27
12	3.90	1.10	4.08	1.17	3.82	1.10	3.93	1.29	4.60	0.55	0.58
13	2.88	1.10	2.42	1.31	2.55	1.06	3.27	1.29	3.00	1.00	2.01
14	4.18	0.86	3.92	0.90	4.16	0.92	4.43	0.63	4.40	0.55	1.06
15	4.02	0.94	4.58	0.67	4.25	0.76	4.40	0.68	4.20	0.45	1.87
16 ^b	4.74	0.64	4.83	0.39	4.76	0.44	4.70	0.70	5.00	0.00	0.35
17 ^b	4.27	0.92	4.42	0.90	4.46	0.67	4.67	0.55	4.20	0.45	1.40
18	4.68	0.51	4.58	0.52	4.58	0.56	4.53	0.63	4.60	0.55	0.44
19	4.27	0.92	4.08	1.08	4.18	1.01	4.30	0.84	3.60	1.67	0.66

20	4.07	1.01	4.08	1.08	4.31	0.82	3.87	1.11	4.00	1.73	0.74
21 ^b	4.39	0.65	4.50	0.67	4.30	1.05	4.33	0.80	4.40	0.55	0.16
22	4.50	0.63	4.50	0.67	4.55	0.67	4.57	0.68	4.40	0.55	0.11
23 ^b	3.83	1.12	3.83	1.27	4.33	0.74	4.07	1.02	4.20	0.45	1.47
24	3.91	1.11	4.17	0.94	4.24	0.94	4.37	0.76	4.60	0.55	1.48
25	4.05	0.74	4.17	0.58	4.30	0.64	4.07	0.79	4.80	0.45	1.81
26	4.00	0.80	4.33	0.49	4.27	0.95	4.07	0.64	4.60	0.55	1.38
27	4.37	0.62	4.25	0.87	4.27	0.88	4.40	0.68	4.60	0.55	0.35
28	3.51	1.07	3.18	0.98	3.45	1.06	3.80	0.93	3.40	0.89	0.91
29	1.95	1.14	2.58	1.44	2.38	1.36	2.60	1.30	3.40	1.82	2.58 [*]
30	4.56	0.63	4.50	0.67	4.46	0.71	4.63	0.56	4.60	0.89	0.33
31	4.39	0.70	4.17	0.84	4.27	0.80	4.43	0.73	4.40	0.89	0.40
32	4.21	0.68	4.25	0.87	4.42	0.56	4.20	0.71	4.40	0.89	0.65
33	4.56	0.63	4.58	0.67	4.55	0.51	4.70	0.60	4.60	0.55	0.34
34 ^b	4.12	1.09	3.83	1.27	4.58	0.66	4.50	0.57	4.40	0.55	2.48 [*]

^aNumbers correspond with those in Table 7.

^bThose showing significance at .05 level in Bartlett's test for homogeneity of group variances (see Table 12).

* Significant at .05 level.

Table 12. Nonparametric Kruskal-Wallis ANOVA of perceptions of respondents on the transferability of eight aspects of U.S. technology education programs to Nigeria according to previous employer categories of respondents

Aspect ID NO ^a	Group 1 mean rank	Group 2 mean rank	Group 3 mean rank	Group 4 mean rank	Group 5 mean rank	Chi-square value
1	72.09	61.25	72.41	57.20	74.90	4.810
8	65.39	68.00	70.05	74.68	57.70	6.041
10	69.57	63.00	66.98	65.34	84.00	1.560
16	69.18	71.42	66.38	68.33	82.50	1.625
17	63.83	70.71	68.20	79.83	49.50	5.687
21	67.52	74.54	71.30	67.60	65.80	0.612
23	62.61	64.83	79.44	71.23	69.60	4.527
34	63.92	53.71	79.59	73.53	66.50	6.695

^aNumbers correspond with those in Table 7.

The results in Table 11 show that significant difference among group means of the respondents' perceptions was found only on two (2) out of the thirty-four (34) variables (representing 34 aspects of U.S. technology education programs considered). Thirty-two (32) others showed no significance. In other words, the respondents' perceptions on the transferability of those 32 aspects of U.S. technology education programs to Nigeria did not vary significantly with the respondents' categories of previous employers. The null hypothesis was therefore retained on those 32 variables. It was rejected on the other two variables (aspects). These were Aspect 29 and Aspect 34. However, there were no major implications of these significant results. For

Aspect 29 (local government councils should control all secondary, technical and other vocational schools - as opposed to State control of schools), none of the group means was significantly greater than 3.00, the cutoff point (see Hypothesis 1). This means that when divided into groups according to their previous employer categories, the respondents, as groups, did not still recommend that aspect for transfer. For Aspect 34 (universities, polytechnics, and other institutions/agencies should be involved in the evaluation of public school programs), all the group means were significantly greater than 3.00, the cutoff point. This meant that grouping the respondents according to their previous employer categories did not affect their stand on recommending that aspect for transfer.

However, the analysis on the same variables using the nonparametric Kruskal-Wallis ANOVA technique, shown on Table 12, did not yield any significant results. This is not surprising since nonparametric techniques are known to be weaker than the parametric counterparts in identifying significance (Minium, 1978). As stated earlier, the two results are reported together for the varied interest of readers of this report.

Hypothesis 5

It was hypothesized that there would be no agreement among Nigerian students in the U.S. in their ranking on factors that might hinder them transferring to their work-places those technologies they acquired in U.S. education system. A list of factors that might hinder

educational technology transfer was given to respondents and they were required to rank these factors in the order they considered them critical, beginning from 1 for the factor that might hinder transfer most, and moving to 6 for the factor that might hinder transfer least. Hypothesis 5 highlighted that there would be no consistency or agreement among the ranks assigned to these factors by the respondents. Stated statistically, therefore, the hypothesis became:

The calculated coefficient of concordance (Kendall's W) for the means of respondents' ranks for the factors that might hinder transfer would not be significantly greater than zero. ($H_0: W = 0$)

The results of this analysis which involved all the 140 respondents in the sample are shown in Table 13.

Table 13 indicates that the calculated coefficient of concordance (Kendall's W) was significantly greater than zero at the selected level (.05). This means that there was agreement or consistency among the respondents in their ranking, and that it was not a random assignment of numbers to the factors given. The mean ranks show that Nigerian students perceived that those factors would hinder educational technology transfer in the order of criticality resembling the order the factors appear in Table 13. The null hypothesis as stated above was therefore rejected.

Table 13. Analysis of the ranking of factors that might hinder educational technology transfer to Nigeria by respondents

ID NO	Factors that might hinder transfer	Mean Rank
1	Lack of technical equipment	2.14
2	Lack of adequate maintenance of available equipment	3.35
3	Lack of appropriate textbooks and other instructional resources	3.65
4	Prevailing school policies and practices	3.95
5	Lack of support from school administrators and other colleagues	4.11
6	State control of the schools/curriculum	4.90

$w^a = 0.3201$ Chi-square = 268.8945* $df^b = 5$

^aDenotes Kendall's coefficient of concordance.

^bDenotes Degree of freedom.

* Significant at .05 level.

Hypothesis 6

It was hypothesized that there would be no agreement among Nigerian students in U.S. in their ranking of what they perceived as the most effective approach of addressing teacher preparation for technology education in Nigeria. A list of approaches (three) was given to the respondents and they were required to rank these

approaches in the order they perceived as most effective for Nigeria in addressing teacher preparation. The economy and educational needs of the country were to be considered in expressing their opinion. They were to give 1 to the approach they considered the most effective, and move to 3 to the approach considered to be least effective. Hypothesis 6 highlighted that there would be no consistency or agreement among the ranks assigned by the respondents to these approaches. Stated statistically, the hypothesis became:

The calculated coefficient of concordance (Kendall's W) for the means of respondents' ranks for approaches of teacher preparation would not be significantly greater than zero. ($H_0: W = 0$)

All the 140 respondents participated in this ranking, and the result of the analysis is shown in Table 14. As the table indicates, the calculated coefficient of concordance (Kendall's W) was significantly greater than zero at .05 level. The null hypothesis as stated above was, therefore, rejected. There was consistency in the respondents' ranks. The mean ranks in the table show that Nigerian students in the sample perceived the given approaches of teacher preparation as effective in reverse order as they appear in Table 14 ("doing the training exclusively locally" as the most effective, and "sending people to be trained abroad - like the TTTP" as the least effective).

Table 14. Analysis of the ranking by respondents of approaches for addressing teacher preparation for technology education in Nigeria

ID NO	Approaches of teacher preparation	Mean Rank
1	Sending people to be trained abroad (like the TTTP)	2.45
2	Having experts from abroad come to train people in Nigeria	2.13
3	Doing the training exclusively locally (using local experts)	2.06

$w^a = 0.2269$ Chi-square = 95.302* $df^b = 2$

^aDenotes Kendall's coefficient of concordance (W).

^bDenotes degree of freedom.

*Significant at .05 level.

Results of Other Analyses

It was the researcher's curiosity to find out whether the perceptions of the respondents on factors that might hinder educational transfer of technology, and on approaches of teacher preparation for technology education in Nigeria varied with the respondents' student status, area of specialization and previous employer categories. Since the analyses involved in exploring this aspect of the study involved comparing ranking among groups and no statistical program to handle

such analyses was immediately available to the researcher, descriptive information were gathered to answer the questions formulated.

Research question 7a

The first part of Research question 7 (whether perceptions on factors and approaches vary with student characteristics) was:

Would the respondents' perceptions on factors that might hinder educational technology transfer, and on approaches of teacher preparation for Nigeria's technology education vary with the respondents' student status?

To answer this question, respondents were split into two groups of undergraduate and graduate students, and their mean ranks, as groups, for the six factors and three approaches identified by the researcher on the questionnaire were computed. The results are shown in Table 15. The factor identification numbers correspond with those in Table 13, and the approach identification numbers correspond with those in Table 14.

Table 15 shows that the undergraduate students' ranking and that of the graduate students on factors that might hinder technology transfer were almost the same except for Factors 4 and 5. Undergraduate students' ranking showed fifth and fourth positions respectively, while graduate students' ranking showed fourth and fifth positions. The ranking remained the same on other factors.

On approaches of teacher preparation, Table 15 shows that there was a difference in the groups' ranking. While undergraduate students

Table 15. Mean ranks of respondents on factors that might hinder educational technology transfer, and on approaches of teacher preparation, according to student status of respondents

Factor/Approach ID NO ^b	Undergraduate (N ^a = 80) Mean rank	Graduate (N ^a = 50) Mean rank
Factor 1	2.026 (1) ^c	2.143 (1)
2	3.208 (2)	3.250 (2)
3	3.539 (3)	3.592 (3)
4	3.987 (5)	3.809 (4)
5	3.974 (4)	4.021 (5)
6	5.149 (6)	4.532 (6)
Approach 1	2.494 (3)	2.776 (3)
2	2.039 (1)	2.531 (2)
3	2.256 (2)	1.816 (1)

^aNumber of respondents in each group.

^bNumbers correspond to the ones in Table 13 (for factors) and Table 14 (for approaches).

^cNumbers in parentheses show order of the ranks within each group.

chose Approach 2 (having experts from abroad come to train people in Nigeria) as the most effective, graduate students chose Approach 3 (doing the training exclusively locally) as the most effective. The two groups, however, were unanimous in choosing Approach 1 (sending people to be trained abroad - like the TTTP) as the least effective. Considering majority opinion reflected in the ranking in Table 15, and in answer to the research question above, it can be said that the

respondents' perceptions on factors that might hinder technology transfer and on approaches of teacher preparation did not vary with the student status of the respondents. It is noted, however, that the graduate students' ranking on both the factors and approaches matched the overall ranking of all the respondents shown earlier in Table 14.

Research question 7b

The second part of Research question 7 (whether perceptions on factors and approaches vary with student characteristics) was:

Would the respondents' perceptions on factors that might hinder educational technology transfer, and on approaches of teacher preparation for Nigeria's technology education vary with the respondents' areas of specialization?

To answer this question, respondents were split into four groups and their mean ranks, as groups, for each of the six factors and three approaches identified by the researcher were computed. The groups (1 = electrical/electronics engineering; 2 = mechanical/automobile engineering; 3 = building/civil engineering; 4 = other areas) and their mean ranks are shown in Table 16. The factor and approach identification numbers (ID NO) in this table correspond to those in Table 13 and Table 14 respectively.

Table 16 shows that all the groups chose Factor 1 (lack of technical equipment) as the most probable critical hindrance to transfer of technology, and Factor 6 (State control of schools/curriculums) as the least probable critical hindrance. All

Table 16. Mean ranks of respondents on factors that might hinder educational technology transfer, and on approaches of teacher preparation, according to areas of specialization of respondents

Factor/ Approach ID NO ^b	Group 1 (N ^a = 24) Mean rank	Group 2 (N = 37) Mean rank	Group 3 (N = 44) Mean rank	Group 4 (N = 29) Mean rank
Factor 1	1.833 (1) ^c	1.824 (1)	2.186 (1)	2.414 (1)
2	2.917 (2)	3.576 (3)	3.024 (2)	3.310 (2)
3	3.478 (3)	3.515 (2)	3.861 (3)	3.483 (4)
4	4.478 (5)	3.875 (5)	4.095 (5)	3.448 (3)
5	4.000 (4)	3.727 (4)	4.024 (4)	4.379 (5)
6	5.348 (6)	4.750 (6)	5.171 (6)	4.500 (6)
Approach 1	2.333 (2)	2.771 (3)	2.476 (3)	2.690 (3)
2	2.500 (3)	2.118 (2)	2.209 (1)	2.241 (2)
3	1.792 (1)	1.944 (1)	2.357 (2)	2.035 (1)

^aNumber of respondents in each group.

^bNumbers correspond with those in Table 13 (for factors) and Table 14 (for approaches).

^cNumbers in parentheses show order of the ranks within each group.

groups but one chose Factor 5 (lack of support from administrators and colleagues) as the fourth critical factor, and Factor 4 (prevailing school policies and practices) as the fifth critical factor. All groups but one chose Factor 2 (lack of adequate maintenance of available equipment) as the second critical factor. Opinions split on which one should be the third critical factor. Two groups chose Factor 3 (lack of appropriate textbooks and other instructional resources).

It is noteworthy that no group's ranking matched the ranking of the overall group of respondents as shown in Table 13.

On approaches of teacher preparation, Table 16 indicates that all groups but one chose Approach 3 (doing the training exclusively locally) as the most effective, and Approach 1 (sending people to be trained abroad - like the TTTP) as the least effective. Opinions varied on Approach 2 (having experts from abroad come to train people in Nigeria). Two groups chose it as the second most effective, one group chose it as the most effective, and one group chose it as the least effective. It is noteworthy that ranking of groups 2 and 4 matched the overall ranking of the whole sample as reported in Table 14. From the results in Table 16, it is difficult to derive a clear-cut answer to Research question 7b. Going with majority opinion, however, it can be said that the respondents' perceptions on the most and least critical factor that might hinder technology transfer, and on the most and least effective approach of teacher preparation did not vary substantially with the respondents' areas of specialization.

Research question 7c

The third part of Research question 7 (whether perceptions on factors and approaches vary with student characteristics) was:

Would the respondents' perceptions on factors that might hinder educational technology transfer, and on approaches of teacher preparation for Nigeria's technology education vary with respondents' previous employer categories?

To answer this question, respondents were split into five groups, and their group mean ranks for each of the six factors and three approaches were computed. The groups (1 = State teaching service; 2 = Federal teaching service; 3 = post-secondary institutions; 4 = State/Federal ministries - not teaching; 5 = other employers) and their mean ranks are shown in Table 17. The factor and approach identification numbers in this table correspond to those in Table 13 and Table 14 respectively.

Table 17 indicates that apart from group 4, all others ranked Factor 1, Factor 2 and Factor 3 in that order as the most probable critical hindrances to technology transfer. All the groups chose Factor 6 as the least critical hindrance. Some variations featured in the ranking of other factors. There was, however, some consistency among groups 1, 2, 3 and 5 in their ranking. Group 4 was somewhat different from others; incidentally, this group consisted of people who had been working before in State or Federal ministries not involved in teaching. Only the ranking of Group 3 matched the ranking of the overall sample shown in Table 13.

On approaches of teacher preparation, variations in perceptions featured. However, three groups chose Approach 3 (exclusive local training) as the most effective, and all groups but one chose Approach 1 (training abroad) as the least effective. While Approach 2 (foreign experts train people in Nigeria) was chosen by two groups as the most effective, the same approach was chosen by three groups as the second

Table 17. Mean ranks of respondents on factors that might hinder educational technology transfer, and on approaches of teacher preparation, according to previous employer categories of respondents

F/A ^a	Group 1 (N ^b = 57)	Group 2 (N = 12)	Group 3 (N = 33)	Group 4 (N = 30)	Group 5 (N = 5)
ID NO ^c	Mean rank	Mean rank	Mean rank	Mean rank	Mean rank
F 1	1.834 (1) ^d	2.417 (1)	1.906 (1)	2.345 (1)	3.000 (1)
2	3.185 (2)	3.083 (2)	2.968 (2)	3.448 (3)	3.600 (2)
3	3.611 (3)	3.417 (3)	3.438 (3)	3.750 (4)	4.000 (3)
4	4.192 (5)	3.917 (5)	3.938 (4)	3.214 (2)	4.600 (4)
5	4.038 (4)	3.833 (4)	3.968 (5)	4.000 (5)	4.600 (4)
6	4.962 (6)	5.182 (6)	4.839 (6)	4.786 (6)	4.800 (6)
A 1	2.564 (3)	2.364 (2)	2.750 (3)	2.567 (3)	2.800 (3)
2	2.309 (2)	2.000 (1)	1.938 (1)	2.413 (2)	2.400 (2)
3	2.018 (1)	2.417 (3)	2.094 (2)	2.067 (1)	2.000 (1)

^aF represents Factor, and A represents Approach.

^bNumber of respondents in each group.

^cNumbers correspond to those in Table 13 (for factors), and Table 14 (for approaches).

^dNumbers in parentheses show order of the ranks within each group.

most effective. The ranking of three groups (1,4 and 5) matched the overall ranking of the whole sample shown in Table 14.

The results in Table 17 indicate that Research question 7c may be answered in the affirmative; that is, the perceptions varied with the groups. However, going with the majority opinion, it can still be said that the respondents' perceptions on the most and least critical factor

that might hinder transfer, and on the most and least effective approach of teacher preparation for Nigeria's technology education did not vary substantially with the respondents' previous employer categories.

CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In this final chapter, the summary of the study is presented. Conclusions, discussions and recommendations based on the findings are also presented.

Summary

Restatement of the problem

Nigeria, like other third world countries, has been sponsoring her citizens to study technology education programs in the U.S. with the hope, probably, that the trained personnel will transfer some of the "technologies" acquired there to improve the educational programs back home. Since the literature has shown 'technology transfer' to be characterized by many factors and problems; and that many U.S. colleges and universities do not consider the peculiar needs of foreign students and their countries in the programs offered, the foreign student then has to select what he or she feels as transferable from all that he or she sees or learns. This study was designed to investigate those aspects of U.S. technology education programs that could be transferred and applied in Nigeria, as perceived by those studying or observing them.

Restatement of the purpose

The purpose of this study was four-fold: (1) to identify what Nigerian students studying technology education programs in U.S.

perceived as transferable to Nigeria from selected aspects of U.S. technology education programs, taking into consideration Nigeria's culture, economy and educational needs, (2) to find out whether these perceptions varied with students' status, area of specialization, and previous employer categories, (3) to identify the factors that Nigerian students studying technology education programs in U.S. perceived as potential barriers to transfer of their acquired technologies to Nigeria, and (4) to find out what these Nigerian students perceived as the most effective approach of addressing teacher preparation for technology education in Nigeria.

Previous chapters of this report included:

1. An introduction describing the background of the study that led to the formulation of the research problem, questions, hypotheses, procedures, and analysis techniques used in the study.
2. A comprehensive review of literature on selected aspects of U.S. technology education programs, and on issues on technology transfer. Some background information about Nigeria were also reviewed.
3. A description of the methodology and procedures used to collect data, and the analysis techniques used to treat the data.
4. A presentation of the analyses of data and the findings therefrom.

In the section that follows, the findings reported in Chapter Four are summarized, and conclusions are presented and discussed.

Conclusions

The conclusions presented here are organized under each question and hypothesis of the study. Each research question with the accompanying hypothesis is restated, the answer or finding on it is reported, the conclusion(s) following that is presented, and a brief discussion is added to it.

Research question 1

What aspects of U.S. technology education programs do Nigerian students studying in the U.S. perceive as transferable to Nigeria ?

This question led to the formulation of the following null hypothesis.

Hypothesis 1

The Nigerian students in the sample would be neutral in their perceptions on the transferability of each of the 34 aspects of U.S. technology education programs selected for consideration to Nigeria (that is, the mean score of their perceptions would not be significantly greater than 3.00 - the numerical score for 'neutral' response on the questionnaire).

Conclusion

The 34 aspects of U.S. technology education programs considered were presented in Table 7. The table indicated that the mean scores on 32 of these 34 aspects were significantly greater than 3.00, the cut-off point, at .05 level. The mean scores on two aspects were not significantly greater than 3.00, although one had a significant negative t-value, meaning that the mean score was significantly less than 3.00. This means that the null hypothesis was rejected on 33 aspects. From these results, and in answer to Research question one, it is concluded that Nigerian students studying technology education programs in the U.S. perceived the following aspects of U.S. technology education programs as transferable to Nigeria, and recommended the adoption of these in Nigeria's education education programs:

1. The content taught in a vocational program should be derived from verified industrial/production needs of the surrounding community.
2. The content taught should evolve from the identified competencies needed by most people in that trade.
3. Instruction should be tailored to individual student needs (individualized instruction teaching approaches).
4. Use of computers in the schools to facilitate instruction (computer-assisted instruction) should be adopted.
5. Special attention (like laws, programs, etc.) should be given to special needs (handicapped) students in the school system.

6. Prospective teacher should be required to pass minimum competency test(s) in his or her subject area before being employed.
7. Evaluation of beginning teachers by the principal should be carried out.
8. Specified minimum and relevant industrial experience should be required before one is employed to teach a vocational program.
9. Besides the school diploma/degree, certification/endorsement to teach a particular subject at a particular school level should be required of every prospective teacher.
10. Periodic updating requirements (to maintain one's position) should be prescribed for every teacher.
11. Students should be given the opportunity to evaluate the teacher at the end of each term/year.
12. Student evaluation evaluation of the teacher (as well as other data) should be used for teacher evaluation and promotion.
13. A comprehensive program of periodic evaluation of the teacher (which could be used to improve quality of service, determine teacher promotion, etc.) should be in practice.
14. Every teacher should belong to and be actively involved in professional organization(s).

15. Teacher should use a variety of assessment techniques to evaluate a student's academic progress, not just written tests and examinations.
16. A student should meet specified minimum performance standard before being promoted or allowed to progress to the next learning unit/task (testing for 'Mastery' as opposed to 'Norming').
17. Students' examination/test performance should be analyzed, and the results used to improve students' learning.
18. Statewide standardized test(s) should be developed for each vocational program.
19. Nationwide standardized test(s) should be developed for each vocational program.
20. Accreditation boards should be established to periodically accredit every secondary school.
21. Accreditation boards should be established to periodically accredit every technical/vocational school.
22. Students should be given the opportunity to evaluate instruction at the end of each term/year.
23. Data from student evaluation of instruction should be used systematically to improve instruction.
24. Follow-up of program graduates soliciting their evaluation of the school program and other suggestions from alumni should be practiced.

25. Studies of employers' appraisal of the program graduates and employer suggestions should be conducted periodically.
26. Use of advisory committees to evaluate school programs should be practiced.
27. Use of parents-teachers associations to evaluate school programs should be practiced.
28. Close working relationship (partnership) between SCHOOL and BUSINESS/INDUSTRY should be established to plan educational programs for the community.
29. Advisory committees should be established for each vocational program/school.
30. Vocational student organizations should be encouraged, and utilized for instructional purposes.
31. Each school should maintain a full-time guidance counselor to advise on career, emotional, psychological, and other needs.
32. Universities, polytechnics, and other institutions/agencies should be involved in the evaluation of public school programs.

The Nigerian students were neutral in their perceptions on the transferability of one aspect (parents-teachers associations should be involved in the evaluation of the teacher). They did not recommend it for transfer, neither did they come out to oppose recommending it. Their mean score of perceptions (2.829) was not significantly different from (greater or less than) 3.00.

On one other aspect (local government councils should control all secondary, technical and other vocational schools - as opposed to State control of schools), not only did Nigerian students fail to recommend it for transfer, the statistical analysis showed that the students were specific in not recommending it for transfer. Their mean score of perceptions was 1.308 with a negative t-value of 6.49, significant at .05 level. Of the 34 aspects of U.S. technology education programs considered, it is concluded that these two aspects were not perceived as transferable by Nigerian students observing the practices in the U.S.

Discussion

It would be correct, perhaps, to state that Research question one was the most important question this study sought to answer. It was the main thrust of the study. Nigeria has made substantial investment in sponsoring her nationals to be trained as teachers in the U.S. These trained teachers are the hope of the country at the time the new educational policy on technology education is being implemented. Research question one sought to elicit the opinion of Nigerian students who were studying and observing technology education programs in the U.S. on whether some of the practices they were studying or observing could be transferred and applied back home. The answer to this question has shown that almost all the aspects identified by the researcher on the instrument were perceived positively by the respondents.

Content The recognition given by Nigerian students to the role of 'needs assessment' and 'task analysis' in the process of deriving content in technology education is not surprising. These two are approaches that have characterized the U.S. technology education programs, and their effectiveness has been underscored in the literature (Hunt, 1986; Swierczek and Carmichael, 1985). It is interesting to see the findings of this study being similar to those of Nwoke's study (1986). In trying to identify what Nigerian teacher educators, department executive officers, technical teachers, and graduate students perceived as curriculum approach to be emphasized in industrial and technical teacher education curriculum development for Nigeria, Nwoke found that his respondents agreed strongly that (1) task analysis of what workers do in various occupations, (2) asking employers about necessary competencies needed to obtain and retain a job, and (3) a consensus of subject experts on what should be taught, should be the approaches emphasized. The respondents in this present study seemed to agree that those approaches should be emphasized, not only in teacher education programs, but also in the programs the trained teachers would be teaching.

In a society as heterogeneous as the Nigerian, and in an economy as poor as the Nigeria's, the importance of needs assessment, in determining what programs to offer in a particular school, cannot be over-emphasized. It is one way of ensuring that the school is training the manpower needed in a particular community, and is not producing graduates to roam the streets, looking for non-existing jobs.

Teaching methods It is not surprising that the three aspects under this sub-head were perceived by Nigerian students as transferable. Individualized instruction, computer-assisted instruction (CAI), and special instructional delivery system for the handicapped, gifted and the disadvantaged students, are what Nigerian students recommended for implementation in Nigeria's educational system. If these content delivery strategies are as effective as they are reported to be (Latham, 1987; Lockard et al., 1987; Niemiec and Walberg, 1987; Weston and Cranton, 1986; Yang, 1987), then Nigerian students' recommendations are important and timely at this period Nigerian government is considering evolving a computer education policy and programs for the country (Staff, 1988). . But issues like technical feasibility, cost, affective, psychomotor and social results of implementing such recommendations, as postulated by Melmed (1986), will exert a considerable influence on the seriousness attached to the recommendation. Although the respondents were asked to consider the economy of Nigeria while indicating their perceptions, and they tended to support the adoption of CAI in Nigerian school system, this researcher is very conservative about the viability of such 'project' at this time in Nigeria, considering the economy, though there may be no doubts about its effectiveness. It might be a venture worthwhile in a near future. However, Nigeria's implementation of individualized instruction strategies, and special attention to content delivery strategies for handicapped, gifted and disadvantaged citizens will be a

demonstration of democracy in instructional delivery - respecting and caring for the varied needs and abilities of learners. This recommendations matches those of Obiakor (1983).

Teacher evaluation The perceptions of the respondents on the transferability of the aspects under teacher evaluation are surprising, at least to this investigator; the reason being that more than 60 percent of the respondents were teachers before coming to the U.S. and would be going back to their employers. With general tendency of resentment in people towards evaluation, it appears surprising that teachers participating in this study recommended varied processes for teacher evaluation, including the evaluation of beginning teachers by their principals. It is not surprising, however, to see respondents expressing reservations on the involvement of parents-teachers associations in the evaluation of the teachers.

The evolution of teaching as a profession (like other professions) is still a matter of concern in Nigeria. Perhaps, by recommending that minimum competency tests, certification, endorsement and re-certification requirements, and active involvement in professional associations be adopted into the teacher evaluation scene in Nigeria, the Nigerian students were agreeing with some authors (like LeBrum, 1986; Melville et al., 1987; Popham, 1985; Shanker, 1985) that these are some of the ways to make teaching a genuine profession, and to win public support for schools. They are ways to hold teachers accountable for what they do. The recommendation that specified minimum and

relevant industrial experience be required before anyone is employed to teach a vocational program is important, in the researcher's judgement. Although the implementation of such venture may cripple the already critical situation of having enough technical teachers for the nation's schools, such practice should be the ultimate goal. The finding of this study is similar to that of Nwoke's study (1986). Nigerian departmental executive officers, teacher educators, technical teachers, and graduate students favored a work experience requirement of at least two years (mean = 2.62) for all pre-service industrial and technical teachers. The respondents in that study favored industrial attachment (internship) as a way of satisfying that requirement, and Matthews and Pyle (1978) see cooperative experience as another way. Although Nwoke (1986) has opined that in an era of serious unemployment, a requirement that teachers work full-time in industry for at least two years before going into the classroom would not only be wasteful of needed human resources, but could lead to frustrations on the part of both the teachers and the educational system, the importance of industrial experience for a vocational teacher is underscored. Perhaps this recommendation is a way of asking the Nigerian government to implement what is in the national policy on education concerning recruitment of technical teachers (Federal Republic of Nigeria, 1981).

Student evaluation of the teacher, if implemented, will be a breaking of a new ground in Nigeria, and it is likely that the controversies surrounding the use of such data for teacher evaluation

will feature in Nigeria too. The problems associated with all the aspects of the U.S. technology education programs under teacher evaluation, when implemented, may be enormous, but they have the potential of revolutionizing the Nigerian educational system for good.

Student evaluation The recommendation that a variety of assessment techniques be used to evaluate a student's academic progress, and not just written tests and examinations is recognizing what is conventional (Sia and Sydnor, 1987). 1987). Analyzing students' test performances and using such results to improve instruction is satisfying one of the purposes of student evaluation (Dunham, 1986). Statewide and nationwide standardized tests for vocational programs may be ways of ensuring standards across the nation, but the implementation will require some tact so that the heterogeneity of the nation's groupings is not threatened. Testing for mastery or mastery learning as an approach of content delivery is an innovation that could revolutionize the educational system in Nigeria, assuming the reports given about the approach are true (Burns, 1979; Walberg, 1987; Whiting and Render, 1987). If the approach is blended with the continuous assessment technique specified for Nigerian school system in the national policy on education (Federal Republic of Nigeria, 1981), a strong and dependable system of student evaluation will be the result, and student gains in schools will be measurable and substantial.

Curriculum/program evaluation It is noteworthy to find the respondents consistent in their recommendations. Having recommended some practices under teacher and student evaluation, Nigerian students went ahead to recommend some practices under curriculum/program evaluation that have the potential of maintaining standards among technology education programs in Nigeria. The recommendation that accreditation boards should be established to periodically accredit every secondary, technical and vocational school is a way of calling on the Nigerian educational policy makers to realize that these categories of schools need careful attention in maintenance of standards, just like the polytechnics and other colleges in the country (Shirer, 1987). It is a call for either expanding the functions of the present National Board for Technical Education (NBTE) which accredits all the polytechnics and colleges of technology, or creating a similar board or agency to handle the affairs of secondary and technical/vocational schools. This might be a way of gradually approaching the American way of accreditation which involves nongovernmental agencies, and is voluntary in nature (Stoodley, 1987).

When students evaluate the teacher, they are indirectly evaluating instruction, and vice versa. If this recommendation is implemented, it will lead to the fulfillment of one of the purposes of course evaluation as outlined by Cronbach (in Madaus et al., 1983). Nwoke (1986) observed in his study that it appeared administrators of industrial teacher education programs in Nigeria did not consider

follow-up studies as useful tools for program evaluation. Nigerian students, having observed the practice in the U.S. did recommend that follow-up of program graduates should be conducted, and graduates' perceptions about the school program, and their suggestions for improvement, should be collected during such study. As this practice operates in the U.S. (Wentling, 1980), it might work similarly in Nigeria. Closely related to follow-up of program graduates are studies of employer appraisal of the program graduates and employer suggestions for the improvement of school program based on the observed performance of the school graduates. Implementing the recommendation of respondents of this study will enable Nigeria's educational programs to benefit from inputs that such groups provide to ensure quality programs (Paris, 1985).

The involvement of advisory committees and parents-teachers associations (PTAs) in the evaluation of school programs, as recommended by the respondents, is consistent with the recommendation on needs assessment or the involvement of the community in shaping the direction of the school. It is noteworthy, however, to find the respondents recommending that PTAs be involved in evaluating school programs, and not in evaluating teachers. On the whole, it appears Nigerian students in the sample of this study, who would be occupying some places in the country's technology educational scene, did recognize the importance of program or curriculum evaluation. It is hoped they would do every thing possible to initiate the implementation of some of their recommendations in their environments.

Administration Nigerian students were not just neutral on whether local government councils should control all secondary, technical and vocational schools (as opposed to State control of schools), they were definite in not recommending such practice. It is either the respondents were not convinced of the effectiveness of such practice in the U.S. school system, or they were anticipating some problems in implementing such practice. However, this researcher acknowledges the fact that that very item on the questionnaire was not specific enough, and so it could have meant different things to different people. It could have engendered thoughts on funding, designing curriculums, designing and enforcing standards, recruitment and discipline of teachers, or such other issues that 'control of schools' might connote. It was not clear, therefore, to what exactly the respondents were objecting. Perhaps, the drive behind the recommendation might have evolved from the respondents' reflections on the financial experiences of these local government councils since their establishment in 1976 (Olowu, 1988) which have been anything but encouraging.

Having recommended the practices of needs assessment and task analysis, employer appraisals, and involvement of PTAs and advisory committees in school programs, it is not surprising to find Nigerian students recommend the establishment and maintenance of partnership between schools on one end, and businesses and industries on the other end. The recommendation that advisory committees be established for

each vocational program/school is equally consistent with other recommendations. The respondents were saying that perhaps it was time the business community and industries in Nigeria participated substantially in helping the school meet its obligations, including that of turning out trained manpower for the community. This participation might include funding, inputs in curriculum design and evaluation, and providing opportunities for industrial training for students. The respondents were indirectly calling on Nigerian government to implement that aspect on involvement of business and industry in the national policy on education (Federal Republic of Nigeria, 1981). Nwoke (1986) also realized this need for cooperation between educational institutions and industry in his study. If advisory committees are established for Nigerian vocational programs/schools, and they perform such functions as outlined by Calhoun and Finch (1982), Nigerian technology education system would have a big boost.

The recommendation that student organizations be encouraged and utilized for instructional purposes is a step further from the statement in the national policy on education which recognizes these organizations only as instruments of character training (Federal Republic of Nigeria, 1981). However, the effectiveness of such practice would probably depend greatly on the resourcefulness of teachers who would work directly with the students. The government will probably need to initiate the process by making a policy on the

involvement of student organizations in content delivery, and going ahead to give recognition to these organizations.

The maintenance of full-time guidance counselor in each school, as recommended by the respondents, will be breaking a new ground in Nigeria's educational system. The investigator, however, doubts the successful implementation of such practice, observing that very few personnel in this category are trained at any particular time. The involvement of universities, polytechnics and other institutions and agencies in the evaluation of public school programs, as recommended in this study, will amount to utilizing the services of these institutions properly. It will also give these institutions the opportunity of ensuring that their intakes (who come from these public schools) do have adequate and expected preparation in their schools.

Research question one was the main thrust of the study. This researcher concludes that if all the aspects of U.S. technology education programs recommended for transfer by Nigerian students who participated in this study are implemented in Nigeria's educational programs, there will be a tremendous boost to the educational system, and the outcome of such boost will result in substantial harvests in the lives of the citizens, and in the economy of the communities.

Research question 2

Is there any difference between the perceptions of undergraduate students and those of the graduate students on the transferability of selected aspects of U.S. technology education programs to Nigeria?

This question led to the formulation of the following null hypothesis.

Hypothesis 2

There would be no significant difference between the perceptions of undergraduate students and those of graduate students on the transferability of each of the 34 selected aspects of U.S. technology education programs to Nigeria.

Conclusion

The result of analysis reported in Table 8 showed that the mean scores for undergraduate students were significantly different from the mean scores of graduate students on only two of the thirty-four aspects considered. Hence, the null hypothesis was not rejected on thirty-two variables or aspects studied (except on those other two variables). Even on those two aspects, the mean scores of the two groups were each significantly greater than 3.00 (refer to Hypothesis 1) on one aspect, and significantly less than 3.00 on the other aspect. Thus, though statistical analysis indicated a difference in the perceptions of the two groups of respondents, there was no difference in their perceptions in recommending one aspect for transfer and in not recommending the other aspect. From these results, and in answer to Research question one, it is concluded that there was no difference between the perceptions of undergraduate students and those of graduate students on the transferability of the aspects of U.S. technology education programs considered in this study to Nigeria.

Discussion

It is interesting to observe the unanimity among Nigerian students in their perceptions. It means the status of the student, as undergraduate or graduate student, had no major influence on his or her perceptions. This finding is similar to Ogunbi's (1978) who found no significant difference in the perception of educational relevance between the older and more experienced students and the younger and less experienced students, assuming the student classification in this study is accepted to resemble Ogunbi's classification. In the two aspects where significant difference was found in the group mean scores, and in other cases (through visual inspection of the group mean scores), it was evident that the graduate students were more conservative in their perceptions, and hence, in their recommendations. Perhaps, this was evidence of more experience or maturity.

Research question 3

Do the perceptions of Nigerian students on the transferability of selected aspects of U.S. technology education programs to Nigeria vary with the students' areas of specialization?

Based on this question, the null hypothesis below was formulated.

Hypothesis 3

The perceptions of the respondents on the transferability of each of the 34 selected aspects of U.S. technology education programs to Nigeria would not vary significantly with the respondents' areas of specialization.

Conclusion

Of the 34 aspects considered, only in one aspect did the analysis show significant difference among the group mean scores (see Table 9). The null hypothesis was, therefore, not rejected on 33 variables (aspects), except on that one aspect. Even on this one aspect, each of the four group mean scores was significantly greater than 3.00 (cut-off point), meaning that all the groups recommended that aspect for transfer, the statistical significant results notwithstanding. From these results, and in answer to Research question 3, it is concluded that the perceptions of Nigerian students on the transferability of the aspects of U.S. technology education programs considered to Nigeria did not vary with the students' areas of specialization.

Discussion

Unanimity among the Nigerian Students in the sample in their perceptions is again observed from the data analysis. The result shows that the felt importance of the selected aspects of U.S. technology education programs considered in this study was not influenced by respondents' areas of specialization. In other words, the aspects were considered equally important and applicable in the areas of electrical, electronics, mechanical, automobile, building engineering, woodwork, agriculture, home economics, and other related areas, and, perhaps, in other subject areas in the Nigerian educational system.

Research question 4

Do the perceptions of the respondents vary with the respondents' previous employer categories?

From this question, the following hypothesis was derived.

Hypothesis 4

The perceptions of the respondents on each of the 34 aspects under consideration would not vary significantly with the categories of the respondents' previous employers.

Conclusion

It was indicated in Table 11 that the group mean scores showed significance on only two of all the variables. The null hypothesis was therefore not rejected on 32 of the 34 variables (aspects). Even on these two aspects, all the group mean scores were significantly greater than 3.00 (cut-off point) on one aspect (meaning that all the groups recommended that aspect), and none of the group mean scores was significantly greater than 3.00 on the other aspect (meaning that all the groups chose not to recommend that aspect). Based on these results, and in answer to Research question 4, it is concluded that the perceptions of Nigerian students on the transferability of the aspects of U.S. technology education programs under consideration to Nigeria did not vary with the students' previous employer categories.

Discussion

This finding is consistent with other findings (Research questions 1 to 3). It is similar to Nwoke's finding (1986) that there was no significant difference in perception among department executive officers, teacher educators, technical teachers, and graduate students regarding (1) objectives to be sought, (2) curriculum approach to be emphasized, and (3) participants to be involved, all in industrial and technical teacher education programs in Nigeria. The background of the respondents in this study (highlighted in Chapter 1) matches those in Nwoke's study. The importance of the aspects recommended for transfer in this study is further enhanced by the fact that respondents from different employers agreed together in recommending 32 of the aspects, and failing to recommend 2 of the aspects. It is interesting, however, to find that the group mean score for the category 'post-secondary institutions' was the greatest on Aspect 34 (universities, polytechnics, and other institutions/agencies should be involved in the evaluation of public school programs). This tends to show that Nigerian students were not only making these recommendations, but some of them were indicating their willingness to be participants in the implementation of the recommendations. It is noteworthy also to find that there was no significant difference in the perceptions of these respondents who were not teachers before coming for training in the U.S., and those who had been teachers before. Teachers in the Federal service did not perceive significantly different from teachers in the

State service, neither did post-secondary teachers perceive significantly different from other teachers at the lower level. These results were obtained in spite of the varying conditions of service of these categories of employers. This variety had little or no influence on the students' judgement on what would be needed to improve technology education programs in Nigeria.

Research question 5

What factors do Nigerian students in the U.S perceive as having the potential of critically hindering them from transferring to their work-places those technologies acquired by them in U.S.

An hypothesis derived from this question follows.

Hypothesis 5

There would be no agreement in the Nigerian students' ranking of factors perceived as having the potential of critically hindering them transferring to their work-places those technologies acquired in U.S.

Conclusion

The coefficient of concordance on the respondents' ranking of factors identified by the researcher, as shown in Table 13, was significantly greater than zero. The null hypothesis was therefore rejected at .05 level. There was agreement in their ranking. From these results, and in answer to Research question 5, it is concluded that Nigerian students perceived the following factors, in the order of criticality, as having the potential of critically hindering transfer of their acquired technologies from the U.S. to Nigeria:

1. Lack of technical equipment.
2. Lack of adequate maintenance of available equipment.
3. Lack of appropriate textbooks and other instructional resources.
4. Prevailing school policies and practices.
5. Lack of support from school administrators and other colleagues.
6. State control of the schools/curriculums.

Discussion

The literature has indicated that transfer of technology is characterized by many factors, conditions and problems (Kosenko and Samli, 1985; Singh, 1983). Research question 5 was designed to elicit from the respondents what they perceived as potential barriers to their efforts in transferring and applying some of the technologies they were learning/observing in U.S. technology education programs. However, they were not asked to formulate all of these factors. Instead, they were asked to rank the six factors identified by the researcher, and to add their own factors. The analysis has shown that 'lack of technical equipment' was cited as the most critical factor that could hinder transfer and application of technologies learnt in the U.S. The second critical factor was chosen to be 'lack of adequate maintenance of the available equipment'. Consistency in their perceptions were demonstrated by the respondents in their ranking 'State control of schools/curriculums' as the least critical factor that could hinder

transfer. They had already chosen not to recommend transferring the practice of local government councils controlling all secondary, technical and vocational schools (see Hypothesis 1). The ranking in this study tends to support the comment by International Research Associates (1955) that often times, the physical base for application of skills, techniques, and methods is not existent, and limits application. But the finding is inconsistent with that of Sudsawasd (1980) which showed that non-availability of equipment and facilities were not perceived by Thai returnees as having effect on utilization of their education.

The item on the questionnaire that addressed this research question asked the respondents to indicate other factors perceived by them as possible hindrances. The ones with relatively more frequencies were:

1. Poor image of vocational/technical education.
2. Poor conditions of service for teachers.
3. Unstable governments.
4. Poor economy in the country.
5. General poor attitude to work in the country.

The above factors tend to show that vocational/technology education in Nigeria is still plagued by poor image, and Nigerian students showed concern that this image issue might stand in their way in bringing the necessary innovations into Nigerian school system to improve the system. This researcher tends not to see this issue as a

serious barrier, rather as a challenge to the respondents and the population they represent when they would return to Nigeria. The underlying issue about some of the factors was poor economy or insufficient funds for the educational system. While the respondents and other educational practitioners in Nigeria may have little control over the state of the nation and global economy, they do have substantial role to play in addressing other factors like poor image of vocational/technical education and poor attitude to work.

Research question 6

What approach do Nigerian students in U.S. perceive as the most effective for addressing teacher preparation for technology education in Nigeria?

The following hypothesis was formulated based on this question.

Hypothesis 6

There would be no agreement in the Nigerian students' ranking of possible approaches of addressing teacher preparation for technology education in Nigeria.

Conclusion

The coefficient of concordance on the respondents' ranking of the approaches identified by the researcher, as reported in Table 14, was significantly greater than zero at .05 level. The null hypothesis was therefore rejected. There was agreement in their ranking. From this result, and in answer to Research question 6, it is concluded that

Nigerian students in U.S. participating in this study perceived that the most effective approach for addressing teacher preparation for technology education in Nigeria was "doing the teacher training exclusively locally (using local experts)". The approach perceived by the respondents as the least effective was "sending people to be trained abroad (like the TTTP)". The second choice was "having experts from abroad come to train people in Nigeria".

Discussion

The problems associated with technology transfer in any field have been discussed in the literature, and a number of reasons for transfer failures in some instances have been highlighted (Cavusgil, 1985; Gwiasda, 1984; Matlock, 1984). Research question 6 was formulated to elicit the respondents' perceptions on whether Nigeria should get involved in the transfer process in the area of teacher preparation for the country's technology education, considering not only the problems involved in the transfer process, but also the ailing economy of the country. The result of the analysis is, at the least, surprising. It is surprising to see participants in the TTTP rejecting that approach (training abroad) as the most effective, and even perceiving it as the least effective approach for the country, in spite of the element of bias one would expect the respondents to exhibit in their responses. One would have thought that the obvious choice from the few privileged Nigerians benefiting from training in the U.S. under the TTTP would be the continuation of such program. Surprisingly, the opposite was the

case. The approach was ranked the least effective. This implies that, given the chance, the respondents would recommend the discontinuation of the program. This finding may raise a question or doubt on the relevance of the education and other kinds of experiences these TTTP participants might be getting in the U.S.

The finding is not surprising, however, when the economy of the country is brought into perspective vis-a-vis the cost involved in the TTTP. Perhaps, Nigerian students in the TTTP were expressing objectivity and patriotism in their perceptions. Perhaps, given the high cost of education in the U.S, the Nigerian students in the sample were observing that the cost of training one person in the TTTP could possibly take care of about ten people going through similar training within Nigeria. This might hold true, particularly at the exchange rate of currency in the 'foreign exchange market (FEM)' which was in vogue at the time this study was conducted. When they considered the small number of people that could be trained abroad (like in the TTTP), and the large number of trained teachers needed for the country's technology education programs, the respondents tended to forget about their personal benefits in the TTTP, and to recommend what they judged to be in the best interest of Nigeria, given the state of the economy. It is not clear whether this perception of respondents about the TTTP was based solely on the cost of the program vis-a-via Nigeria's economy, or whether the TTTP participants were indirectly passing judgement on the relevance of the education they were getting to their

personal and country's needs. May be this judgement on programs like the TTTP, by the TTTP participants themselves, should be taken seriously by those who share the responsibility of formulating and implementing educational policies for Nigeria.

The respondents were asked to indicate their own preferred approach(es) for teacher preparation for Nigeria's technology education. The comments of most of those who responded centered on the idea that more universities in Nigeria should establish programs in vocational/technical teacher education. Other suggestions were that those earlier trained in the TTTP should be gathered and used in the training of others within the country; and that the training abroad could continue together with local training with foreign and/or local experts until there is a sizeable pool of teachers for the technology education programs in the country. These findings are supported in the literature (Aina and Beecroft, 1982; Nwoke, 1986), and reflects Nigerian government's stand on foreign training programs and international aid, as expressed in the national policy of education (Federal Republic of Nigeria, 1981).

Other results (Research question 7)

In addition to addressing the main questions and hypotheses of the study, the researcher sought to find out whether the respondents' perceptions on factors that might hinder technology transfer, and on approaches of addressing teacher preparation for Nigeria's technology education varied with the respondents' student status, area of specialization and previous employer categories.

Conclusion

As reported earlier in previous chapters, no statistical test was involved in the analysis to this question. So, rejecting a null hypothesis or otherwise was not applicable here. From the descriptive reports in Tables 15, 16 and 17, and without prejudice to the little disagreement among some groups in their ranking, it is concluded that the perceptions of the Nigerian students on those two issues did not vary with their student status, area of specialization and previous employer categories in most cases. That serves as an answer to Research question 7.

Discussion

The three variables are considered separately.

Student status No major difference in opinion was detected in the ranking of undergraduate and graduate students on factors that might hinder transfer. The two groups agreed that 'lack of technical equipment' would be the most critical factor, and 'State control of schools/curriculums' the least critical factor (Table 15). This unanimity is similar to the one found in Hypothesis 2. There was a slight difference in opinion, however, between the two groups on the most effective approach of teacher preparation. While the graduate students favored exclusive local training (which matched the choice of the entire sample), the undergraduate students favored local training with foreign experts. It is noteworthy to find that both groups perceived 'training abroad' as the least effective approach of teacher

preparation for the country. Their perceptions could be summarized as a favor for 'training locally', and a disfavor for 'training abroad'. Hence, their responses need not be seen as difference in opinion.

Area of specialization No major difference in opinion was found among the four groups. They all chose 'lack of technical equipment' as the most critical factor that might hinder transfer, and 'State control of schools/curriculums' as the least critical factor (Table 16). Three of the four groups favored 'training locally (with local experts)' as the most effective approach of teacher preparation for the country, and also three of the four groups perceived 'training abroad' as the least effective approach. The difference in the ranking of one group among four groups should be understandable. This was another case of unanimity among the respondents in their perceptions irrespective of the differences in their areas of specialization.

Employer All the five groups perceived 'lack of technical equipment' as the most critical factor that might hinder technology transfer, and 'State control of schools/curriculums' as the least critical factor (Table 17). Three of the five groups favored 'training locally (using local experts)' as the most effective approach of teacher preparation; the other two groups favored 'training locally (using foreign experts)' as the most effective approach. So, it can be said that all the groups perceived 'training locally' as more effective than 'training abroad' which four of the five groups ranked as the least effective approach. Although there were these slight

disagreements among the groups (which should be understandable), no major difference was detected among the major underlying groups in the sample. For example, those who were teachers before coming to the U.S. for the training did not perceive differently from those who were not teachers before (workers in ministries and industries); Federal government employees did not perceive differently from State government employees; employees at the post-secondary level did not perceive differently from employees at the secondary level. Only those respondents who were in the Federal service (those teaching at Federal government colleges) before coming to the U.S. ranked 'training abroad' as the second most effective approach, and 'training locally (using local experts)' as the least effective. They were the only group to have favored 'training abroad' that much. The reason is not immediately discernable to this researcher.

General discussion

This study gathered the perceptions of Nigerian students studying technology education programs in the U.S. on the transferability or applicability of some of the practices they were studying/observing in the U.S. in Nigeria. Nigeria's economy and educational needs were to be considered in these perceptions. The perceptions on possible factors of hindrance to the transfer of their acquired technologies, and on approaches of teacher preparation for the country's technology education, were also studied. The findings have been really revealing. Even when they were split into groups according to their student

status, area of specialization and previous employer categories, the Nigerian students were still unanimous in their recommendations. Although it was doubtful whether the students actually considered the economy of the nation in some of their perceptions, this researcher read objectivity and patriotism in most of these perceptions. He exercises a good measure of confidence in placing the findings of this study before the authorities in educational matters in Nigeria. However, he would like to point out that the actual number of Nigerian students whose responses were used for the analyses in this study (140) was about 60 percent of the entire TTTP participants of that year. No one knows what the difference in the findings would have been if all the participants took part, or if all the people in the population of Nigerian students studying technology education programs in the U.S., whether sponsored or private students, (unknown to this researcher) took part in the study. A measure of caution is therefore recommended in interpreting and applying the findings.

Recommendations

Based on the findings of this study, the following recommendations are made.

1. The Federal Ministry of Education in Nigeria should initiate actions to gradually implement the recommendations that Nigerian students made in this study.

2. The governments that run the schools in Nigeria and the school administrators should work out strategies of involving business community and industry in formulating and funding school
3. Dialogue, understanding and cooperation should be established among the different levels of education in Nigeria (from primary to tertiary levels), with the staff at the tertiary levels showing more concern and interest in what happens at the lower levels.
4. The Federal government should make a serious consideration on whether the educational needs of the country are being served in embarking on programs like the TTTP, and should make a definite decision on their continuation. The government could explore on whether it might be more appropriate to train one set of students (say, graduate students only or undergraduate students only) than training all groups as it is done now.
5. The Federal government should evolve a system of harnessing all the inputs that TTTP participants (since its inception) can make, as individuals and as groups, to the consolidation and improvement of educational programs in the country.
6. A measure of availability of technical equipment should be one of the major factors in deciding to send people for training abroad.

Suggestions for Further Research

1. A similar study that involves all the Nigerians studying technology education programs in the U.S. (not those on the TTTP alone) should be carried out.
2. A similar study should be carried out with Nigerians studying engineering and other professional courses in the U.S.
3. A study that identifies all the participants in the TTTP since its inception and examines the contributions they are making to technology education in Nigeria, and identifies the issues involved in their efforts to transfer and apply the technologies acquired in U.S. in Nigeria, should be sponsored by the Federal government (the chief sponsor of the TTTP). Such study could provide additional data on the effectiveness of the program, and the reasonableness in the continuation of it as a way (or one of the ways) of addressing teacher preparation for technology education programs in Nigeria.

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ACKNOWLEDGEMENTS

It is difficult to list all the people who contributed in various ways to the success of both this study and my entire graduate studies in the United States of America. I am deeply grateful to every one of them.

My special thanks go to members of my graduate studies committee, Dr. William D. Wolansky, Dr. Anton J. Netusil, and Dr. Donald J. Mckay, who provided guidance as I went through this study and my program. I am particularly grateful to my major professor, Dr. William Wolansky, whose leadership, understanding and support saw me through the study and my entire program. I also thank him for the opportunity to work under him on a research project to broaden my experience in research. I am equally grateful to my co-major professor, Dr. Anton Netusil, for his contributions toward the quality of this study.

I acknowledge also the help and advice of Dr. William G. Miller toward the statistical analysis in this study. The support of Dr. Trevor G. Howe, Chair of the Department of Industrial Education and Technology, is also acknowledged with appreciation.

I feel I had great opportunities studying under Dr. Don Mckay, Dr. John Dugger, Dr William Miller and other faculty in the two departments I shared. I appreciate the contribution of each of them to my experiences and achievement.

I register my appreciation to the contact persons (internship coordinators, department heads, some Nigerian students) at the

different universities in the U.S. who helped in distributing the questionnaire used for this study. The financial support from Research Institute for Studies in Education (RISE), Iowa State University, to supplement expenses in data collection, is also acknowledged here with appreciation.

My indebtedness also goes to my sponsor, the Federal Government of Nigeria, for giving me the opportunity to study in the United States, even during the difficult economic period in Nigeria. I consider it a great privilege, and I deeply appreciate the gesture.

To my mother, Akon Joshua, Sr., I express my appreciation for her love, understanding, and help in the family during my absence. I owe a debt of gratitude to her, my in-laws, other family members, and other friends for their varied contributions and support.

A special 'thank you' goes to my beloved sister, friend, and wife, K-mma (Akon, Jr.), for her love, patience, and support to me, even from such a distance. She took care of our son, and supported the entire family in my absence. I owe her eternal debt of love and gratitude. I am also indebted to my son, Mfonobong, who would go through his first seventeen months in life without knowing and seeing his father. To the two Akon's and Mfonobong, who bore most of the pains of my absence, I dedicate this work.

Lastly, but more importantly, I express my thanks to God for His love and provision to me and my family throughout the period of my leave from home. May His name be praised and honored in my life and home forever.

APPENDIX A. LETTERS OF CORRESPONDENCE

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OWA STATE
UNIVERSITY

Telephone: 515-294-1033

July 14, 1987

Mr. Carlyle Mason
The Project Officer
Reimbursable Training Programs
Agency for International Development
SA-16, Room 311
Washington, D.C. 20523

Dear Mr. Mason:

Information for Research Project

I am one of your students in the NTTTP here at Iowa State University. As one of the requirements for my degree, I am proposing to conduct a study on PERCEPTIONS OF NIGERIAN STUDENTS IN THE UNITED STATES ON THE ASPECTS OF U.S. INDUSTRIAL EDUCATION PROGRAMS TRANSFERRABLE TO NIGERIA.

The purpose of the study is to assess and catalog what Nigerian students perceive as transferrable back home from all that they see and study from the U.S. Industrial Education Programs, taking into consideration Nigeria's economy and educational needs. Hopefully, the findings of the study will enhance the work of educational administrators back home.

The data for the study, which is already approved by my major professor (Dr. Wolansky) and my department, will be collected from Nigerian students studying Industrial (or Vocational) Education at both graduate and undergraduate levels here in the U.S. Since the TTTP specifically places Nigerian students in Industrial (or Vocational) Education, the participants form the most qualified population for this study. I am therefore requesting that you forward to me the names and contact addresses of the 1986 group of TTTP students. These will be used exclusively for mailing the questionnaire. They will not be used for any other purpose and will be kept confidential.

You will notice that this study is markedly different from evaluating the TTTP or anything of that sort. Your office should feel freer to give out the information. I request that the information gets to me as soon as possible as I am already putting together my proposal.

Also I request that you send to me any newsletters or documents in your office that contain the specific objectives of TTTP and the role of AID in educational development of third world countries. These will help me in the literature review.

Mr. Carlyle Mason
July 14, 1987
Page 2

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Once again, I solicit for your prompt response. If there is any further clarification you would need from me, you could contact me through the telephone with the number below. Thanks for your cooperation.

Your student participant,

Monday T. Joshua
(515)294-8529

Dr. Donald J. McKay
Advisor

Dr. Trevor G. Howe
Department Chairman

IOWA STATE
UNIVERSITY

Telephone: 515-294-1033

July 14, 1987

The Administrative Attache (Education)
Nigerian Embassy
2201 M Street NW
Washington, D.C. 20037

Dear Sir:

Information for Research Project

I am a Nigerian student undergoing a graduate program in Industrial Education and Technology at Iowa State University. As one of the requirements for the degree, I am proposing to conduct a study on:

PERCEPTIONS OF NIGERIAN STUDENTS IN UNITED STATES ON THE ASPECTS OF U.S. INDUSTRIAL EDUCATION PROGRAMS TRANSFERRABLE TO NIGERIA.

The purpose of the study is to assess and catalog what Nigerian students perceive as transferrable back home from all that they see and study from the U.S. Industrial Education Programs, taking into consideration our country's economy and educational needs. Hopefully the findings of the study will enhance the work of educational administrators back home.

The data for this study, which is approved by my major professor and my department, will be collected from Nigerian students studying Industrial Education (including Vocational, Industrial Arts, Industrial Technology and Technical Education) both at graduate and undergraduate levels here in the U.S. I am therefore requesting that your office send to me the names and contact addresses of Nigerian students (available in your office) studying the said Industrial Education here in the U.S. (both graduate and undergraduate). These will be used exclusively for mailing the questionnaire. They will not be used for any other purpose. I would specifically request the names and addresses of the Nigerian students who came to the U.S. under the Nigerian Technical Teacher Training Program (NTTTP) in August 1986. This is so because that program specifically places students in Industrial (Vocational) Education programs. Please feel free to add to that list other Nigerians studying Industrial Education but not under the NTTTP.

This service of yours will go a long way to assist me in the study. I request that you respond to my plea as quickly as you can, as I am already putting together my proposal.

The Administrative Attache
July 14, 1987
Page 2

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Thank you for your cooperation as I await your response.

Sincerely,

-
-
Monday T. Joshua
Graduate Student

Dr. Donald McKay
Advisor

Dr. Trevor G. Howe
Department Chairman

APPENDIX B. LETTERS OF TRANSMITTAL AND FOLLOW-UP

IOWA STATE
UNIVERSITY

Telephone: 515-294-1033

August 04, 1987

Dear _____

REQUEST FOR WILLINGNESS TO PARTICIPATE IN A STUDY

I am a Graduate student in the Dept of Industrial Education and Technology of Iowa State University. I am a participant in the U.S. Agency for International Development administered Nigerian Technical Teacher Training Program (NTTTP). For my Thesis, I am proposing to conduct a study on:

PERCEPTIONS OF NIGERIAN STUDENTS IN UNITED STATES ON ASPECTS
OF U.S. INDUSTRIAL EDUCATION PROGRAMS TRANSFERRABLE TO NIGERIA

The purpose of this study is to identify what Nigerian college and university students studying Industrial Education here in U.S. perceive as transferrable from all they see and study in the U.S. Industrial Education Programs to improve the Industrial Education Programs back home in Nigeria, taking into consideration Nigeria's economy, culture and educational needs.

The population to be used for this study is the 1986 group of the NTTTP students, both graduate and undergraduate. For me to reach these students at your school, I will need your assistance as one involved in their INTERNSHIP programs. I am therefore soliciting for your cooperation and assistance.

Specifically, I need your help in distributing the copies of the questionnaire I will send to these NTTTP students at your school, and sending the completed copies of the questionnaire back to me in a stamped-addressed envelope to be provided. My request to enlist your help is necessitated by the difficulty in securing a comprehensive list of this group of students which would have enabled me to deal with them directly. Your cooperation will therefore be very much appreciated.

Please complete the enclosed form and kindly forward it to me in the stamped-addressed envelope enclosed. I will appreciate receiving your feedback in the next TWO weeks.

I thank you in anticipation.

Yours Sincerely,

MONDAY T. JOSHUA

Dr. William D. Wutianing
Major Professor

YES I am willing to participate in your study and to assist as requested.

The number of 1986 NTTTP students at my school here is _____.
Of these, _____ are Graduate students.

NO I'm sorry I can not participate in your study as requested.

However, the number of 1986 NTTTP students at my school is _____.
You can write to _____ (one of these students)
at this address: _____

to help you.

Signature _____

Name _____

Date _____

YES I am willing to only give out your Questionnaire.
The students will return them directly to you.
The number of these students is _____.

YES I am willing to participate in your study and to assist as requested.

The number of 1986 NTTTP students at my school here is _____.
Of these, _____ are Graduate students.

NO I'm sorry I can not participate in your study as requested.

However, the number of 1986 NTTTP students at my school is _____.
You can write to _____ (one of these students)
at this address: _____

to help you.

Signature _____

Name _____

Date _____

YES I am willing to only give out your Questionnaire.
The students will return them directly to you.
The number of these students is _____.

OWA STATE
UNIVERSITY

Telephone: 515-294-1033

October 6, 1987

Dear _____

A couple of weeks ago, I sent a letter and/or I made a phone call to you, and I requested that you would help me reach the Nigerian students under the Technical Teacher Training Program (TTTP) in your school/department with my questionnaire. In your response, you indicated that you would be willing to give out my questionnaire to these Nigerian students, collect the completed copies and send them en bloc to me. Thanks much for this willingness.

I am hereby sending these copies of questionnaire for you to help as I requested. You said the number of these students there is _____. I have included _____ extra copies in case anyone was left out (the number of copies sent is _____).

You will notice that with the business reply envelope attached to each questionnaire, the students can return their copies directly to me (without going through you). But I imagine that asking them to return to you could be a strategy to motivate them to complete the questionnaire. When the copies are returned to you in the business reply envelopes, just drop them in the post box for me. However, if you find your returning the copies too inconveniencing, you could tell the students to return them directly to me.

You will observe that with this arrangement, it will be difficult for me to know non-respondents for purposes of follow-up. So I will appreciate your doing anything you can in your position to encourage the TTTP students to complete and return their copies.

Thank you very much for your help. If you should have any question(s), or there is a need for more copies of the questionnaire, please send me a note with the business reply envelope enclosed for you.

Sincerely, _____

MONDAY T. JOSHUA

Dr. William D. Wolansky
Professor of Industrial Education & Technology, and
Coordinator of International Education Programs.
(Major Advisor)

IOWA STATE
UNIVERSITY

Telephone: 515-294-1033

October 6, 1987

Dear _____

A couple of weeks ago, I sent a letter and/or I made a phone call to you, and I requested that you would help me reach the Nigerian students under the Technical Teacher Training Program (TTTP) in your school/department with my questionnaire. In your response, you indicated that you would be willing to give out my questionnaire to these Nigerian students, and the students would have to return them directly to me. Thanks much for this willingness.

I am hereby sending these copies of questionnaire for you to help as I requested. Each has a business reply envelope for return. You said the number of these students is _____. I have included _____ extra copies in case anyone was left out. (The number of copies sent is _____).

You will observe that with this arrangement, it will be difficult for me to know non-respondents for purposes of follow-up. So I will appreciate your doing anything you can in your position to encourage these TTTP students to complete and return their copies of the questionnaire.

Thank you very much for your help. If you should have any question(s), or there is a need for more copies of the questionnaire, please send me a note with the business reply envelope enclosed for you.

Sincerely,

MONDAY T. JOSHUA

Dr. William D. Wolansky
Professor of Industrial Education & Technology, and
Coordinator of International Education Programs.
(Major Advisor)

IOWA STATE
UNIVERSITY

Telephone: 515-294-1033

November 04, 1987

Dear _____

SURVEY OF NIGERIAN TTTP STUDENTS

About one month ago I sent some copies of my questionnaire to you to help me distribute them to the Nigerian TTTP students in your school, and to send the completed copies back to me. This was based on your earlier promise to help me in this direction.

As of today, 4 weeks after my sending these copies out, out of _____ copies I expected from your school, only _____ copies have been returned. The overall percentage of returns I have now is not up to what I can use for my study, and everything is at a standstill. Since the names of these students are not available to me, I cannot contact them directly.

Please, I am requesting that you do anything possible to help me, anything to get the non-respondents in your school to respond. My suggestions include: (i) sending a memo from your office to these students and reminding them of the issue and that their colleague's graduation is at stake somewhere; (ii) contacting one or two of these students and requesting them to remind their colleagues of the questionnaire issue; (iii) other approach(es) you deem appropriate.

My assumption, so far, is that the questionnaires left your office and got into the hands of the TTTP students. If some of them are yet to reach the students, this letter will also serve as a reminder to you to try and give them out as soon as you possible. I expect to move ahead with the study by November ending. Please do something to help me. If extra copies of the questionnaire are needed by you, please let me know (my business reply envelope is still with you). I am really sorry to place this extra inconveniences on you.

Sincerely,

Monday T. Joshua
Graduate Student

Dr. William D. Wolansky
Professor, Industrial Education & Technology
(Major Advisor)



**Indiana State
University**

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School of Technology
Department of Industrial Technology Education

November 10, 1987

Mr. Monday T. Joshua, Graduate Student
Iowa State University
College of Education
Department of Industrial Education
and Technology
Ames, IA 50011

Dear Monday:

I am in receipt of your recent letter requesting assistance on getting a better response to your questionnaire. I am a little surprised at only having nine returned of a possible 18. However, this is not unique in view of the response we have had over time by Nigerian students to answer questionnaires.

I am enclosing a listing of the students who are at Indiana State University. I really have no way of knowing which students returned to surveys to you since they did not sign their names to the survey.

Looking forward to having you complete the study and hoping we can do as much as possible to make this come about. I shall see Dr. William Wolansky in Chicago this week and will discuss this with him.

Sincerely y

LOWELL D. ANDERSON, Ph.D.
Chairman and Professor
Department of Industrial
Technology Education

LDA/jo

Enclosure

CMSTU Central Missouri
State University²²⁵

College of Applied Sciences and Technology
Office of the Dean

Warrensburg, MO 64093-5014
816-429-4450

October 27, 1987

Mr. Joshua T. Monday
Industrial Education and
Technology, IED B3
Iowa State University
Ames, IA 50011

Dear Joshua:

At long last I have received a list of Nigerian students who are on campus currently, and those who were here during the 1986-87 year.

As I said, I thought we had six students here now, and that is correct. You may wish to contact those who were here last year directly.

I'm sorry to be so late with this information, but our person who works directly with the students just got the list to me.

I hope this will be of help to you. Thank you.

Sincerely,

Robert A. Ulrich, Ph.D.
Coordinator of Graduate Programs
College of Applied Sciences & Technology

mjb

enclosure

Agriculture
Home Economics
Nursing

Electricity & Electronics
Manufacturing & Construction
Power & Transportation
Industrial Arts and Technology

Graphics
Military Science
Safety Science & Technology

IOWA STATE
UNIVERSITY

Telephone: 515-294-1033

May 05, 1988

Dear _____

SURVEY OF NIGERIAN (TTP) STUDENTS:
A THANK YOU NOTE

You would recall that between October and December last year, I requested for and obtained your assistance in distributing my questionnaire to the Nigerian students on the Technical Teacher Training Program (TTP) in your school. Your assistance really helped me to have a good percentage of questionnaire returns from my sample, and this led to the success of the study.

I am hereby expressing my profound gratitude to you. I really appreciate every thing you did to help me. Please, thank you very much, and God bless you.

Sincerely,

Monday T. Joshua
Graduate student

Dr. William D. Wolansky
Professor of Industrial Education & Technology,
Coordinator, International Education Programs
(Major Advisor)

APPENDIX C. INSTRUMENT FOR DATA COLLECTION (QUESTIONNAIRE)

We are interested in your opinion

TTTP FELLOWS

Iowa State University *of Science and Technology*



OWA STATE
UNIVERSITY

Telephone: 515-294-1033

1 October, 1987

Dear Nigerian Student,

I am a fellow Nigerian student studying here at Iowa State. Our Federal Government sends us to the United States specifying what to study and even when to return. The expectation is that we will bring back the "technologies" we see and/or acquire here to improve the educational programs in Nigeria. But, as we all know, not all that we see and study can be transferred to Nigeria.

I am conducting a study, for my thesis, on "NIGERIAN STUDENTS' PERCEPTIONS REGARDING TRANSFERRABILITY OF SELECTED ASPECTS OF U.S. TECHNOLOGY EDUCATION PROGRAMS TO NIGERIA". The purpose of the study is to identify what Nigerian students studying here in U.S. perceive as transferrable to Nigeria, and they would recommend for introduction into the Nigerian Technology Education Programs, from all they see and study in the U.S. Technology Education Programs. As a participant in the TTTP, you are therefore selected for this study.

Following is a QUESTIONNAIRE designed to measure your perceptions on the issue. The focus of the study is on the Secondary school level. I request that you take the necessary time to complete the Questionnaire which calls for your objective and professional opinion. My definition of Technology Education Programs includes all programs in the TTTP. So your opinion is important.

Considering how important you and your responses are to this study, I hope you will not hesitate to spend the extra time it will take from your busy schedule to complete this instrument. Your responses will be treated confidentially, and all responses will be analyzed as batch data.

Please complete it as quickly as you can (preferably within one week of your receiving it), put it in the business reply envelope attached, and

- return it to _____ in your school, who will send it to me.
- drop it in the nearest post box (postage is prepaid).

Remember, your timely response is very important, and I count on your cooperation.

Thank you.

Your fellow Nigerian student,

MONDAY T. JOSHUA

Dr. William D. Wolansky /
Professor of Industrial Education and Technology, and
Coordinator, International Education Programs
(Major Advisor)

QUESTIONNAIRE

PERSONAL DATA

GENDER: () Female () Male

STATUS: () Undergraduate student () Graduate student

State where your University is located _____

Your current major _____

Your area of specialization () Electrical/Electronics Engineering
 () Mechanical/Automobile Engineering
 () Building/Civil Engineering/Woodwork
 () Agric/Home Economics
 () Other (Please specify) _____

Your Employer in Nigeria () State Teaching Service (excluding post-secondary)
 () Federal Teaching Service (excluding post-secondary)
 () Post-secondary Institution (State or Federal)
 () State/Federal Ministry (not teaching)
 () Other (Please specify) _____

INSTRUCTIONS

This study focuses on SIX selected aspects of Technology Education Programs in the United States. Within each aspect, there are brief statements describing the practices in the U.S. Your opinion is being sought on which of these practices you would recommend for introduction into the Nigerian educational system (Technology Education Programs). You are to consider Nigeria's culture, economy and educational needs while indicating your opinion. Use the scale below and circle your response.

WHICH OF THESE DO YOU RECOMMEND FOR INTRODUCTION INTO THE NIGERIAN EDUCATIONAL SYSTEM ?

	Strongly Recommended	Recommended	Neutral	Not Recommended	Strongly Not Recommended
A. <u>CONTENT TAUGHT</u>					
1 The Content taught in a vocational program should be derived from verified industrial/production needs of the surrounding community	5	4	3	2	1
2 The Content taught should evolve from the identified competencies needed by most people in that trade	5	4	3	2	1
B. <u>TEACHING METHODS</u>					
3 Instruction should be tailored to individual student needs (Individualized Instruction)	5	4	3	2	1

	Strongly Recommended	Recommended	Neutral	Not Recommended	Strongly Not Recommended
4 Use of Computers in the schools to facilitate Instruction (Computer-Assisted Instruction) should be adopted	5	4	3	2	1
5 Special attention (like laws, programs, etc.) should be given to Special Needs (Handicapped) students in the school system	5	4	3	2	1

C. TEACHER PREPARATION AND EVALUATION

6 Prospective teacher should be required to pass minimum competency test in his/her subject before being employed	5	4	3	2	1
7 Evaluation of beginning teachers by the principal should be carried out	5	4	3	2	1
8 Specified minimum and relevant industrial experience should be required before one is employed to teach a vocational program	5	4	3	2	1
9 Besides the school diploma/degree, Certification/Endorsement to teach a particular subject at a particular school level should be required of every prospective teacher	5	4	3	2	1
10 Periodic Updating requirements (to maintain one's position) should be prescribed for every teacher	5	4	3	2	1
11 Students should be given the opportunity to evaluate the teacher at the end of each term/year	5	4	3	2	1
12 Student evaluation of the teacher (as well as other data) should be used for teacher evaluation and promotion	5	4	3	2	1
13 Parents-Teachers Associations should be involved in the evaluation of the teacher	5	4	3	2	1
14 A comprehensive program of periodic evaluation of the teacher (which could be used to improve quality of service, determine teacher promotion, etc.) should be in practice	5	4	3	2	1
15 Every teacher should belong to and be actively involved in professional association(s)	5	4	3	2	1

D. STUDENT EVALUATION

16 Teacher should use a variety of assessment techniques to evaluate a student's academic progress, not just written tests and examinations	5	4	3	2	1
17 A student should meet specified minimum performance standard before being promoted or allowed to progress to the next learning unit/task (testing for Mastery as opposed to Norming).	5	4	3	2	1

	Strongly Recommended	Recommended	Neutral	Not Recommended	Strongly Not Recommended
18 Students' exam/test performance should be analyzed, and the results used to improve students' learning	5	4	3	2	1
19 Statewide Standardized Test(s) should be developed for each vocational program	5	4	3	2	1
20 Nationwide Standardized Test(s) should be developed for each vocational program	5	4	3	2	1
E. CURRICULUM/PROGRAM EVALUATION					
21 Accreditation Boards should be established to periodically accredit every Secondary school	5	4	3	2	1
22 Accreditation Boards should be established to periodically accredit every technical/vocational school	5	4	3	2	1
23 Students should be given the opportunity to evaluate INSTRUCTION at the end of each term/year	5	4	3	2	1
24 Data from Student evaluation of Instruction should be used systematically to improve instruction	5	4	3	2	1
25 Follow-up of program graduates soliciting their evaluation of the school program and other suggestions from alumni should be practiced	5	4	3	2	1
26 Studies of Employers' Appraisal of the program graduates and their suggestions should be conducted periodically	5	4	3	2	1
27 Use of ADVISORY COMMITTEES to evaluate school programs should be practiced	5	4	3	2	1
28 Use of PARENTS-TEACHERS ASSOCIATIONS to evaluate school programs should be practiced	5	4	3	2	1
F. ADMINISTRATION					
29 Local Government Councils should control all secondary, technical and other vocational schools (as opposed to State control of schools)	5	4	3	2	1
30 Close working relationship (Partnership) between SCHOOL and INDUSTRY/BUSINESS should be established to plan the educational programs for the community	5	4	3	2	1
31 ADVISORY COMMITTEES should be established for each vocational program/school	5	4	3	2	1
32 Vocational Student Organizations should be encouraged, and utilized for instructional purposes	5	4	3	2	1

	Strongly Recommended	Recommended	Neutral	Not Recommended	Strongly Not Recommended
33 Each school should have a full-time Guidance counselor to advise on career, emotional, psychological, and other needs .	5	4	3	2	1
34 Universities, Polytechnics, and other Institutions/agencies should be involved in the Evaluation of public school programs	5	4	3	2	1
35 The following are factors that may hinder transferring to your workplace some of the "technologies" you are acquiring/seeing in the United States. From your experience, <u>RANK</u> them in the order you consider them critical. Start with 1 for the factor which will hinder transfer the <u>most</u> , moving to a 7 for the factor which will hinder transfer the <u>least</u> .					

RANK

- ___ Lack of technical equipment
- ___ Lack of adequate maintenance of the available equipment
- ___ Lack of appropriate textbooks and other instructional resources
- ___ Prevailing school policies and practices
- ___ Lack of support from school administrators and other colleagues
- ___ State control of the schools/curriculums
- ___ Other (Please specify) _____

36 Following are some approaches that Nigeria has adopted or can adopt to address Teacher Preparation for the Country's Technology Education Programs. Please RANK these in the order you would recommend for the Nigerian Government to follow, considering the country's economy and educational needs. Give 1 to the one you would recommend most, and 4 to the least.

RANK

- ___ Sending people to be trained abroad (like the TTTP)
- ___ Having experts from abroad come to train people in Nigeria
- ___ Doing the training exclusively locally (using local experts)
- ___ Other (Please specify) _____

37 Please write any other aspect(s) of U.S. Technology Education Programs not identified on this questionnaire that you would recommend for transfer and introduction into the Nigerian Technology Education Programs. Be as specific as possible.

APPENDIX D. HUMAN SUBJECTS APPROVAL FORM

INFORMATION ON THE USE OF HUMAN SUBJECTS IN RESEARCH
IOWA STATE UNIVERSITY

(Please follow the accompanying instructions for completing this form.)

235

1. Title of project (please type): NIGERIAN STUDENTS' PERCEPTIONS REGARDING
TRANSFERRABILITY OF SELECTED ASPECTS OF U.S. TECHNOLOGY EDUCATION PROGRAMS TO NIGERIA

2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are properly protected. Additions to or changes in procedures affecting the subjects after the project has been approved will be submitted to the committee for review.

MONDAY T. JOSHUA 09/14/87 _____
Typed Name of Principal Investigator Date Signature of Principal Investigator

Room B3, I ED II 294-8529
Campus Address Campus Telephone

3. Signatures of others (if any) , Date Relationship to Principal Investigator
_____ 9-14-87 Major Advisor

4. ATTACH an additional page(s) (A) describing your proposed research and (B) the subjects to be used, (C) indicating any risks or discomforts to the subjects, and (D) covering any topics checked below. CHECK all boxes applicable.

- Medical clearance necessary before subjects can participate
- Samples (blood, tissue, etc.) from subjects
- Administration of substances (foods, drugs, etc.) to subjects
- Physical exercise or conditioning for subjects
- Deception of subjects
- Subjects under 14 years of age and(or) Subjects 14-17 years of age
- Subjects in institutions
- Research must be approved by another institution or agency



5. ATTACH an example of the material to be used to obtain informed consent and CHECK which type will be used.

- Signed informed consent will be obtained.
- Modified informed consent will be obtained.

6. Anticipated date on which subjects will be first contacted: 10 01 87
Anticipated date for last contact with subjects: 11 30 87

7. If Applicable: Anticipated date on which audio or visual tapes will be erased and(or) identifiers will be removed from completed survey instruments:
_____ Month Day Year

8. Signature of Head or Chairperson Date Department or Administrative Unit
_____ 9/14/87 Ind. Ed. & Technology

9. Decision of the University Committee on the Use of Human Subjects in Research:
 Project Approved Project not approved _____ tion required
George G. Karas 9/17/87 _____
Name of Committee Chairperson Date Signature of Committee Chairperson