

DESIGN OF A LEARNING RESOURCE CENTRE FOR VOCATIONAL-
TECHNICAL EDUCATION IN BENUE STATE, NIGERIA

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ABSTRACT

DESIGN OF A LEARNING RESOURCE CENTRE FOR VOCATIONAL- TECHNICAL EDUCATION IN BENUE STATE, NIGERIA

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In this study, a technology resource centre has been designed for the vocational-technical school in Benue State, Nigeria. A major consideration in this study is the researcher's attempts to utilize the concepts of educational technology in developing this model. The centre is designed to alleviate some of the educational problems experienced in Nigeria and common to other developing countries: lack of materials and equipment, lack of trained personnel, lack of curriculum development and professional attitudes, and poor organizational structuring.

The centre is designed to 1) update and enrich vocational-technical instructional programs; and 2) provide additional educational services to vocational-technical education, such as methods, model development of teaching-learning techniques, individualized instruction, materials, and evaluation.

In order to determine appropriate design parameters, extended visits were made to two Canadian vocational colleges that operate learning centres: Algonquin and Holland Colleges.

The major areas considered in the design of a technology resource centre were: 1) hiring and training personnel; 2) planning of layout and facilities; 3) equipment and materials for production; 4) budget and estimate of expenses for learning resource materials and personnel; and 5) evaluation of the whole program for the centre.

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Dedication

To my mother, Naomi Usar Yongu.

To my brothers, Iyordye Yongu and Ikume Yongu.

To my sisters, Gom Yongu, Ugoho Yongu, Afai Atii,
and Kwase-Kpadoo Yongu.

To my wife Mbaalumun Yon'gu.

who have ~~tried~~ tried to see my progress.

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CHAPTER 1

Introduction

There are many problems of education in developing countries. These problems include: low participation rate, high population growth, high rates of illiteracy, high dropout and repetition rates in the school system, employment problems for graduates, teacher surpluses in urban areas and shortages in rural areas, combined with high demand for education (Wells, 1976).

Other problems range from inadequacies in teacher training, organizational structuring, instructional technology, and well designed resource centres, to curriculum development.

These problems have been present from the very beginning of the educational setting in Africa. The basic aim of missionary education was to teach people to be able to read the Bible, while the aim of the colonial masters was to train people to do what their masters told them to do. However, reports from many developing countries in Africa indicate that adults in villages who have learned to read and write have slowly become more confident about themselves as individuals, and have begun to change their attitudes from their previous peasant orientation.

As a result of this change of attitudes, developing countries have now accepted the view that education has an important role in promoting social and economic development. They believe that it is through education that unity among various tribes and different linguistic and cultural groups can be fostered.

Adams and Bjork (1969) have suggested that one of the ways to improve education in developing countries is to improve the effectiveness of applying theories of educational planning derived from developing

countries. Gelfand (1968) earlier commented that an accelerated rate of economic growth could only be achieved if developing countries concentrated on producing and improving additional human resources for use at all levels of governmental and non-governmental activity.

During the Lagos Workshop on Non-Formal Education, Aderibigbe (in Sheffield & Diejomaoh, 1972, p. xiii) stated that "formal education, important as it is, cannot solve all the problems now facing African society; it is therefore necessary to develop an educational strategy that will enable the majority of the population to share in the modernization process." Fafunwa (1967, p. 8) concluded that if Africa is to make progress in moving from non-formal to formal education, "it is apparent then that science and technology must play a vital role in the new African curricula."

The development of scientific attitudes does not solve all the problems of African education, however, it is one step towards the development of vocational-technical education. All the developing countries have certain problems of educational development in common; Nigeria, the most populated country in West Africa, is no exception.

Context of the Problem

Geographical Background. The Federal Republic of Nigeria is situated on the west coast of Africa. It has an area of 913,072.64 sq. km (356,669 sq. miles) (Iyelobu, Note 1). The population in 1980 was estimated to be 80 million (Federal Ministry of Education, 1977).

The Development of Vocational-Technical Education in Nigeria. The development of modern education in Nigeria began in the 1940's.

Although education on the whole developed at a slow pace, the vocational aspects of it were completely ignored. There was more effort invested in building grammar schools than in any other area of education. To push a pen in an office was the dream of an educated Nigerian; anything less was held to be "derogatory and below his dignity" (Ikejiani, 1965, p. 8). Because of the lack of attention paid toward developing vocational-technical education, manual and technical work has been seen traditionally as being of a lower status and suitable only for the uneducated (UNESCO, 1973).

Since Nigerian independence in 1960, there has been pressure for development in all areas, especially in science and technology. The search for an effective plan for national development resulted in the Third National Development Plan (1975-1980). This plan greatly emphasized education, agriculture, industry, health, and social welfare. "The major objectives of the educational programme for the Third National Plan will be to expand facilities for education aimed at equalizing individual access to education throughout the country and to consolidate and develop the nation's system of higher education in response to manpower needs" (Federal Ministry of Education, 1977, p. 3).

The Nigeria National Policy of 1977 proposed that Educational Resource Centres be established at the state and federal levels. These centres include audio-visual centres to be set up under the auspices of the federal and state governments. The policy went on to state that since libraries are one of the most important educational services, every state ministry of education needs to provide funds for the establishment of libraries in all educational institutions (Federal Ministry of Education, 1977, p. 31).

The Policy went on to demand that educational and training facilities be multiplied and made accessible to afford individuals a far more diversified and flexible choice (Federal Ministry of Education, 1977, p. 19). Vocational-technical education is a part of "the total educational, and particularly the career, continuum" (Bartel, 1976, p. 31). Vocational and occupational education provides individuals with the "opportunities to develop psychomotor, cognitive and affective skills so that they can take their rightful place in society and assume responsibilities beyond those related to their selected occupation" (Bartel, 1976, p. 32).

It is the educational policy of 1977 that has made Nigerians aware that education is good for all, that technical education is a process for nation building, and that there is not just one way, approach, or method for achieving or improving education.

The Aims of Vocational-Technical Education in Benue State, Nigeria.

Benue is one of the youngest of the nineteen states that were created in 1976. The state is bounded on the west by Kwara, Ondo and Bendel States, on the north by Niger, Plateau and Gongola States, and on the south by Anambra and Cross Rivers States. These are shown in Figure 1, a map of Nigeria with Benue State shaded in.

The Technical Training School is situated in Makurdi, the capital of Benue State. Benue is committed to developing vocational-technical education and to producing manpower for the needs of the state as well as the nation. The aims of vocational-technical education in Benue State are to:

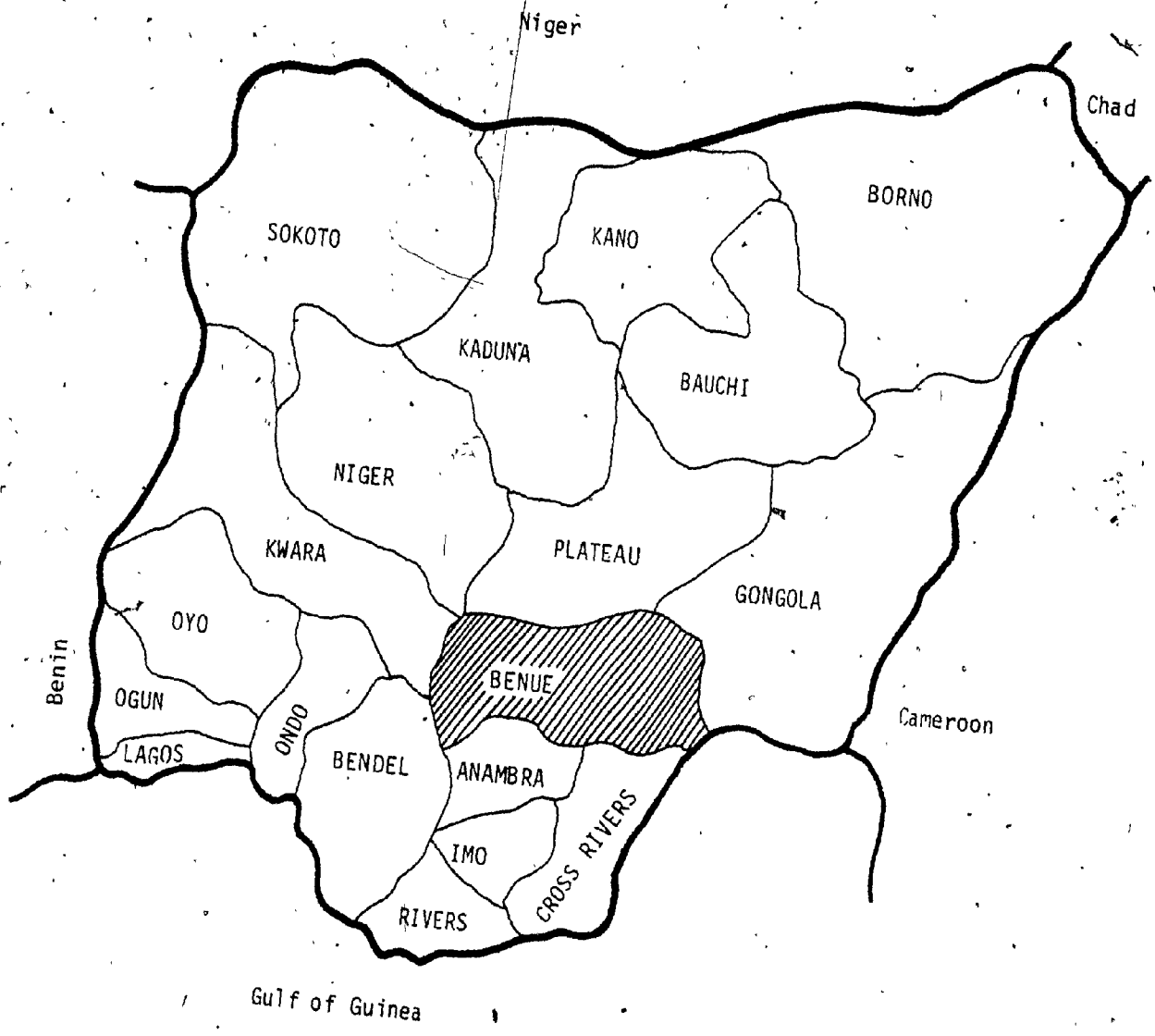


Figure 1. Map of Nigeria, with Benue State shaded in.

- 1) provide trained manpower in applied science, technology, and commerce, particularly at sub-professional grades;
- 2) provide the technical knowledge and skills necessary for agricultural, industrial, commercial and economic development;
- 3) provide people who can apply scientific knowledge to the improvement and solution of environmental problems for the use and the convenience of people; and
- 4) enable our young men and women to have an intelligent understanding of the increasing complexity of the developmental process (Federal Ministry of Education, 1977, p. 19).

Such an increased awareness of vocational-technical education and its special concerns calls for well designed resource centres which will give people access to education to meet the manpower needs of the country.

CHAPTER 2

Objectives

Needs Analysis

At present, developing countries are facing educational problems in all areas and disciplines. These problems have been identified as lack of facilities, learning centres, and trained teachers, and problems in curriculum development. Nigeria is no exception to this situation. The purpose of this study is to design a learning resource centre that will facilitate learning in the vocational-technical school in Benue State, Nigeria:

Learning resource centres can be an effective way of organizing and managing aids to learning. They give the student a place to find information, to discover facts, ideas and problems, and eliminate the necessity of the teacher always being present throughout the learning process.

The vocational-technical training school, a resource centre will provide learners with a diversity of teaching and learning processes and easy access to materials and resources. The centre envisioned in this proposal will offer learning facilities covering the following areas:

- 1) agricultural mechanization;
- 2) automobile engineering;
- 3) electrical installation;
- 4) carpentry and joinery; and
- 5) machine shop.

Determining the Needs

In determining the needs for an effective design of a

learning resource centre for vocational technical school, the following questions will be considered (Bureau of Training, 1977).

- 1) Will what is learned help employees in their immediate job or some future job?
- 2) Will the time taken for trainees' studies interfere with work schedules and loads?
- 3) Will what is learned at the centre be valuable in advancing employee careers?
- 4) Are there instructional programs presently available to help meet employees' objectives?

Questions to consider for the organization of a learning resource centre include the following.

- 1) Will a centre fit the organization's training structure?
- 2) Will the centre complement the organization's training objectives?
- 3) Are employees interested?
- 4) Will employees accept such a centre and its mode of instruction?
- 5) What is the potential enrollment in the first year? subsequent years?
- 6) Are there centres nearby that could be used instead?
- 7) What job classifications and grades need training?
- 8) Is a learning centre the most effective means of teaching people in these categories?
- 9) Will the centre teach skills, knowledge, or both?
- 10) Can centre activities be scheduled only during the work day?
- 11) Will the schedule increase employee production and reduce

- the amount of time the employee is away from the job?
- 12) Is a suitable facility available for the centre or will it be necessary to build one?
 - 13) Is the training staff qualified to operate a centre?
 - 14) Can the organization afford a centre and continue its operations?
 - 15) How effective is the present mode of instruction?
 - 16) Are there instructional programs presently available to teach the objectives of the program?
 - 17) Must instructional programs be designed to teach the required knowledges and skills?
 - 18) Can upward mobility training requirements be accomplished?

Target Population

(i) Primary Audience

The technical training school in Makurdi was founded in 1975. Its technical school has an existing population of 301 students (Benue State Ministry of Finance, 1977, p. 114). (Appendix A shows the number of streams of classes and enrollment in commercial/technical colleges in Benue State.) However, the population is expected to increase by 50 per cent because of high demand for, and increasing awareness of, vocational education. The average age of the student who will be using the centre is 16-17.

(ii) Secondary Audience

Because of the limited educational resources in the country, the centre will also serve the target clientele of in-service training teaching teachers, and the open university students. The in-service students will

be those who have had informal or formal training without the application of educational technology. The open university students are those who are working, and who do not want to go full time to the university. They have had no opportunity to go to university, for one reason or another. Thus, another secondary audience will be the community as a whole.

The Purpose of the Centre

The centre will provide:

- 1) a variety of individualized and individual experiences for clients through independent study, media resources, and tutorial activity;
- 2) support for instructional programs offered by academic areas;
- 3) leadership in the area of media to help the institution with the evaluation, selection, and utilization of media appropriate to a variety of learning needs;
- 4) space and facilities for teachers and students to preview, listen to, review, and try out various teaching media;
- 5) ways for students to become more effective learners in conventional classes, in independent study, and in the lifelong pursuit of learning in vocational education.

Other purposes of the centre will be to:

- 1) provide materials which are unique to a specific teaching situation;
- 2) inform teachers and students about new developments in materials, equipment, and teaching technology;
- 3) assist teachers and students in the use of equipment and materials;

- 4) serve as a comprehensive learning laboratory in which students can learn to use all types of learning materials and equipment;
- 5) offer services for in-service training and adult education;
- 6) contribute to the preparation of materials for the open university;
- 7) distribute audiovisual equipment and materials to faculty and students;

In this centre, both the learners and teachers will have the opportunity to work in a place where new knowledge is created, instead of one where old knowledge is merely presented. (Holder & Mitson, 1974).

Limitations of the Study

Unlike other developing countries, Nigeria has the financial means to execute her educational policy. But although money is available, other problems, such as curriculum development, equipment, electrification, finance, personnel, professional attitudes, university and college enrollment, and space are significant.

Curriculum Development. The present curricula are rigidly designed so that there is no flexibility for innovation. "Those innovative methods and techniques, such as those which could be employed by the use of educational technology in administration and curriculum design and development, are all considered as an infringement or invasion of established position" (Soremekun, 1979, p. 217).

Equipment. Educational equipment and materials are all imported. The prices are phenomenally high, including the actual cost of the item and the costs of importing. In some areas where there is instructional equipment, there is no software to run on it.

Another practical problem is ordering equipment. Apart from the fact that it takes a long time to order and receive the equipment and materials, an added disadvantage is that the materials and equipment received do not always correspond to the cultural requirements of the country because of the voltage requirement and climate.

Electrification. In some areas there is no electricity. Schools situated in such areas have their own generators which operate on an hourly basis. Some schools run the generator only four hours every evening for students' study hours, while some operate ten hours daily. Electricity operates on a 24-hour basis only in big towns and cities; even so, there are constant power failures. This situation makes it difficult to use instructional materials and equipment conveniently.

Finance. The system of financial allocation has a strong effect on schools. The allocation is based on the present development of an institution, and is made in bulk to the institutions concerned. The sharing of funds among the departments is the sole responsibility of the head of the school. Since the heads are academically oriented, very little attention is given to equipment, materials, and maintenance.

Personnel. Personnel is another problem. In some schools, there are more technicians and production personnel available than the academically

trained, yet it is the academicians who influence the decision to develop the area of educational technology.

Professional Attitudes. Other issues may arise because most academic personnel are highly inflexible in their job performance. This rigidity of academic personnel is due to the traditional attitudes associated with the low prestige of jobs requiring psychomotor skills; this attitude is changing gradually.

University and College Enrollment. Overexpanded university and college enrollment is another serious problem. Because of the pressure of increasing awareness of and high demand for education by the people, the quality of teaching is becoming low. The introduction of universal primary education in 1976 and free university education, just started in 1980, has necessitated massive teacher training and development of instructional materials. This situation has suddenly saddled teachers and lecturers with large classes for which they must use whatever media or methods are available (Soremekun, 1979).

Space. As of now, even those institutions offering educational technology programs have no adequate provision made for storage, space and distribution of materials and equipment. Even the available production areas are not usually well equipped and maintained for effective services because of various attitudes, and delays in import procedures.

Because of these problems, educational technology in a developing country such as Nigeria requires a gradual approach. That is, it should

start with inexpensive, simple materials and equipment, and gradually extend to more sophisticated levels (Sam, 1975).

Significance of the Study

The expansion of educational and training facilities for both youth and adults is one of the urgent needs of developing countries. The daily traditional routine is challenged; the talking teacher and the prescribed textbooks are no longer the sole sources of knowledge and learning in a developing country such as Nigeria. New methods and modern techniques will have to be employed in order to bring about effective instruction and learning. This calls for designing learning resource centres which will provide services to a large audience, with individual instruction, new media for educational communication, new ideas of learning and new methods of teaching. Such centres will also encourage changes in values and attitudes, in social structure, in economic resources, and in technology.

Nigeria, which is almost the same size as the province of Quebec, has a population of about 80 million people. There is, therefore, the need to emphasize a system which can produce large numbers of trained people in as short a time as possible. Considering this priority in expanding educational methods, machines and materials, new educational and training systems need to be designed to enable the masses, who have been unable to get access to educational facilities, to be trained.

The idea of learning resource centres has found acceptance in Nigeria. The Minister for Education has assured all the principals of technical colleges that the federal government of Nigeria is going to establish production units in various institutions to assist in providing

equipment and training services in practical subjects for qualifying students (Madubuike, 1980). Nigerian President Shehu Shagari (1980) promised in a broadcast that his government will improve the quality of education and of teachers and their conditions of service: "My administration is irrevocably committed to making education a priority. We also plan to make education more qualitative and functional with a sound moral content: (Shagari, 1980, p. 1898). This statement by a prominent Nigerian suggests an avenue that the establishment of instructional or learning resource centres could be accepted, though with a degree of resistance because of lack of awareness of educational technology among the majority of people. In any society, an educational innovation, as indeed any innovation, will not be accepted automatically; a strategy has to be planned, initiated and implemented (Husen, in Soremekun, 1979).

The task of formal education has thus become a big undertaking in our day, and every child will have to run a strenuous course of formal as well as informal education in order to grow up and become an effective citizen of our new world (Black, in Toynbee, 1972). It is therefore important that students should be exposed to the benefits of educational technology in terms of informing them of the potential of the instructional materials centres, media centres, and library centres, and the centres should be made available and accessible.

The introduction of educational technology in Benue State, Nigeria, is an advantage to both teachers and students. Allen and McCullough (1980, p. 47) recently stated that "the purpose of educational technology is to free teachers to teach more effectively in their own terms and to assist students in learning more with a greater sense of personal control over the processes they choose."

It is hoped that this study will create an environment which will improve technological advancement and reduce unemployment by preparing students, youth and adults, to meet the manpower needs of the nation. Such a centre can also provide services for faculty members, provide a variety of individualized and individual experiences, support instructional programs, provide leadership in the media, support in-service training programs, and assist in learning both as a product and a process.

The Learning Resource Centre and the Transfer of Educational Technology

The researcher visited various schools in Canada and the United States in order to see how resource centres are operated and designed, to provide help in designing a learning resource centre in Benue State, Nigeria. This study has been carried out in response to industrialization and economic pressure in Nigeria, especially in the area of technology. The national awareness on the part of the state and federal governments of the need for transfer of technology to cope with limited facilities in technical institutions in Nigeria is very encouraging. Efforts are being made to promote an international exchange of ideas, technological equipment, materials and personnel.

These efforts have been stressed by the federal government (Federal Ministry of Education, 1977, pp. 19-20):

The government is aware that only limited facilities exist for technical teacher education... effort to expand the facilities for the training of technical teachers is being made... The government will continue to welcome international aid and cooperation in higher technical education. Such aid and cooperation could be in the form of exchanges of personnel, exchanges of ideas, curriculum development and staff development.

It is accepted that without the exchanges of ideas and personnel, and the purchase of equipment, tools and materials from developed countries, technological development will be very slow in Nigeria. But in order to carry out a transfer of technological processes, some issues are worth examining, such as the question "What are we transferring?" (Romiszowski, 1980/81). Are we transferring only the personnel? What type of people do we need? What types of tools, instruments and machinery are we transferring? Who is going to maintain and repair them? Would such machines fit the voltage requirements of the country?

The design of a technology resource centre and its operation will be based on considering these and other questions. It will therefore be important to note that the instruments, tools, elements, technical knowledge, techniques and skills which are employed in the centre will be appropriate for the needs of the community and the nation as a whole. As Schumacher (1973, p. 66), has warned:

The task of education would be first and foremost, the transmission of ideas of value, of what to do with our lives. There is no doubt also the need to transmit know-how but this must take a second place, for it is obviously somewhat foolhardy to put great powers into the hands of people without making sure that they have a reasonable idea of what to do with them.

In an appropriate transfer of technology, the people involved must be qualified to handle and operate the machines and instructional equipment imported for schools. Staff qualifications must also include values and applications (Krishnamurti, 1968). It is through the values we attach to a particular tool that such a tool becomes meaningful to us, and it is through the application of practical and theoretical knowledge that a nation can achieve educational goals. To be educated implies that one must have knowledge. This is not knowledge in the ordinary sense, but

includes as well an understanding of principles through various processes. As Peters (1966, p. 8) states, "to be educated is not to have arrived, but it is to travel with different views."

Considerations of views, values, and applications are critical issues to note in the successful implementation of education technology in Nigeria.

The following areas (Chadwick, 1973, p. 82) are examples complementing Peters' explanation of acquiring different views from education:

- applying scientific investigation;
- analyzing educational philosophy;
- studying social institutions and organizations;
- making the teaching-learning process more visible;
- increasing labour specialization in teaching staff;
- improving concepts of measurement and evaluation of the educational system;
- objectifying goals and classifying intentions of instruction;
- shifting the factors of production toward less labour and more instructional materials and equipment.

Exploiting these areas will not only increase awareness of different views on the transfer of technology, but will also contribute to a higher quality and quantity of output from the educational system.

Technology Resource Centres as an Appropriate Transfer of Technology

The researcher is aware that the present design of the technology resource centre will need future expansion. The expansion will include

more machines and instructional equipment, and the designing of teaching-learning methodology within the learners' capabilities.

Otherwise, what is the need for buying sophisticated machines which no one will be able to use? Why provide instructional materials that are very expensive and scarce?

An example of the dangers of importing educational materials wholesale, without careful examination, is provided by Romiszowski (1980/81). In 1970, he examined a "project plan" in Saudi Arabia, installed by an American oil company to fulfill contractual obligations to install educational facilities for all the families of local employees. But what the Saudi children were studying in their individualized learning packages were topics such as the geography of the Rocky Mountains, the Fifth Amendment, and the causes of the American Revolution. They were being assessed by a computer in California on the basis of comparisons with American schoolchildren.

There is no need to build and equip a technology resource complex with television studios and equipment, computers and radios, which will not be used for almost half a year in this initial development. If we are to accept the transfer of technology, then we must implement something more appropriate, something which will satisfy local needs, local supplies of labour, local production methods, existing skills, and existing cultural background.

Many educators are concerned about the way developing countries are introducing educational development and industrialization. Good intentions still require careful assessment in the area of priorities and level of sophistication. In considering such problems, Dieuzeide (1971) has warned that developing countries will be repeating a historical

process that will end in general educational crises if they want to jump the stages of the slow educational development of the industrialized nations of the nineteenth century. But trying to follow the stages of educational development does not necessarily mean slow progress; it is, rather, a matter of being systematic.

Keeping this in mind, the present technology resource centre was designed to contain only those areas and facilities that are priorities for the needs of the Nigerian people and the resources of the economy. Other areas would be implemented in future expansion.

CHAPTER 3

Literature Review

The Concept of a Technology Resource Centre

There is no institution in our society today that is changing more rapidly than our schools, and vocational education leads in these changes (Bentley, 1977, p. 195).

As a result of technological changes, there is a need today to recognize and design a system which will integrate the satisfactory implementation of unique facilities and updating, enriching and supplementing the teaching-learning process. This can be done through curriculum research, model and innovation development, and other research investigations into the improvement of methods, learning techniques and materials.

A technology resource centre is based on the current trends in educational systems and technological advancement. A research report from Rutgers University (1963) outlines the following concepts of a technology resource centre:

- 1) technology changes rapidly as a reflection of scientific research, and industrial and business development;
- 2) updating the principles of science to new applications in production services for industry, business, and agriculture is also a major concern of education;
- 3) vocational-technical educators, and especially teachers, require current information and familiarity with new hardware innovations to be effective;

- 4) the need for overcoming obsolescence is one of the greatest challenges facing vocational-technical education today;
- 5) new concepts in teacher education and in-service growth are recognized as supplements to existing programs, activities, and facilities.

Concepts such as these listed above, when properly implemented, will give students the opportunity to have access to learning facilities and to acquire an intrinsic and extrinsic education which is capable of dealing with life as a whole, and not in parts.

The concept of a technology learning resource centre can be a combination of library, audiovisual resources, instructional development spaces, and supportive service stations. Though a centre has various manifestations, its function does not change, i.e., the emphasis is always on learning.

An analysis of the underlying concepts of a learning resource centre yields the following principles:

- 1) media should be viewed with regard to their informational and stimulus possibilities;
- 2) the instructor in a learning environment, a manager of information, and a learning counselor all provide access to learning in the school;
- 3) learning and instruction are not one and the same; learning proceeds in accordance with objectives and the nature of the subject to be taught; and instruction;
- 4) the wide variety in type and emphasis of stimulus media

- is exploited to maximize learning potential;
- 5) an integrated approach to learning is most economical in terms of all human resources;
 - 6) technology of instruction is now becoming available in education, and that technology can best be introduced through learning centres.

One now finds a variety of terms used to describe learning resource centres. Some people call them library centres, others call them media centres, others audiovisual or technology-resource centres. Despite the fact that these centres have different names, they still have components that are common to all. These components are enumerated by Peterson (1975b):

- 1) the traditional library--gives the basic supply-support functions of selection, evaluation, distribution/retrieval, description and storage;
- 2) the traditional audiovisual service--gives supply-support function in nonprint media, and hardware systems, production functions and utilization of technology;
- 3) instructional development--provides for analysis of the components of a learning system; also provides for the engineering of appropriate learning models to meet individual learning needs.
- 4) promotion of innovative learning in environments appropriate to a number of levels of learning including highly structured packaged learning situations, where the learner has control of his/her objective definitions and path delineation.

As a function of all these factors, a learning resource centre can only be complete when personnel responsible for the following functions are involved:

- 1) instructional;
- 2) production (engineering technology);
- 3) supply-support;
- 4) consultative;
- 5) administrative.

All these areas fit well into the concept of a learning resource centre. The following section includes the views of several authors on learning resource centres.

The Usefulness of Learning Resource Centres in General

As discussed previously, a major concern in Nigeria is improving education and making it accessible to all who need it. One of the ways to improve education that may work well in Nigeria is to provide learning resource centres.

Waynant (1977) and Peterson (1975a) have reviewed the components and advantages of learning centres. According to them, learning centres offer a series of student-directed activities developed and designed on the basis of specific objectives and characteristics to introduce, develop, and reinforce skills or concepts. Horton and Horton (1973) emphasized learning centres as a service to pupils, teachers, administrators and other school personnel, rather than as a storage space for materials.

In education, 'resource' means "an item of information, a piece of evidence, an activity, an idea, or a combination of several of these, which pupils may be directed to, or turn to, in the development of their

ability to learn, think, feel, discriminate and create" (Holder & Mitson, 1974, p. 3). This definition suggests that a resource centre is a place where pupils, teachers and the community as a whole will have maximum access to an educational learning environment.

A properly designed learning resource centre should be cost-effective. Gunselman (1971) and Kim (1980) have emphasized the need for improving the cost-effectiveness of vocational-technical education. Kim says that improving the effectiveness of a vocational program requires more resources such as personnel, equipment, print and non-print materials, which may lead to decreasing the cost-efficiency of the program. Gunselman (1971, p. 2) listed five areas where learning centres can have an impact: "in instructional design, in resources, in students' activities, in facilities and in curriculum." This view assumes that a resource centre is not just one unit of a program. It is an effective environment, designed for a total integration of the learning process.

In a recent review of the literature, Gordon (1978, p. 11) comments that one requirement for achieving effectiveness in a resource centre is to make materials both appropriate and accessible: "If emphasis is placed too much on the system and too little on the users, the centre will remain passive and under-used." Gordon's statement is a clear indication that a resource centre is not a rigid environment; it is a place designed with flexibility to facilitate learning.

Because of the important role of educators in improving learning/teaching situations, researchers have particularly supported this aspect of the establishment of resource centres. Fothergill (1973, p. 49) found that "a resource centre offers guidance to the learner or teacher in finding

materials that he wishes to use, assists him with any equipment needed to present it, and offers opportunities for further production of new resources." Holder and Hewton (1973, p. 53) see the urgent need for resource centres: "such needs have come from the classroom because there has been crisis caused by the very real pressure of curriculum development and the need for innovation."

Like (1969, p. 33) sees resource centres as centres that can help students become independent, self-directed learners, by "providing normal library contents plus audio tapes, film-strip projectors, record players, 16 mm projectors, models, and listening centres, all designed for student users." Other studies by Neil (1972), Nerden (1976), and Orebanjo (1976) all share the same views that resource centres are helpful both in formal and non-formal education.

The Usefulness of a Technology Resource Centre

Larson et al. (1965, p. 189) have examined two essential divisions of technology resource centres in vocational technical education: "the technology complex designed to expedite effective instruction in the workshop, and the resource complex designed to provide a concentrated approach to increasing the quality and quantity of instructional materials." Since vocational education involves both theoretical and practical considerations (education and hands-on experience), a resource centre designed as two-in-one will motivate, enrich the background and broaden the scope and scientific and technical knowledge, and increase the ability to apply the skills and knowledge gained in practical situations.

A research report from Rutgers University (1963) also supports the

viewpoint that a technology resource centre is devoted to updating and enriching the instructional programs, and "for keeping present and future vocational technical educators aware of new technology, new 'hardware', new pedagogical developments" (Rutgers University, 1963, p. 7). Therefore, satisfactory implementation of a vocational-technical education can only be achieved if such centres are designed with adequate facilities and learning environments.

Bucher et al. (1979) also support the presence of learning resource centres in vocational education:

A learning resource centre in vocational education encompasses the total curriculum of a school. It is the key to supplemental and alternative strategies for skill-training and career development. The learning resource centre is the learning bank of instructional materials to support curriculum and from which teachers and students can draw for self improvement (1979, p. 3).

Vocational education is a life-long process, and those who are involved in the profession need to have a total curriculum designed to contain human resources, print and non-print materials, and models which will help the student to employ real-life situations in the learning process.

Several authors have pointed out that instructional resource centres are very important in school settings. McGinnis (1969, p. 156) thinks of a learning resource centre or instructional materials centre in terms of four E's: "Efficiency, Excellence, Economy and Enrichment." Ford (1969) designed an instructional resource centre as an educational facility to accommodate and encourage the achievement of the schools' educational goals, and to attain maximum efficiency in the use of equipment, time, space and staff.

Problems Associated with Learning Centres

The usefulness and the need for learning resource centres have been reviewed in the first part of this survey of the literature. In the third part, an effort will be made to review the problems associated with the centres.

Although the idea of learning resource centres seems to be advantageous in many school situations (Horton & Horton, 1973), it is not easy to design one without problems. McGinnis (1969, p. 156) concludes that "unless the clerical and technical help are available, it would be unwise for any school to rush into setting up a learning resource centre." Peterson (1975a, p. 20) stated that "the process of planning learning centres call for commitment to introduce a number of functions new to the organisation, functions which will initially face resistance from both within the learning center and from the total institution." Such problems could be funds from the government agency involved, recruitment of staff, and supply of both hardware and software.

Holder and Mitson (1974) have listed several advantages of learning resource centres, yet they have emphasized the availability of funds as being one of the major obstacles in designing a centre. However, funds are not the only problem in designing a centre. Another aspect that needs to be considered carefully is staffing. Featherstone (1973) concludes that adequate staffing is the key to running a successful centre; without sufficient staff, the organization will never reach its full potential. That is, even if both the hardware and software exist, the expensive and sophisticated equipment does not run itself. Someone who is qualified and experienced, patient, adaptable and willing to work

with staff and pupils would be a suitable staff person for a resource centre (Smith, in Malcolm, et al., 1973).

These points are some of the problems that should be anticipated when designing a learning resource centre.

Guidelines in Designing a Learning Resource Centre

In designing a learning resource centre, it is helpful to set up some guidelines. These guidelines can serve as a blueprint in the planning stages, and can be summarized as follows.

When accommodating technology seek the simple solutions, the solutions that are educationally sound but which require the least commitment in terms of facilities. Above all, don't first plan a school for instructional technology; rather plan for people... A school building that is good for people is about as good as a school can be and chances are it will also be good for instructional technology (Green, in Unwin & McAleese, 1978, p. 470).

Any centre that is designed with these principles in mind will create an environment which is useful for both students and teachers and does not interfere with the learning process.

Resource centres vary in size according to their requirements. "The minimum requirements of a resource centre should include staff who are qualified, machinery which is adequate, space which is appropriate, and print and non-print materials which are suited to the needs of the school" (Malcolm, et al., 1973, p. 40).

Unwin and McAleese (1978, pp. 470-471) have suggested the following guidelines in designing a resource centre.

- 1) Variety of Spaces. The spaces should be designed to meet the requirements of the school and the centre

as a whole. These would include:

- a) learning spaces for individual students and different sized groups of students;
- b) space for production, maintenance, storage, and distribution of equipment and materials.

2) Flexibility. This would be necessary to accommodate different group sizes, teaching methods, and media.

There would be a need for:

- a) spaces for interchangeable functions, such as rooms equally suited for tutorials and for individual private study;
- b) spaces for specific functions that involve multidisciplinary use.

3) Changes in Technology. Because of the rapid advances in technological development, equipment should not be installed permanently in the building. Provision should be made for new equipment to replace old equipment easily.

To reduce or eliminate financial problems during the development of the centre, the proportion of the general educational budget spent on the learning centre should not be less than eight percent (Allen & Allen, 1973).

Other planning guidelines (American Association of School Librarians, et al., 1978, p.50) emphasize the need for consideration of:

- 1) safety facilities and equipment;
- 2) furniture and equipment;
- 3) staff requirements;

- 4) storage areas;
- 5) experimental variables such as acoustical, visual, and spatial factors; and
- 6) supportive facilities.

The Maryland State Department of Education (1978) has suggested some safety design considerations when planning a learning resource centre.

- 1) Planning for safety in facilities, furnishings, and equipment is essential.
- 2) Nonflammable or fire-resistant furnishings should be used throughout the centre.
- 3) Purchasing should be made according to specifications to assure elimination of hazard.
- 4) There should be no sharp corners or edges.
- 5) Installation should be made within easy access of the users.
- 6) There should be provision of balanced costs and furniture.
- 7) Colour codes for machines and special areas (painting hazards yellow, or yellow and black) should be provided.
- 8) Shelving should be securely installed.
- 9) Wire or power cords should be clear of traffic areas.
- 10) There should be no obstacles in traffic areas.
- 11) Good workmanship is an absolute necessity in the overall construction of the centre.

In planning for an adequate budget, the following educational technology questions need to be answered (Brong, 1977, p. 72):

- 1) What fraction of yearly funds should be spent to purchase materials, to rent materials, or to produce materials?
- 2) What type of support, at what cost in resources, needs to be expanded to provide accessibility to the instructional materials available?
- 3) How can the usefulness of an item and its role in the attainment of the institution's goals be determined?
- 4) When a desired item is out of the collection and off somewhere else, can measures be identified that indicate the loss of utility?
- 5) Which of the institution's programs require greater or lesser support from the Resource Center?
- 6) What are the criteria for determining program adequacy?
- 7) What impact will various forms of delivery (e.g. electronic versus physical) have on the use of resources and availability of these resources?
- 8) What data need to be gathered in order to undertake a scientific analysis of a learning resources program in an attempt to identify its role in providing institutional service?

Such analysis can bring about a balanced budget to implement and operate a successful technology resource centre.

In an address at Concordia University, Arthur Shears (Note 2) of Holland College stressed that in establishing a resource centre in a

vocational institution, the objectives should be clearly stated with a precise and supportive rationale so that funds can be granted from the Board of Education. In developing materials, Shears' general rule of thumb is to "try and develop a system where the programs are relatively simple but effective."

CHAPTER 4

Research Design

Methodology and Procedures

The main objective of this study was to design a technology resource centre for the technical training school in Benue State, Nigeria. In order to achieve this objective, several steps were necessary:

The first step was to define the objectives and state the purposes of designing such a centre in the state. This was accomplished in the first section of the proposal describing the context of the problem.

The second step, describing different aspects of learning resource centres, involved library research of publications, committee reports, research reports, journal articles and position papers. This procedure was covered in the literature review.

The third step was to conduct on-site visits to selected vocational institutions (Note 3) which operate learning resource centres for vocational technical training, observing and interviewing staff in these locations in depth, and gathering information that would assist in the development of a model for the proposed technology resource centre. The method of gathering data was designed not only to obtain information but also to allow for the evolution of objective procedures for interpreting the data to fit the learning resource centre to be designed in the Nigerian context. The major areas of study considered during the on-site visits were:

- 1) personnel and training;
- 2) planning of layout and facilities;

- 3) budget and estimate of expenses for learning resource centre materials and personnel;
- 4) equipment and materials for production;
- 5) evaluation of the whole operation.

The centres visited by the researcher which are discussed here are Algonquin College, Ontario (March-April 1981), and Holland College, Prince Edward Island (April 20-24, 1981).

A checklist was prepared of items, materials and equipment to be observed during the visits. The checklist was suggested by Rowel and Heidbreder (1971), and included the following areas:

- 1) the type of services offered to both teachers and students;
- 2) personnel and training of centre staff and leadership, and job description for each position;
- 3) layout and facilities:
 - a) climate control - how the temperature was controlled in regard to special production areas (with particular attention to environments similar to Nigeria, which is a tropical country);
 - b) acoustical control - soundproofing for special needs such as taping; location of heating, cooling, and ventilation systems; height and treatment of walls and ceilings;
 - c) utilities, including accessibility of electrical areas; plumbing system; special installations for special needs;
 - d) furniture - the type of furniture used in the

resource centre in regard to size, shape and durability, texture and colour in different areas, e.g. carrels, benches, file cabinets, tables and book racks;

e) space allocation, especially:

- large group study areas;

- office space and media planning areas;

- activity or seminar areas;

- student production areas;

- individualized study areas;

- staff lounge;

- storage areas;

- darkroom.

f) safety factors in design and production processes in regard to accident prevention for students and staff and the safe use of equipment;

g) the type of equipment and materials used for production purposes;

h) electrical supply--whether direct from a public corporation or from a standby generator.

(For full checklist, see Appendix B.)

The information gathered was not limited to these items. The learning resource centre directors, coordinators and technicians were encouraged to write additional comments on the checklist. A tape recorder was also taken on the visit to facilitate recording of information which was important but not easy to write down. A camera was used to take pictures of important areas which could then be reviewed to recall

specific features. Provision was also made to talk to people who were involved in other areas of work, but who were knowledgeable in fields relevant to the design of resource centres.

Three replies were received from various institutions with additional information regarding the design of a technology resource centre. The first reply was received from the Audiovisual Coordinator, District One Technical College, Wisconsin, USA. This letter included a report on developing a 12-channel closed-circuit cable campus system (see Appendix C).

The second reply was received from the Head of the Department, Electro-Mechanical, Algonquin College, Ottawa, Ontario, Canada. The letter contained information on the type and cost of equipment required in the technology resource centre areas (units) (see Appendix D).

The third reply was received from the Media Specialist, Holland College, Prince Edward Island, Canada. The letter explained various operational processes, including the type of materials and equipment available, working hours, written job specifications, training programs for staff, and the practical problems encountered at the centre (see Appendix E).

Management, Budget, and Estimates for Learning Resource Centre Materials

In any organization or society, a system will only survive if the budget is properly planned. Thus an attempt was made to find out useful information that would help in implementing and managing a successful budget. Most of the practical problems in developing countries, as in the case of Nigeria, have been cited in the previous chapters. Considering such problems, the data collected were analyzed and used so that only

those areas, materials, and equipment which would be adaptable to the Nigerian environment would be implemented. For example, because of electricity problems in Nigeria, the technology resource centre will be established in the capital of Benue State, where there is a supply of electricity from the Rural Electricity Board to run the equipment and production facilities. There is also a standby generator in the school which functions when there is a power failure from the main supply.

Following the on-site visits, the checklist, which had been completed by the various learning resource centre personnel, were reviewed. The recorded tapes and the slides were reviewed. All this information was used to develop a design of a technology resource centre for the vocational-technical school in Benue State, Nigeria.

The proposed model of the design includes:

- 1) personnel-staff;
- 2) space allocation, including production areas, study carrels, individualized instruction areas, conference rooms, offices for staff, storage areas, darkroom, washrooms, sound and recording rooms, and maintenance areas;
- 3) equipment (the number of machines of each type will be determined after research is conducted on the necessity and usefulness of each apparatus): overhead projector, opaque projector, slide projector, record player, tape recorder, cassette recorder, portapack video, copy stand, spirit duplicator, thermal copier, laminator, paper cutter;

- 4) production materials, including: film and photo paper, overhead transparencies, duplicator stencil and paper, photo mounting tissue, sound effects, cardboard sheets, posters and charts.

Both the teachers and students of the centre will be involved in preparing materials for the proposed centre.

CHAPTER 5

On-Site Visits to Learning Resource Centres

In order to acquire the sound knowledge necessary to develop a technology resource centre for vocational-technical schools in Benue State, several visits were made by the researcher to vocational schools in Canada and the United States that operate learning resource centres. The following section outlines the visits made to two such institutions where centres are currently functioning.

In March and April of 1981, the researcher visited Algonquin College, Ontario, a college which operates a learning resource centre serving students in Applied Arts, Technology and Trades Divisions. The centre has many books, periodicals, government publications, and audio-visual materials.

The second visit was made to Holland College, in April 1981. This school operates individualized learning instruction in post-secondary and Adult-Trade Occupational programs.

These particular schools were selected because both of them offered vocational programs, but each has a different approach to instructional training. Algonquin College supplements classrooms, while Holland College operates an individualized instructional system that replaces traditional classroom lecturing.

From the experiences and the information obtained during these visits, it became clear that it was necessary to take into account the differences between the principles on which Holland College and Algonquin College are based when planning for the establishment of any new centre.

The Resource Centre of Algonquin College, Woodroffe Campus

The administrative structure of the college includes eight campuses. The Vice-President (Academic), the Acting Director, the Secretary, and the

Administrative Assistant are the key figures in running the eight campuses (see Figure 2). There are five main areas serving the eight campuses.

- 1) Human Resource Development: responsible for the training, recruitment, and development of personnel.
- 2) Educational Development Services: provides computer-assisted learning, circulates AV equipment to staff and students, services AV equipment and produces media materials for staff and student use.
- 3) Technical Services and Outlying Campuses: conducts special projects and helps in acquisition of materials, bibliographic control, media maintenance, and collection of periodicals.
- 4) Public Services: deals with circulation of materials, collection and development of films, reference materials, and the organization of users' instructional materials.
- 5) Campus Resource Centre Services: a learning resource centre is established at each of the eight campuses. Each centre offers many services and facilities, including a viewing room, AV equipment, calculators, computer-assisted reference and learning services, and library instruction. These services are offered to students, faculty, and staff of the college, and community members.

Each campus has a centralized resource centre to serve all the existing programs.

Materials. Thousands of books, both in English and French, are available on almost all subjects--including psychology, business, cookery,

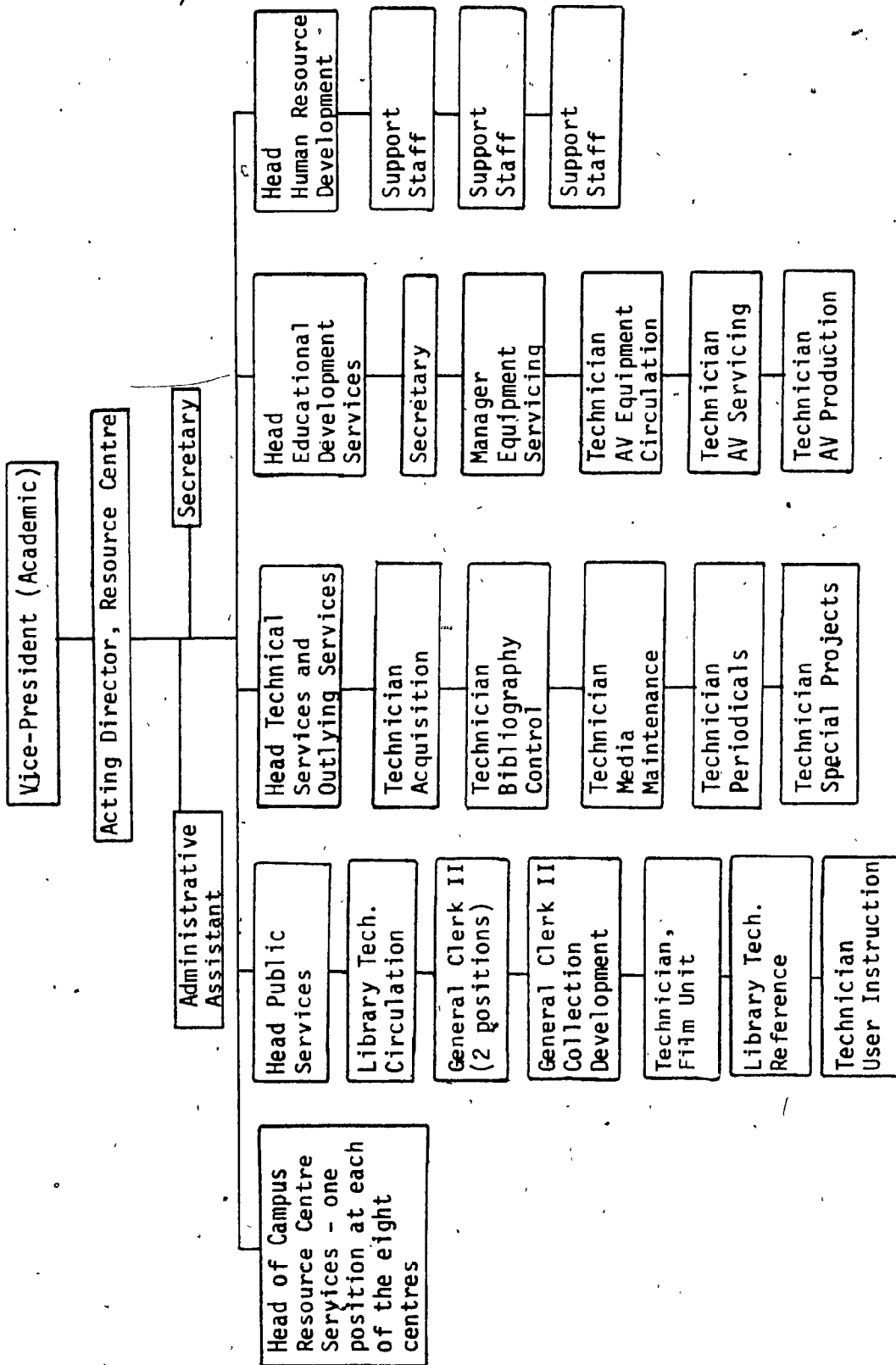


Figure 2. Organizational Chart, Algonquin College

electronics and literature. Journals, general interest magazines, and trade and technology periodicals are available--about 600 in all. A computerized list of the magazines and newspapers available in all the resource centres of the college can be found in the periodicals area. A number of general and specialized periodical indexes are received by the resource centre to facilitate access to magazine articles. Local and out-of-town newspapers are available for in-library use. Back issues are microfilmed. There are approximately 2,000 volumes in a browsing collection of paperbacks (the resource centre welcomes donations of both new and used titles). Pamphlets, annual reports of companies, clippings on many subjects of current interest, and road maps are also housed in the centre.

The learning resource centre also houses a large selection of materials published by the federal and provincial governments. Most of these are indexed in the card catalogue. Statistical publications on Canada and other countries are received in the centre but filed separately from the main collection.

There are approximately 1,000 films for classroom use of viewing in the resource centre's viewing room or mini-cinemas. All these films are listed in the printed catalogue and the card catalogue. The films are available in all programs of study, e.g., architecture, astronomy, carpentry, metalwork, welding, painting and decoration, building and industry, and communication.

Audio cassettes, video tapes, slides, filmstrips and film loops are all catalogued on the shelves with the books; they also cover almost all the subjects under the programs mentioned above.

Equipment. Two coin-operated photocopy machines are located in the reading area. Typewriters are available in reserve rooms for student use. Calculators are permanently fixed on the carrels for use; some are available at the circulation desk for library use.

AV equipment is available both for use in the reading area and for borrowing. The loan of equipment such as projectors, recording equipment, and playbacks can be arranged on request. The staff is always present to assist the students using the equipment, and the technicians are also always on call to help students with any mechanical breakdowns.

Microfilm and microfiche readers are located near the periodicals, and can provide paper copies from the originals.

Services. The learning resource centre offers comprehensive services to the users. The staff at the information desk gives help to users who encounter problems in using the centre's facilities.

A "self-instructional package" is available at the information desk. It is designed to introduce the services of the resource centre and provide instruction on how to use the library resources such as the card catalogue and periodicals index. The self-instruction packages are also available for basic research methods and on the resources for any particular subject area.

The information staff uses computer-based searches to provide services for those students engaged in study or research projects. This staff also helps in inter-library loan processing. A personal reserve system is operated; an instructor can also put material on reserve for class use.

Media Production. Trained personnel are available to work with faculty and students to design instructional packages. Technical facilities are provided for photo reproduction, audio-tape reproduction, graphic reproduction, and integrated videotape editing. A studio is available by reservation to make black-and-white videotapes.

Facilities. A 25-seat film-viewing room can be reserved for class use. Two mini-cinemas are located just outside the film section of the resource centre. The mini-cinema rooms are designed mainly for individual viewing on a first-come, first-served basis.

Carrels are located in the reading area. This section offers a variety of audio-cassette playbacks, slide projectors, record players, videotape, and televisions, for in-library use. Individual study carrels are available on reserve.

Space. The problem of lack of space for expansion has been a primary concern of the resource centre at Algonquin College, Woodroffe Campus. As a result of the expansion in student population, the centre, which is meant to be centralized, has most of its component areas scattered around the school. For example, there is a library upstairs, a library downstairs, a production area outside the centre, and a storage area in the basement. Table 1 shows the various areas of the resource centre and the space allocated to each. These areas are distributed outside the resource centre because the centre was not initially planned and built with future expansion in mind. This situation has caused a number of problems of movement of staff and students in terms of production and information research.

Table 2 presents the resource centre user seating capacity, including

Table 1. Resource Centre Space, Algonquin College, Woodcliffe Campus

UPSTAIRS LIBRARY	Square Feet
Administration	675
Selection and Information Section	1,435
Film Bookings	140
Film Bookings	222
Film Bookings	422
Mini-Cinemas	220
Media Maintenance	224
Acquisitions	640
Master Tapes, Acquisitions and Circulation Storage	112
Pathway to Media Maintenance and Film Bookings and Mini-Cinemas	276
Searching Areas	364
Periodicals	420
Media Circulation	1,050
Computer-assisted learning	206
AV Carrels	382
Study Area 1	414
Study Area 21	864
Remaining Open Area	11,881
Sub-total	20,112

(continued)

Table 1 (con't.)

DOWNSTAIRS LIBRARY		Square Feet
Main Area		7,200
C103	} Reading Rooms	384
C106		273
C108		169
C110		360
Main Room		666
Side Room		91
Sub-total		9,143

OUTSIDE LIBRARY		
Viewing Rooms		464
Viewing Rooms		509
Production Studio		625
Video Control Room		79
Audio Control Room		76
Video Editing Room		61
Reproduction Room		112
Main Media Production Area		988
Photo Studio and Darkroom		437
Media Processing		851
Media Processing		805
AV Equipment (loans and storage)		851

(continued)

Table 1 (con't.)

OUTSIDE LIBRARY (con't.)	Square Feet
AV Servicing (repairs)	805
Xerox Room	28
AV Storage	114
RC Storage Business Basement	522
Sub-total	6,466
<hr/>	
TOTAL Resource Centre Space	36,357

Table 2. Resource Centre User Seating Capacity, Algonquin College
Woodroffe Campus *

TYPE-PURPOSE OF SEATING	Number
Study seats at carrels	222
Study seats at tables	83
Seats for newspaper consultation	13
Seats for literature collection consultation	5
Seats at AV equipment carrels	18
Seats in mini-cinema	12
Seats at resource centre self-orientation carrels	10
Seats in film viewing room	36
Seats in film viewing room	37
Seats at index tables	21
Seats for information file consultation	4
Seats for Telidon viewing	6
Seats for Bibliographic Searching Tool Consultation	16
Seats at drafting tables	4
TOTAL	487

* In addition, there are 22 seats located in the corridor just outside the resource centre doors (20 at carrels, 2 at a table)

the number of seats contained in study carrels, mini-cinemas, viewing rooms, index tables, Telidon viewing, drafting tables and film viewing room. This type of breakdown is useful because it helps in estimating the total number of seats that would be required to furnish various units of a learning resource centre.

The resource centre space and the user seating capacity should be considered in determining the space allocation needed in the construction, layout, and number of seats required in the various units of the proposed technology resource centre.

Funding. The question of funds, like that of space, is also a major problem for the college. Most of the time, the head of the resource centre does not get the required amount of money budgeted for the annual operating cost of the centre. This situation leads to problems in the acquisition of new materials and instructional equipment. The gravity of these problems will become more severe as the government has already proposed budget cutbacks in most Canadian educational institutions. If that is the case, Algonquin College will not be an exception.

The Learning Resource Centre, Holland College, Prince Edward Island

Holland College was established in 1969. The College offers services in the areas of Applied Arts and Technology, vocational training, and adult education. The college has three campuses: Royalty Centre, Charlottetown Centre and Summerside Centre. Each of the centres has a Program Development Coordinator. Figure 3 shows the administrative structure of the college, including all campuses. The Director of Program, Professional Services, the Director of Program

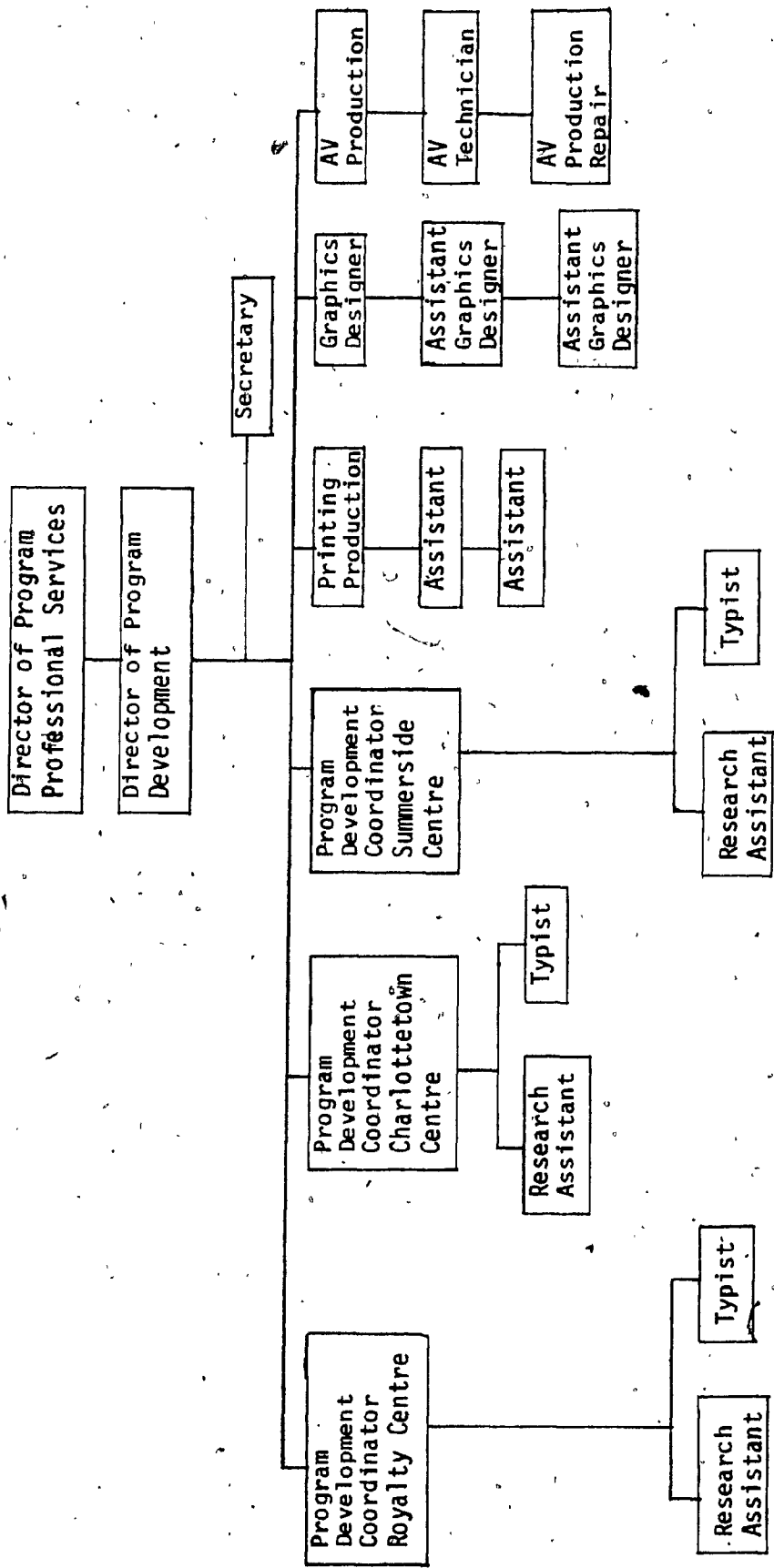


Figure 3. Organizational Chart, Holland College

Development, and the Secretary all help in the running of the whole organization.

The goals of the College are as follows (Holland College, 1974):

- 1) provide learning experience for secondary school youth who wish to prepare for entry into employment or experience skill learning as part of their educational program;
- 2) meet the needs of graduates from any secondary school program who desire occupation-oriented programs;
- 3) meet educational needs of adults and out-of-school youth, whether or not they are secondary school graduates;
- 4) provide diversity and flexibility in educational programs to meet individual and community needs.

Instructional Procedures. The nature of the instructional procedure approach used in the college is called STEP (Self-Training and Evaluation Process). The objective of STEP is to help learners assume responsibility for their own development while acquiring the skills needed to enter wage-earning employment. The basic principles used in this approach to instruction are as follows (Holland College, 1974).

- 1) Skills required in an occupational field are identified by persons in the field.
- 2) Students are responsible for their own progress, and instructors are accountable for student progress.
- 3) Learning is stressed, rather than teaching.
- 4) The role of the instructor is to assess, diagnose,

prescribe and tutor, but not to be the sole conveyor of information.

- 5) The program is individualized to the extent that resources allow.
- 6) Resource rooms, materials and instructors are scheduled, instead of students.
- 7) Evaluation is as realistic and meaningful as possible, in keeping with evaluation in the work environment.
- 8) Students are able to enter and exit from the program at any time.
- 9) Credit is given for previously acquired skills.
- 10) Ratings are based only on performance.
- 11) Students evaluate their performance prior to confirmation by an instructor.
- 12) Students are able to continue their learning program in a systematic way even after leaving the college.

While other colleges have more emphasis on curriculum development, Holland College is more concerned with identifying the skills to be performed. The College has a committee of 8-15 people who must be well versed in the field and their specialty, and who are willing to share ideas and participate in discussions and be open to innovation. The committee, which is led by a coordinator, sets out task analysis to be performed in each career field.

All the courses offered in the college are conducted on an individual basis. Each student has a learning package for the course s/he is studying. The course is identified in major areas of competence within the field; the skills are identified and graded from simple to

complex. For example, a student taking a program in carpentry will be given a task analysis chart which s/he then follows (see Appendix F). A rating or evaluation scale is a major part of the chart. The scale is based on performance criteria and stresses quality, speed and degree of supervision required to perform a skill. The categories of the rating scale are described in Figure 4.

The Development of Programs and Learning Resources

Holland College, unlike Algonquin College, has no curriculum consultant. Instead, the college has a program developer who develops programs to suit the individual needs of the students. While other colleges, such as Algonquin, design curricula for students to follow and complete in order to be awarded certificates, Holland College develops programs which are specifically designed for students and are based on entry behaviour, learning experiences, and previous understanding (from simple to complex concepts). Holland College students do not obtain a diploma when they graduate. Students who meet the requirements of the program are issued an official copy of a chart entitled "Record of Achievement".

The program instructor is in charge of developing the programs. In each program of study, the instructor's responsibility is to define each skill more precisely by identifying its components for the students. After the program has been developed, the instructor is involved in the gathering and preparation of learning materials. Human resources are identified and equipment required for learning activities is specified.

While other colleges have a centralized resource centre, at Holland College each program of study has its own resource room. This

4	<p>C CAN PERFORM THIS SKILL SATISFACTORILY AND CAN LEAD OTHERS IN PERFORMING IT.</p>
	<p>B CAN PERFORM THIS SKILL SATISFACTORILY WITH INITIATIVE AND ADAPTABILITY TO SPECIAL PROBLEM SITUATIONS.</p>
	<p>A CAN PERFORM THIS SKILL SATISFACTORILY WITH MORE THAN ACCEPTABLE SPEED AND QUALITY.</p>
3	<p>CAN PERFORM THIS SKILL SATISFACTORILY WITHOUT ASSISTANCE AND/OR SUPERVISION.</p>
2	<p>CAN PERFORM THIS SKILL SATISFACTORILY BUT REQUIRES PERIODIC ASSISTANCE AND/OR SUPERVISION.</p>
1	<p>CAN PERFORM SOME PARTS OF THIS SKILL SATISFACTORILY BUT REQUIRES ASSISTANCE AND/OR SUPERVISION TO PERFORM THE ENTIRE SKILL.</p>

Source: In S.T.E.P. with Holland College, 1974.

Fig. 4. Rating Scale, Holland College

is an attempt to simplify the storage of learning materials for efficient access to information.

Vertical file boxes are labelled to match each skill found on a program chart placed on the shelves. Each file contains material designed to help the learner acquire the skill. These materials consist of prepared lecture notes, manufacturers' handbooks, catalogues, and articles taken from periodicals as well as references to selected texts.

Selection and preparation of a wide variety of audiovisual materials is greatly emphasized. Most of the materials are prepared by the faculty. The instructors improve resources by obtaining commercially prepared audio and video tapes, slides, and filmstrips.

The Student Learning Process. The philosophy of the college in regard to learning processes is very strong, and somewhat different from other colleges. Materials are designed for student, and not for staff, use. This philosophy is based on the premise that students should be able to learn from the materials without an instructor's assistance. To reinforce this process, each student is given a copy of the occupational analysis of his/her program. The learning process proceeds on the basis of the model for learning and evaluation using the DACUM (Develop a Curriculum) process presented in Figure 5. The purpose of this chart is to set the objectives, to select appropriate skills to reach that objective, to determine what sequence is required and to put the whole together into a plan of action.

As mentioned above, Holland College does not operate on a classroom basis. It takes students as long as four to five months to adapt to a learning philosophy which gives the learner much

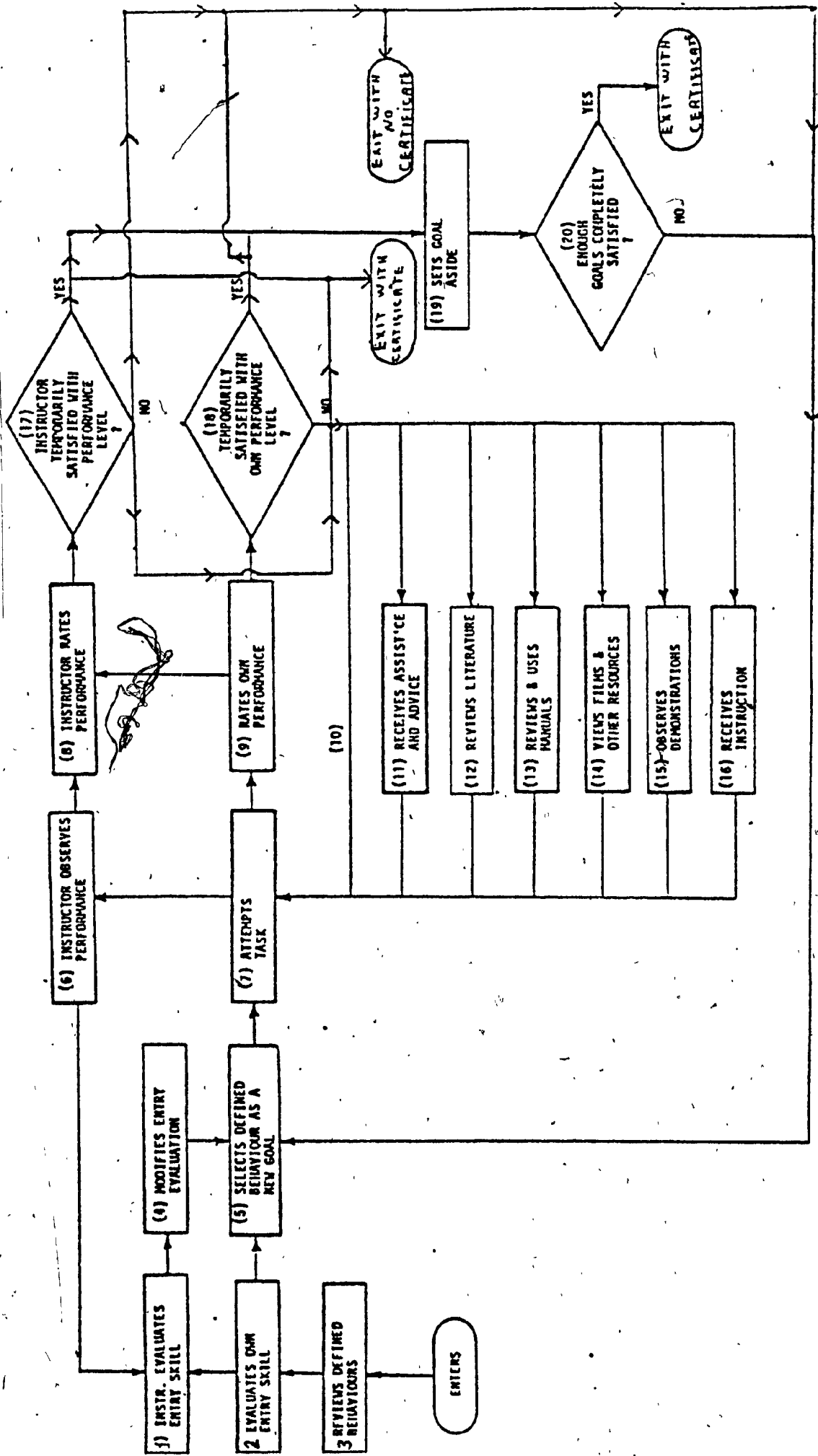


Figure 5. Learning-Evaluation Model for Trainee Using DACUM Process, Holland College

Source: In S.T.E.P. with Holland College, 1974.

freedom, yet imposes an equal amount of individual responsibility.

The college concentrates on three major areas of development:

- 1) staff development;
- 2) creation of a learning resource centre; and
- 3) familiarizing employers with its approach to education.

Because most of the college's instructors come from industry, a staff development program has been established to assist instructors in the areas of counselling, creating, and maintaining a learning environment and developing learning materials.

The college emphasizes that learning resources should be located as close as possible to the learning environment. As a result of this philosophy, learning resources are established in each program of study. The instructors are therefore encouraged to order their own A.V. instructional equipment and materials. However, this is done in consultation with the A.V. Co-ordinator.

Problems and Difficulties

Major problems include a shortage of learning centre staff, "turn-around time" involved in repairing equipment, inadequate purchasing of instructional materials and loss of materials.

There is always a shortage of staff needed to run the centre—shortages in support staff such as production and maintenance technicians. This shortage is due to lack of qualified educational technology staff and partly as a result of the recent financial 'cut-back' in Canadian institutions.

There is a repair unit, but because it is separated from the centres, and because the centres themselves are in different locations,

there is always a "turn-around time" involved for repairs (Shears, Note 2). Instructors from various centres have to bring the equipment all the way to the maintenance shop for repairs, or the technician has to call if the repairs are minor. To reduce the breakdown of equipment and increase the efficiency of the centre, the media specialist tries to buy very simple but effective types of equipment for the centre.

Because the centres are decentralized, equipment and materials are purchased according to the requirements of each program. The purchasing is done by the instructor from each of the centres through the media specialist. In many cases, though, instructors feel that it is demeaning to them to purchase instructional materials through the media specialist. However, after by-passing the specialist for the original purchase, it is frequently found that some of the equipment is not to specifications; only then is the media specialist called in for advice.

Sometimes students take out books, learning materials, and even films, and do not return them. Though students are expected to sign out materials, and most of the time they do, there is still a certain amount of loss every year.

Comparison of Holland College and Algonquin College

The researcher's observations and discussions with various media specialists, directors and co-ordinators, and learning resource officers indicate that the two types of learning centres have different philosophies, allocation of space and operational procedures.

Information on various operational procedures for the two centres

was gathered and analyzed, comparing Holland and Algonquin Colleges in terms of types of equipment available at the centre, organisation materials in the centre, functions of the centre, reasons for using the centre, handling of users' requests, in-service and adult education, equipment, organisation of materials and instructional materials used in the centre. The result of each comparison is summarized in Tables 3 through 10.

Philosophies

Though learning resource centres are established in different fashions with different philosophies, they still must satisfy the purposes for which they are designed. During the researcher's visits, it was observed that the learning resource centre at Algonquin College is centralized, with all facilities for student use. At Holland College, learning resource centres are decentralized; each program has its own centre. The reason for this proliferation of centres lies in Holland's philosophy that to make learning situations as realistic as possible, learning resources should be easily accessible and located as close as possible to learners and a learning environment. The general considerations for space allocation of learning resource centre activities depend on the size of the school population, the variety of users, and the community needs.

Functions

The functions of learning resource centres were basically the same, as shown in Table 3, and included training of staff and adult educators in the use of media, stimulating professional leadership among users, and demonstrating A.V. equipment to students and faculty. The only exceptions are that Algonquin distributes media to other schools, and

Table 3. Comparison of Algonquin and Holland Colleges: Functions of Learning Resource Centre

Holland College	Algonquin College	Functions
	X	Planning series of in-service workshops and classes*
X	X	Review materials for college collection
	X	Conduct resource centre staff meetings
X	X	Preparing orders for materials
X	X	Demonstrate AV equipment (students and faculty)
X	X	Materials design, production and processing
X	X	Training student assistants
X	X	Make teachers aware of a wide variety of media to enrich teaching
X	X	Support work of curriculum consultant
	X	Distribute media to other schools
X	X	Train staff and adult educators in the use of media
X	X	Provide, stimulate professional leadership among users
X	X	Review and evaluate media operation
X	X	Answer and obtain items requested by the users

* At Algonquin, includes general orientations given to all first-year students; second- and third-year students are given classes on research methods

plans in-service workshops and classes. Holland College does not plan workshops and classes because the college operates on an individualized basis. There is a training program for staff, because most of the staff at Holland College are brought in from industry and commerce. However, they do not go to the classroom; instead they go through what is called the "Professional Development Centre" where they receive training on how to supervise students' individualized study.

Reasons for Using the Centre

The learning resource centres at Algonquin and Holland Colleges serve administrative public relations regularly, both within and outside the centre. In comparing the two centres in regard to who uses the centre (see Table 4), it was found that many faculty members at Algonquin College use the resource centre to prepare instructional materials and handouts for classroom instruction. But in Holland College, only a few teachers use the centres, because these centres are designed for student use. The learning binders and the learning packages are there for the DACUM (Develop a Curriculum) individualized system.

The total number of students coming into each of the centres per day, including repetition, is almost the same as the number of students on the campus. If repetition is not considered, Holland College has a higher number of students coming into the centre per day because the school is individualized; each and every student has to use the learning packages at the centre in order to progress with the skills on the chart.

Handling of Users' Requests

In Table 5 the handling of users' requests in the two colleges is compared. The only situation in which the members of the staff work

Table 4. Comparison of Algonquin and Holland Colleges,
Services for the Users *

Holland College	Algonquin College	Services for the Users
		Serves administrative public relations:
X	X	regularly
		Serves advertising needs:
X	X	both within and outside the centre
		Number of faculty/teachers who use the centre:
	X	many (about ninety percent)
X		very few (about thirty percent)
		Number of students who use the centre**:
X		all students in the school
	X	three quarters of the students in the school
1,525	1,000	Total number of students on the campus
1,500	1,000	Approximate number of clients (including repetition) coming in per day

* The figures for Algonquin College represent Woodroffe Campus.

** The total number of clients coming in per day at Holland College is high because students are taught on an individualized basis, and each student has to use the centre in order to meet objectives.

Table 5. Comparison of Algonquin and Holland Colleges: Handling of Users' Requests

HOLLAND COLLEGE	ALGONQUIN COLLEGE	HANDLING OF USERS' REQUESTS
	X	Assisted by staff member.
X	X	Staff member goes to school to work with users.
	X	Referred to another source, if unavailable for help.
	X	Staff specially assigned for student's request.

with users is if the latter have questions to ask about the skills on the individualized chart. Algonquin operates on a classroom basis; therefore, there are more alternatives for handling of users' requests and other types of staff assistance are provided.

In-Service and Adult Education

The in-service program operates in Algonquin College because of users' requests and observation of users' needs and not at the request of the centre's staff. Holland College conducts in-service and adult education programs not because of the observed users' needs but because of requests by the program development staff. The use of the materials collection is unlimited in the Algonquin College centre because the centre is centralized and materials are collected in abundance in order to satisfy so many students coming in at a time. Holland College uses the materials collection outside the college because instructional procedures are individualized and students are allowed to use these materials at home or by correspondence. The collection of materials is limited, firstly to keep in line with the skills on the chart, and secondly to satisfy the objectives of the learning packages and modules. Table 6 compares the in-service and adult education programs at the two-colleges.

Equipment

In Table 7, a comparison of equipment owned by each of the centres is shown. The equipment used by the two types of learning centres is similar in certain respects (projectors of various kinds, cassette recorders, video equipment are used). Algonquin has certain equipment that Holland does not have, e.g., monitors and computer assisted

Table 6. Comparison of Algonquin and Holland Colleges:
In-Service and Adult Education Programs

Holland College	Algonquin College	Programs offered to in-service and adult
X	X	Scheduled on user's request
X	X	Scheduled on adult request
	X	Observe users' needs
X	X	Consultance services In centre and outside of college
X		Requested by centre's staff

Table 7. Equipment owned by Resource Centre, Algonquin and Holland Colleges

EQUIPMENT	QUANTITY	
	Algonquin College	Holland College
Calculators	59	
8 mm cameras	14	
Still cameras	50	1
Screens	460	
Flash units	35	5
Filmstrip projectors and viewer	98	12
Filmstrip sync cassette projector and viewer	23	24-36 ≈ 30
Filmstrip sync record player	5	
Overhead projector	278	24-36 ≈ 30
Monitors and television sets	112	
Video cameras	45	6
Microfiche film readers	18	
Opaque projectors	28	24
16 mm projectors	109	24
8 mm projectors	16	6
8 mm film loop and cartridge	38	
Record players and turntables	56	3
Slide projectors	94	12-24 ≈ 12

(continued)

Table 7 (con't)

Equipment	Algonquin College	Holland College
Slide sync cassette viewers	10	
Slide tape synchronizer	11	
Tape recorders	92	3
Language lab tape machines	48	
Cassette recorders	182	100
Cassette playbacks	485	
Video tape recorders	9	
Video cassette recorders	30	6
Video cassette playbacks	13	24-36 ~ 30
Video port-a-pack	19	4
Generators		2
Slide sorter		2
Xerox machine	--	2

AVAILABLE IN OTHER DEPARTMENTS (Holland only)

Copy stand	1
Spirit duplicator	1
Thermal copier	1
Paper cutter	1
Laminator	1
Hot press	1
Microfiche reader	1
Typewriter	1

--- indicates information not given

instruction, while Holland has special equipment unavailable at Algonquin, e.g., copy stand. In general, there is more equipment in Algonquin than Holland College; this is because there are more campuses and a greater number of students at Algonquin.

Organisation of Materials

Table 8 compares the organisation of centre materials. The classification of materials in each of the centre differs. Algonquin College operates a centralized system; as a result of this, all media are classified together except 16 mm films, which need special care and shelving. Holland College operates a decentralized resource centre, therefore, books in each department are catalogued by the Library of Congress; packages and binders are listed according to the chart skill numbers, and A.V. materials in each department are catalogued numerically.

Instructional Materials

In Table 9, it is shown that the instructional materials used at Holland and Algonquin are by and large the same, and include movies, tapes, slides transparencies, microfilms. The only difference is that textbooks, reel-to-reel tape, pictures, art supplies and maps are used more in the classroom at the centre at Algonquin. Holland College has these materials for use in the centre for each program; these instructional materials are used to enrich and reinforce individualized instruction rather than to provide classroom instruction.

Summary

In a traditional school system, teachers conduct routine classroom teaching; the resource and instructional materials are used to support learning processes. This approach is used in Algonquin College. But

Table 8. Comparison of Algonquin and Holland Colleges: Organization of Centre's Materials

ORGANIZATION OF CENTRE'S MATERIALS	
HOLLAND COLLEGE	<ol style="list-style-type: none"> 1. Shelved by the type of media. 2. Books in each department catalogued by the Library of Congress system. 3. Packages and binders listed according to the chart skill numbers. 4. AV material catalogued numerically.
<hr style="border-top: 1px dashed black;"/>	
ALGONQUIN COLLEGE	<p>All media classified together, except:</p> <ol style="list-style-type: none"> 1. the pamphlet file, which houses materials too flimsy to stand on the shelves, or too ephemeral to be worth cataloging; 2. the 16 mm films, which need special care and shelving, and are kept together at Woodroffe Campus.

Table 9. Comparison of Algonquin and Holland Colleges:
Instructional Materials Used in the Centre

Holland College	Algonquin College	Instructional Materials Used in the Centre
X	X	Movies
X		Textbooks
X		Records
X	X	Cassette tapes
X		Reel-to-reel tapes
X	X	Silent sound loops
X	X	Slides
X	X	Sound film loops
X		Pictures
X	X	Posters and charts*
X	X	Transparencies
X	X	Video tapes
X		Art supplies
X	X	Reference books
X	X	Magazines
X	X	Newspapers
	X	Pamphlets
X		Maps
X		Sculpture and art reproductions
X	X	Microfilms
X	X	Individualized learning modules

Table 9 (con't.)

Holland College	Algonquin College	Instructional Materials Used in the Centre
X		Learning packages
X	X	Print materials
X	X	Audiovisual materials
X	X	16 mm films
X	X	8 mm films
	X	Programmed instruction (computer-assisted learning)

*In Holland College, all programs are individualized. In Algonquin College, all programs are supplemented by classroom instruction, except the Gas Fitter Program, which uses an individualized system; posters and charts are created by production staff.

Holland College, which uses an informal system of schooling, places more emphasis on learning than teaching. Here, the role of the teacher is reversed--s/he is used as a support to learning processes, while work with instructional materials and other resources is used as the primary learning process.

The comparison in Tables 3 through 10 show that the materials and equipment used at each centre are identical, though they are used in different ways because of the different approach in philosophy of each college. The different philosophy means that: "When materials and equipment are scarce, centralization makes sense; but when the greatest scarcity is learner's time (the time of the learner and the teacher) than decentralization with duplication is better" (Boyd, Note 4).

It is therefore concluded that both learning resource centres, whether centralized or decentralized, utilize similar learning processes in achieving their objectives.

CHAPTER 6

The Processes and the Physical Facilities Involved in Establishing a Technology-Resource Centre

First Stage

The first stage in designing a technology-resource centre Vocational Technical Education in Benue State is to stress the need for establishing such a centre. After the needs analysis, the objectives will be identified. The consideration of practical problems is equally important in the design process. A flow chart for designing and implementing a technology-resource centre developed by the author is presented in Figure 6. The major steps involved in the planning are identification of needs and objectives, budgeting, purchasing of hardware and software and recruitment of staff, acoustics and evaluation.

The review of previous work done on resource centres, and the on-site visits to several existing centres were attempts to collect more information about what should be done or included in the technology resource centre. The data collected was examined and appropriate items selected for implementation in the model.

Second Stage

The model plan will be taken to the Benue State administration. The administration is made up of: the Chief Inspector of Education (Technical); the Chief Inspector of Education, Secondary Schools; the Permanent Secretary, Ministry of Education; and the Commissioner for Education. They will discuss educational priorities such as curriculum, site, materials, equipment, and personnel.

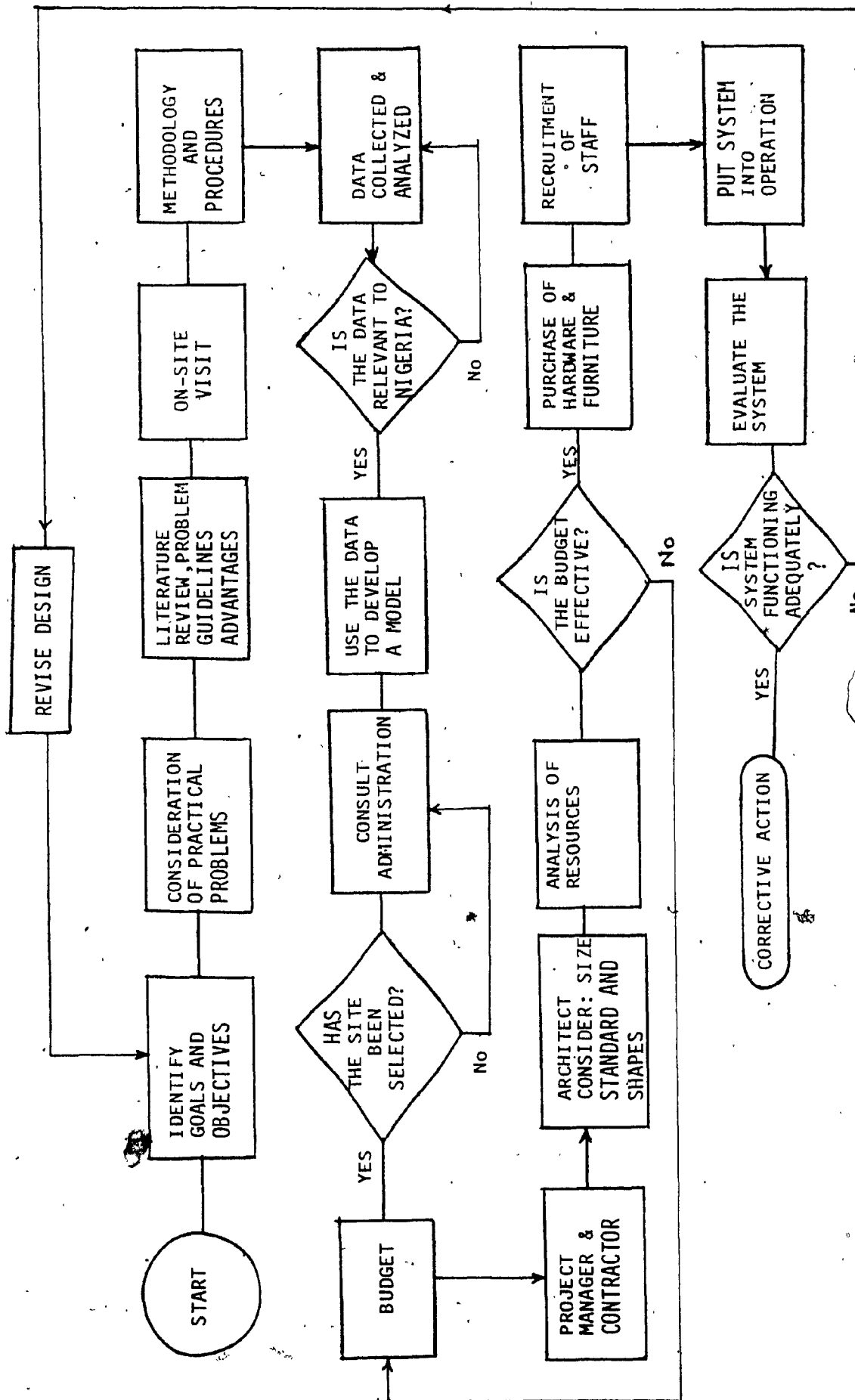


FIG. 6. FLOW CHART FOR DESIGNING AND IMPLEMENTING A TECHNOLOGY RESOURCE CENTRE

Location and Design

Careful consideration should be given to the appropriate location of the centre. Trainees will be willing to use the centre more readily if it is within easy walking distance. This would eliminate the problem of cost and time expended in travel to a centre distant from work areas. The following points should be considered when selecting a technology resource centre:

- 1) easy accessibility at all times, including nights and weekends;
- 2) visibility;
- 3) easy access to all resource centre public areas for disabled users and the community (non-profit organizations);
- 4) only one main public entrance for security;
- 5) shipping and receiving facilities, including convenient access to movement of materials, equipment, and users;
- 6) location of all resource centre services in one area;
- 7) the possibility of internal flexibility;
- 8) the possibility of future expansion;
- 9) windows for natural light; and
- 10) a location away from areas of excessive noise.

When the appropriate site has been selected, the Media Specialist or the Director will make a detailed sketch of what the area will look like and present it to the architect. Stewart (1970) sees an architect as the only person who can bring learning spaces into reality:

Architects are competent to design instructional spaces if spaces to be designed are described in

detail and in terms of how the space and its required equipment will be used. It is therefore incumbent upon the planner to thoroughly describe the:
 1) program to be housed, 2) space required for housing, 3) required environmental considerations, 4) types of furnishings and equipment to be housed, 5) relationships of instructional spaces, and 6) any unique equipment requirement. (1970, p. 64)

The consultant and the architect will work together to determine what functions will be included in the resource centre, functions such as small group study, storage areas and production areas.

The architect then makes the drawings with all the specifications, and presents the whole plan to the administration. If this is approved, it will then be handed over to the project manager. The space allocation to be considered for the centre is discussed below.

A project manager who is a licensed construction specialist will be appointed to supervise the building-related projects involved in the construction. The project manager will have the contractors working under him, and will co-ordinate the work of the various contractors, and inspect and approve construction stages.

The administrative personnel working together with the project manager will be responsible for purchasing of equipment, materials and hiring of personnel staff.

The Physical Facilities in a Learning Resource Centre

The Learning Environment

In order to have a good study area that is conducive to production, instruction and learning purposes, a good learning environment has to be designed. There is a strong relationship between environment and behavior of individuals and groups.

Unwin and McAleese (1978, p. 453) feel that:

this relationship is complex and needs to be considered in social and psychological terms. In recognition of this, it is common to find social scientists contributing to planning and design of environments for learning in collaboration with architects and engineers.

It is therefore necessary to recognize that the learning environment contributes a good deal to the educational system. In planning a technology resource centre, there is a need to consider a good learning environment, an environment which will provide enough space for learning/teaching, and which will accommodate instructional materials and equipment.

It is not only social and psychological factors that are the main consideration in a learning environment. Other needs to be equally considered include seeing, hearing, and comfort. These are summarized by Green et al. (1966, part 2, p. C5):

Certain physiological needs, including seeing, hearing, and bodily comfort, must be met in order for students to learn within a man-made environment. The fact that learning media are part of the educational system places some special demands on the environment in which students, media, and instructor gather for learning.

Another factor in planning is space allocation. For an effective technology resource centre, the careful allocation of space for various areas within the centre is essential.

A model for controlling the total environment is shown in Figure 7. The factors involved in the control of total environment are lighting, acoustic, and thermal (climate).

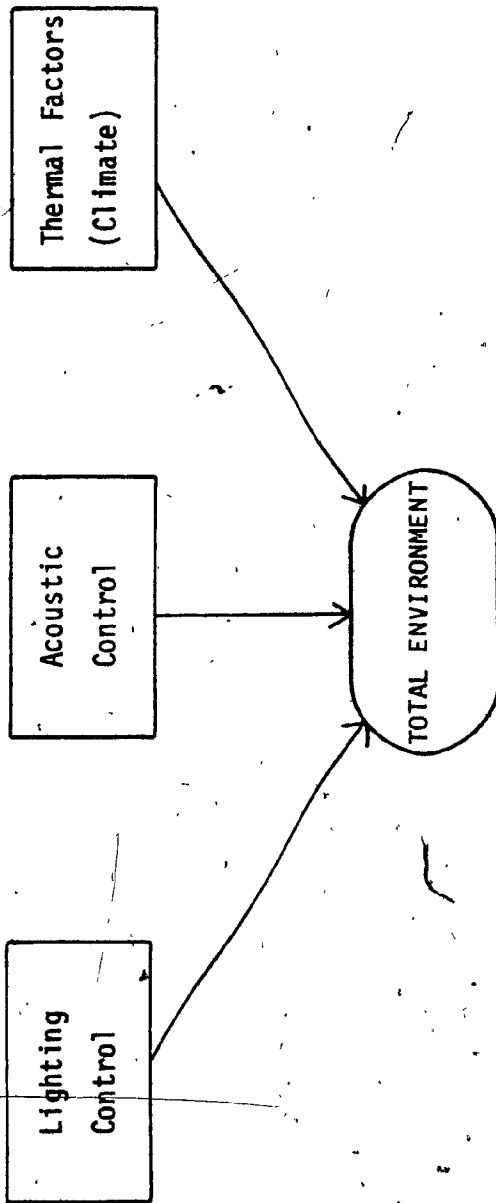


Figure 7. Learning Environment Control

Lighting. A classroom which is well equipped but without light cannot serve its purpose. Lighting has become a very useful tool in our technological age. It is not used only for reading and writing, but also for picture presentation, contrast and comfort.

In institutions, the primary aim of school lighting is to assist students and instructors to see comfortably and efficiently without undue distraction (Green et al., 1966). In order to eliminate boredom and fatigue, and to stimulate interest and maintain an effective study environment, it is better to consider lighting as one of the first things in the technology resource centre.

Good lighting requires careful planning with guidelines. Lighting requirements for instructional areas have been noted by Wells (Note 9) in a paper titled "Learning Environment Design".

- 1) Lighting must provide 70 ft. candles of light at eye and task surface level. Lighting must be overhead fluorescent type with cool white lamps.
- 2) The lighting system must complement good interior design with light that accentuates task areas and subdues sharp contrasts.
- 3) Luminaries must be positioned out of the direct lines of sight of trainees. Several low intensity luminaries should be installed rather than limited bright ones. Use light fixtures which diffuse light.
- 4) Reflectance must be uniform. The colour scheme must maintain a near-uniform appearance in the trainee's field of view.

- 5) Ceilings must be of a high reflectance white.
 Walls must reflect 40-60% of the light incident upon them. The floors of most instructional areas will require reflectance of 30-50%.

A comprehensive planning of lighting for a technology resource centre under this arrangement is based on the theory that inadequate classroom lighting tends to fatigue the students' eyes, possibly leading to nervousness, irritability and even damage of the eye mechanism (Hurtado, Note 10). One must not forget that to obtain good lighting, the key points to consider are illumination level, reflectances, brightness contrast (BCR), glare and colour (McVey, 1977). Table 10 shows illuminating levels of different areas in a technology resource centre. A guide such as this, if properly followed during the design process, will produce a desirable level of comfort for the learning environment.

The recommended screen brightness for different projected images and media projections are presented below:

Motion Pictures: 5 foot length - minimum (marginal for some observers)

10 foot length - satisfactory

15 foot length - excellent

20 foot length - maximum

Slides: 1 foot length - difficult to distinguish colour from black and white

2.5 foot length - minimum for gross images

5 foot length - minimum for slides with details

Table 10. Illumination Levels of Areas of Technology Resource
Centre

AREAS	FOOT CANDLE LEVEL
Auditoriums	25
Cafeterias	25
Classrooms	70
Computer rooms	70
Conference rooms	70
Corridors	5
Drafting rooms	70
Lobby	5
Locker rooms	10
Lounges	10
Mechanical equipment rooms	70
Production rooms	70
Storage areas	5
Toilets	10
Training rooms	70
Student production area	70

(Per Illuminating Engineers Society of North America specifications.)

10 foot length - satisfactory

20 foot length - excellent.

(Association for Educational Communications and Technology, 1977, p.61).

To implement a successful operation of a technology-resource centre in Benue State; these recommendations can serve as a frame of reference for both students and teachers who will later on be involved in the production and presentation of instructional material for classrooms and conferences.

With reference to the layout in Figure 12, it is important to bear in mind that work areas which are action-oriented such as conference room, studio production, staff production and students' production areas, should be decorated with colours such as yellow, orange and red; those planned for quiet activities such as preview room and small group study should have a different colour such as green or blue (Association for Educational Communications and Technology, 1977).

Acoustics. In the technical school Benue State, Nigeria, where the technology resource centre is going to be located, the possibility of background noise is very high because the school is situated in the city. It is therefore necessary to consider background noise as one of the important problems that will be taken into account.

Good acoustics are important in school buildings because education depends on communication and good hearing conditions. Easy audibility depends greatly on the difference between the level of informational sound and the level of background noise. The minimum acceptable signal-to-noise ratio for this purpose is 10 decibels (dB). But normal speech generally registers 60 dB above silence; therefore,

it stands to reason that the background noise should be well below 50 dB in order for speech to be heard. However, that is not to say that a totally quiet room should be recommended, because a certain amount (at least 40 dB) of background noise is desirable to mask the sound created by classroom activities, e.g., writing and page turning (American Association of School Librarians et al., 1978; Association for Educational Communications and Technology, 1977)..

To obtain a standard environment in a learning resource centre, noise reduction is accomplished by standard isolation and absorption techniques.

The basic recommendations for acoustical learning environment are given by McVey (1977, p. 66; 1978, pp. 82-83).

- 1) The best shaped space for acoustical performance is a room with a length-width-height ratio of 5:3:2.
- 2) The orientation of the room's walls, ceiling and floor should be such that sound is projected and reflected from the front of the room toward the rear. To accomplish this, front and side walls should be non-parallel (splayed). Floors should be stepped or inclined.
- 3) The ceiling in the front half of the room should be sonically reflective. If reflecting panels are used, they should be no smaller than 10 feet wide. The ceiling section over the speaker (instructor) should be inclined towards the audience in such a manner that most of his/her voice is projected forward, although a small part of it is reflected downward so that the instructor has no

difficulty hearing her-/himself.

- 4) Rear walls should not be curved (to avoid focus of reflected sound waves). They should also be covered with a highly absorptive material.
- 5) Whenever economy permits, seats should be upholstered and carpeting provided throughout. Carpeting in the perimeter of the room is essential.
- 6) The rooms should be insulated against outside noise. Walls with a noise attenuation of 45 dB are recommended.

When the ceiling is of reflective material, a carpet on the floor is recommended to prevent too much bouncing of sound between floor and ceiling.

All of the above acoustical recommendations are considered with two main objectives in mind, i.e., 1) to provide good hearing conditions where desired, and 2) to eliminate, as far as possible, any unwanted sound and noise (Green et al., 1966). Effort will be made to incorporate a few of these recommendations by providing good quality ceiling, highly absorptive carpet and good furniture in the proposed technology-resource centre.

In a developing country like Nigeria, some of the school buildings are not built to the required specifications. Even those buildings which are intended to meet the specifications do not have the required materials and equipment. Moreover, some of the building contractors are not qualified for their jobs. Therefore, special projects such as the one proposed by the researcher are normally given to foreign contractors. Although it takes a long time to complete arrangements

with foreign contractors, a delay would be preferable to the construction of acoustically inadequate facilities.

Thermal Factors (Climate). The optimum learning environment is more than simply a physically comfortable climate; it is a climate which encourages a learning atmosphere that makes students more active and attentive. Climate, if not properly controlled, will adversely affect the comfort with which visual and auditory tasks are carried out.

In Nigeria, there are two well-marked seasons: the dry season, which lasts from November to March, and the rainy season, from April to October. The humidity can be as high as 95% and the temperature at the coast rises above 32°C (92°F). The climate is drier further in the north, where wide ranges of temperature are common, from $12-36^{\circ}\text{C}$ ($54-95^{\circ}$).

Most of the schools in the country are built without the necessary climatic controls. As mentioned above, there is seldom a regular electricity flow in some of the schools, though the federal government, in co-operation with the states, is making dramatic efforts to electrify all the rural areas in the country. However, an air conditioning system must be installed to take care of the equipment and materials.

In considering the thermal factor, the building has to be well ventilated, and the room temperature has to be between $20-25^{\circ}\text{C}$ ($68-79^{\circ}\text{F}$); for equipment operation and storage, the film projectors should be kept at $18-20^{\circ}\text{C}$ ($65-70^{\circ}\text{F}$). These factors accord with the recommendations of the Association for Educational Communication and Technology (1978).

Equipment and Materials (Hardware and Software)

A learning resource centre depends on many factors such as furniture, space allocation, and staff, with each performing different functions,

but all combining for the effectiveness of the centre. It is very hard for a learning resource centre to function effectively without hardware and software.

In a developing country like Nigeria, the selection of equipment and its standardization will contribute significantly to the success of the entire centre. Much of the decision-making on selection will come from the Director, who as one of the equipment committee will be informed before equipment is purchased. Allen and Allen (1973) have recommended that one committee member be from the business office staff to assist in better planning if there is a large expenditure.

Selection of the equipment and materials will be based on the general criteria laid down by Parker (in Allen & Allen, 1973, p. 147) as follows:

- 1) portability;
- 2) ruggedness;
- 3) cost;
- 4) ease of operation;
- 5) quality of performance;
- 6) effective design;
- 7) ease of maintenance and repairs;
- 8) reputation of the manufacturer;
- 9) local equipment status; and
- 10) available service.

The above criteria for selection are useful for a developing nation like Nigeria which is struggling for technological achievement. The advantages of these criteria for selection and standardization are far greater than the disadvantages. The advantages of these criteria are

given by Eyman (in Allen & Allen, 1973, p. 63).

- 1) It is easier to train teachers and students to prepare the equipment; hence less time and effort will be spent by supervisory personnel on this phase of service.
- 2) There will be fewer operational failures in the classroom because more people will understand how to control the output of the equipment.
- 3) It is easier to service one make of machine because local servicemen are more familiar with it and understand how to fix or adjust it.
- 4) It is cheaper to service the equipment since only one set of spare parts needs to be maintained. Therefore, less money needs to be tied up in a stock of spare parts during any one year.
- 5) There is less clerical and technical work involved in maintaining the inventory of spare parts, and in storing, organizing, and finding space for them.

Keeping in mind the above principles, the equipment and materials to be used in the proposed technology-resource centre will be very simple and easy to operate; of one make of machinery; satisfy voltage requirement and have the spare parts available.

Furniture

For a learning resource centre to be complete and serve the purpose for which it is being built, an adequate supply of furniture is needed. However, this should be done on the basis of functional, aesthetic, and economic criteria which have been already established.

Furniture contributes a good deal to the function of a learning centre environment by providing for the comfort of the personnel, and by giving accommodation to non-print materials. It is therefore necessary that furniture as a part of the learning environment be considered an integral part of the space which a learning resource centre has to employ.

Criteria and Method of Selecting Furniture. In selecting the furniture for the proposed technology resource centre, each space requires the development of specific criteria by which choices are made.

Green et al. (1966) have outlined the following criteria which could be used in furnishing a learning resource centre:

- 1) consideration of structural values, i.e., simplicity of construction and durability;
- 2) ease of cleaning;
- 3) economy of space;
- 4) appearance;
- 5) cost; and
- 6) other functional values such as writing surface, book storage, comfort and posture, accessibility, and adjustability.

The height of the furniture for students, personnel and other special areas such as shelving, circulation desk, cabinets, bulletin boards, and vertical files should be considered one of the criteria in the selection of furniture. The following furniture will be considered:

- 1) oversize cabinet files;
- 2) bracket book-stacks;

- 3) circular reading table;
- 4) rectangular reading table;
- 5) single pedestal administrative desk;
- 6) stenographer's chair;
- 7) armchairs for reading tables;
- 8) study carrels;
- 9) lounge furniture, three-seaters; and
- 10) drawing table.

The number of furniture pieces is subject to increase as the school grows in population and size. In order to implement the potential growth of furniture, the structural values in simplicity of construction and durability of furnishing should be considered; this will include appearance, size and shape, accessibility and comfort.

Space Allocation: General Considerations

Space allocation has much to do with the effective operation of a technology resource centre. For ease of movement and for comfort, the allocation of spaces in relation to one another is essential.

The College Resource Centre, Colleges of Applied Arts and Technology (Ontario Department of Education, Note 5) has suggested that the following rules be used to estimate the spaces in the design process:

- 1) senior professional staff: 150-250 sq. ft. per person;
- 2) professional technical staff: 100-150 sq. ft. per person;
- 3) clerical staff: 50-80 sq. ft. per person;
- 4) carrel station: 30 sq. ft. each;
- 5) table station: 25 sq. ft. each.

Space recommendations for a resource centre as given by the Rideau

Campus Users' Committee (Algonquin College, Note 6) agreed that a good rule of thumb is that 28% of the student population x 30 sq. ft. (2.79 sq. m.) should be used to allocate spaces for learning activities. These recommendations will be used as a reference point in estimating single and multiple study areas (carrel and tables), lounge areas, viewing rooms, multiple-purpose rooms, and circulation aisles to establish a technology resource centre.

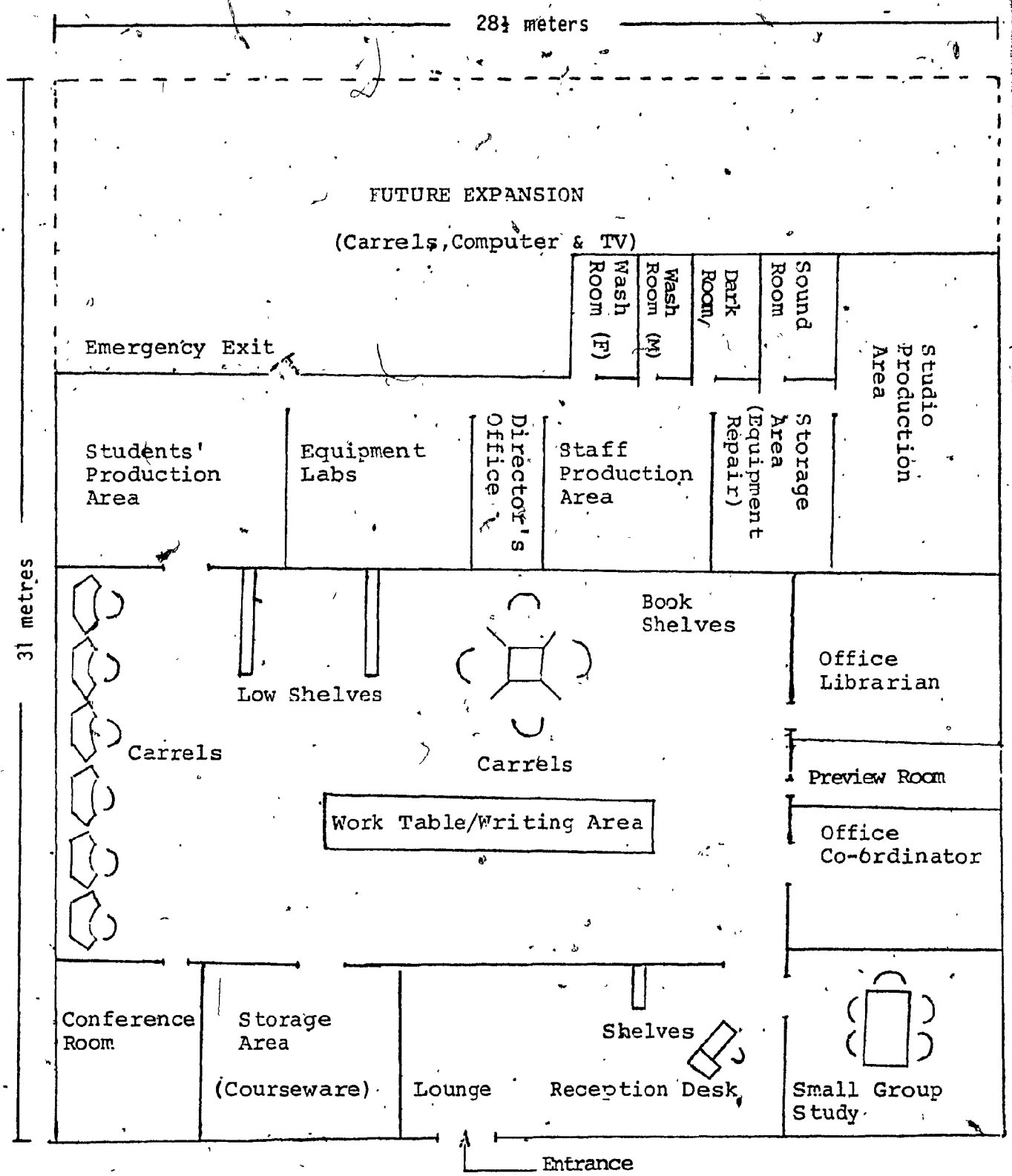
Using the above guidelines, the researcher will design a centre with these space and functional relationships in mind. One possible workable design is shown in the layout in Figure 8. The functional use of each space is thoroughly presented in Table 11. These features have been selected so as to give ease of movement, smooth production and efficient operation of the whole centre.

Budget

A system cannot survive without a budget. In order to plan a workable technology resource centre, the budget has to be well planned. In the case of a vocational resource centre, two factors have to be considered, as shown in Figure 9: the capital budget, involving the construction of the centre, and staff and equipment; and the operating cost, which involves maintenance and replacement materials.

In establishing a proper procedure for budgeting, Strauss et al. (1972, p. 65) concluded that:

The final decision as to what is to be spent to make it possible for an organisation to take full advantage of all published and otherwise available information should be reached after submission of a suggested budget by the head of the services to the official to whom he is directly responsible.



Scale 1 mt = 1/2 ft.

Figure 8. Layout of Technology Resource Centre

Table 11. Space Allocation and Functional Relationship

<u>Space Description</u>	<u>Special Functional Aspects</u>
Equipment storage and distribution	This area provides for availability of equipment in the production and listening/viewing areas of the resource centre. The location should be considered in relation to production area and staff work space. Will contain spare parts.
Maintenance and repair	This area will be used to repair and house all the equipment that is not functioning properly. The best location is adjacent to equipment storage and distribution area.
Darkroom	For photo development and printing. The darkroom will require a sink, running water, electrical outlets, light locks, refrigeration, ventilation, enlarger camera, table and chair.
Preview room	This area will be used for listening and viewing work prior to presentation. It will contain headsets and rear screen projection.
Sound recording	There will be complete recording equipment in this room. The room will be soundproofed, well insulated and carpeted. It will contain a reel-to-reel console and a cassette copier, one cabinet for records, a table, and a chair. It will be used for synchronization and internal taping.
Equipment lab	This area will have equipment such as a 16 mm film projector, cassette recorder, record player, slide projector, and overhead projector for students to practice and prepare assignments.

Table 11. (Cont'd.)

<u>Space Description</u>	<u>Special Functional Aspects</u>
Students' production area	This area will be used for students to prepare their assignments, which involves spirit duplication, graphics, overhead and thermofax transparencies, dry and wet mount.
Staff production area	This area will be used for members of staff to prepare teaching aids for students.
Storage room	This room will be used to store all the production materials such as overhead transparencies, film and photo paper, duplicator stencils and paper, and cardboard.
Technician's office	This area will be placed adjacent to equipment and repair areas.
Washroom (lavatory)	This area will contain two sections of toilets, one for men and one for women. It will be located immediately outside the centre.
Carrel area	This area will accommodate a total of 20 individual dry carrels with 5 units of 4 wet carrels each. These carrels will be equipped with cassette recorders, slide projectors, calculators, and players. Adequate lighting will be provided.
Receptionist/clerical (booking) secretary	This area will be located at the entrance of the centre. It will be made to accommodate 4-6 people. It will have a typewriter, desk, a chair, and a bulletin board.

Table 11. (Cont'd.)

<u>Space Description</u>	<u>Special-Functional Aspects</u>
Director's office	This office will contain a desk, a chair, one open table, and a cabinet.
Co-ordinator's office	Same as Director's office.
Conference room	Will be located in a quiet area of resource centre. The area should be equipped with electrical and television input outlets. Movable walls will be used to combine or divide a series of areas. Minimum of 3 conference rooms.
Librarian and reading space	The non-print library will be located opposite the production unit of the centre. It will contain filmstrips, 8 mm films, 16 mm films, tape and disc recordings, slides, transparencies, pamphlets, posters and charts, magazines, reference books, maps, and individualized learning kits, packages and modules.
Staff lounge	This area, equipped with furniture and newspapers, will be for relaxation.
Studio production	This area will be used for the production of videotape materials for students' work.
<p>The following areas will be reserved for future expansion as a result of the present manpower shortage:</p> <ol style="list-style-type: none"> 1) computer-assisted learning (CAL); and 2) television production studio. 	

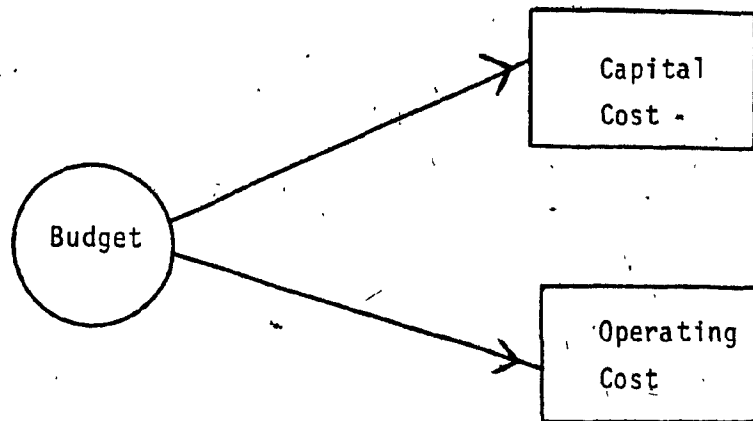


Figure 9. Budgeting Procedure

Owing to the increased involvement of learning resource programs with teaching-learning programs, the learning resource centre has become more than just a centre of learning resources. Resource centres now function as the focal point for instructional development activities and as the agency within the institutions that is most responsible for the faculty's proper utilization of the great variety of learning resources available. Therefore, in planning and designing a technology resource centre, the final budget should not be decided in parts. It should be planned to reflect the whole operation, starting from the construction of the building, to furnishing, staffing, courseware and equipment. Such areas involved in the design and utilization of the learning resource centre need careful analysis during the budgeting process.

Program Planning Budgetary System

In planning the budget, the statement of the fiscal, material, and human resources needed to operate a centre should be a direct reflection of the program to be designed. Such a budget follows the

program, in operation, sequence and content.

A model in Figure 10 shows the program-planning-budgeting (PPB) approach, which could be applied to design a technology-resource centre. Before budgeting can be accomplished, the various components of the program being budgeted need to be identified and examined in order to make up a whole budget.

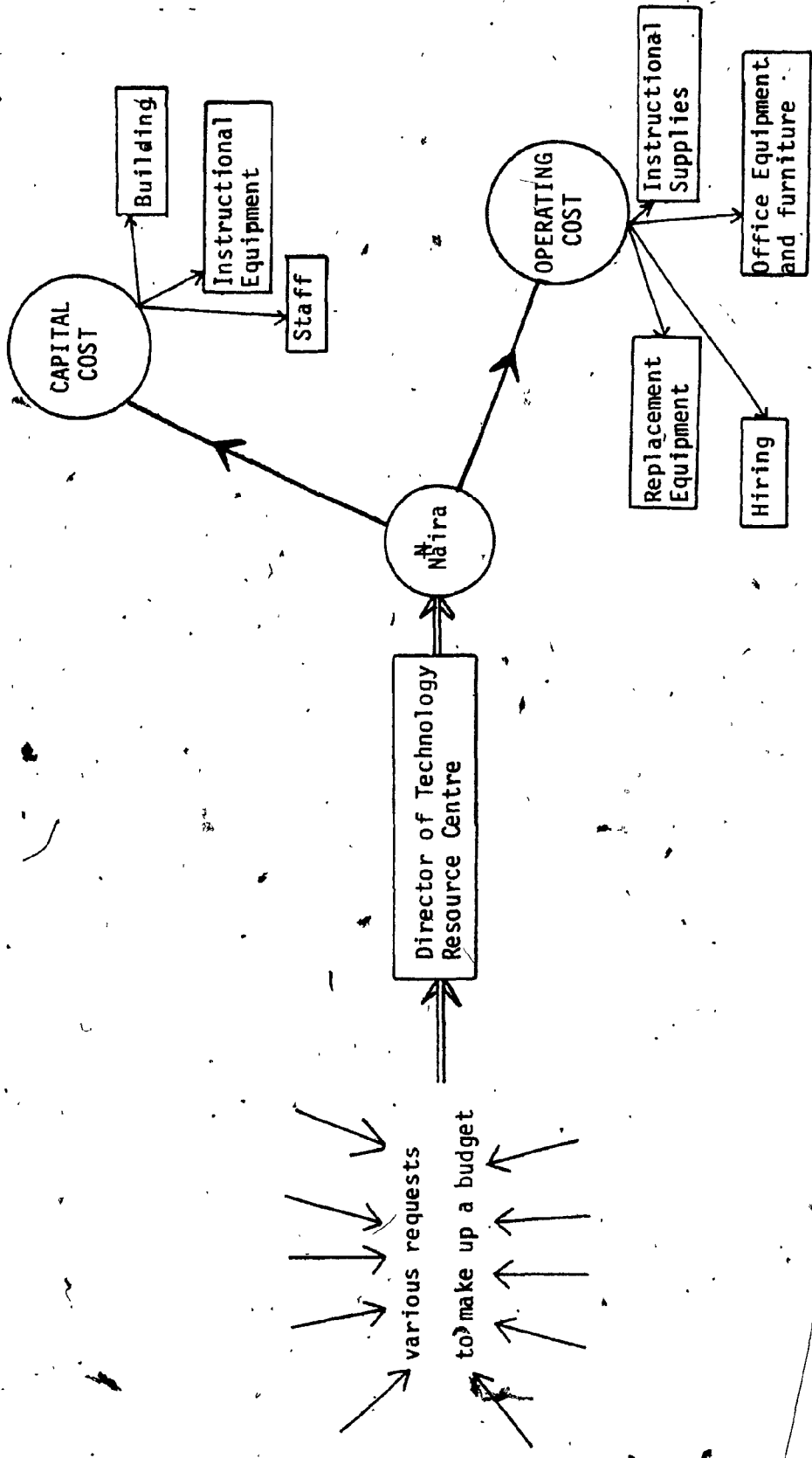
In the case of this new centre, half of the capital budget will be used for the construction of the centre, and the other half will be allocated to the Media Co-ordinator, who will calculate the expenditure on instructional equipment and staff salaries, Table 12.

The operating cost involves the replacement of instructional equipment, maintenance equipment, instructional supplies, office equipment and furniture. A planning system that integrates program planning and budgeting presents a logically consistent approach for examining the approximate expenditure of resources for specific operations involved in the planned program.

Table 13 shows the estimated breakdown of the start-up cost, by area, of a technology resource centre. The costs are estimated and added up to find the total sum of the amount needed to establish a new centre. Careful planning of the budget in a breakdown system is very important and helpful because it gives a budget that satisfies the objectives of the centre.

Balsdon (Note 7) has suggested that the cost of shipping and insuring of all the equipment and materials involved in the establishment of a new centre is "probably" 15%, and should be added to the total budget.

Figure 10. Program Planning Budgeting System Model



= Naira, # = \$2.2 Canadian dollars

Table 12. List and Salary Structure of Staff to
Employed at the Technology-Resource Centre

No Required		Grade Level	Salary Per Annum	
1	Director	GL 16	₦	11, 568
1	Secretary Administration	GL 14	₦	9,168
1	Instructional Designer Co-ordinator	GL 13	₦	8,064
1	In-Service Co-ordinator	GL 13	₦	8,064
1	Librarian	GL 12	₦	7,404
1	Hardware Co-ordinator	GL 10	₦	5,760
1	Secretary (Booking)	GL 09	₦	4,668
2	Audio-Visual Service & Storage Clerks (₦4,668 each)		₦	9,336
1	Assistant Co-ordinator	GL 09	₦	4,668
2	Printing Operators (₦4663 each)	GL 09	₦	9,336
1	Sound Recording Specialist	GL 08	₦	3,564
1	Photographer	GL 08	₦	3,564
1	Audio-Visual Technician	GL 08	₦	3,564
1	Assistant Librarian	GL 08	₦	3,564
1	Graphic Assistant	GL 07	₦	2,952
1	Assistant A.V. Technician	GL 07	₦	2,952
2	Student Assistants (₦2,238 each)	GL 06	₦	4,476
	TOTAL		₦	744,672

Table 13. Breakdown of Start-up Cost of Technology-Resource Centre*

CAPITAL COST

<u>Instructional Equipment (x # of units purchased)</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Labelle projectors (x2)	N** 216	N** 431
Filmstrip projectors (x3)	125	#375
Filmstrip cassette projector (x5)	172	#858
Super 8 sound projectors (x2)	159	#318
Slide synchronizer (x2)	148	#295
Slide projectors (x7)	136	#955
Stereo record player (x1)	68	68
Stereo cassette recorders (x1)	80	80
Betamax Beta 2 playback (x1)	500	500
VH5 playback (x1)	500	500
Cassette tape recorders (x10)	120	545
16mm projector (x4)	396	1,590
34" cart (x2)	28	55
Filmstrip sync cassette viewer (x3)	180	539
Video cassette recorder 3/4" Umatic (x1)	1,136	1,136
Colour TV 20" (x3)	420	1,261
TV carts (x3)	76	238
Slide projector AFG/W timer (x1)	148	148
Calculators basic units (x2)	7	14
Clydesdale box for video cassette playback unit (x1)	135	135

*Items costing more than N100 may have life span of 5 years or more.

**Nigeria Naira, N1 is equivalent to \$2.2 Canadian dollars as of 80/81.

Table 12. (Cont'd.)

<u>Instructional Equipment (x # of units purchased)</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Slide sound sync viewer (x5)	N** 232	N** 1,159
Portable screens 50"x50" (x4)	41	*164
Overhead projectors (x3)	68	*204
Turntable pre-amp (x1)	80	80
16 mm projector (x1)	409	409
42" carts (x2)	32	64
Cassette audio playbacks (x4)	41	*164
Betamax port-a-pak (x1)	1,545	1,545
Soldering stations V-3800 (x4)	41	*164
Electric drill 3/8" variable, reversible (x1)	20	*20
Microfilm reader (x1)	227	227
Upgrade Bowens slide duplicator to include contrast control system and 4x5 holder (x1)	193	193
Rodenstock enlarging lens 135 mm (x1)	182	182
Ring light flash (x1)	114	114
Drafting table with built-in light box (x1)	227	*227
Camera body OM2 with 250 exposure back and motor drive Olympus (x1)	657	*657
Typesetter with dual floppy disks, full editing capability and full page display and paper processor (x1)	3,182	3,182
Periodical display shelving (x2)	148	*295
Newspaper rack (x1)	68	*68
Microfilm cabinet (x1)	227	*227
Binders for newspapers (x10)	27	*273

Table 12. (Cont'd.)

<u>Instructional Equipment (x # of units purchased)</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Book trucks for shelf ends (x8)	59	*473
Paper cutter (x1)	23	*23
TOTAL		19,823

ANNUAL OPERATING BUDGETReplacement of Instructional
Equipment

<u>Description</u>	<u>Amount</u>
Dissolve unit (x1)	*227
16 mm projector (x7)	2,784
Overhead projector (x3)	*205
Electronic flash unit with tilthead (x1)	*80
Record players (x4)	227
Audio cassette recorders (x4)	218
35 mm camera semi-auto manual over-ride (x1)	*136
Calculators, basic model (x2)	*14
Video cassette recorder U-matic 3/4" (x1)	*1,136
35 mm camera (x1)	113
S8 - 8 mm projector (x1)	125
Film inspection and cleaning machine RT1 (x1)	*4,091
Videotape editing system 2 editors plus control unit (x1)	*9,091
TOTAL	* 18,448

Table 12. (Cont'd.)

Maintenance of Equipment

<u>Description</u>	<u>Amount</u>
Projection lamps	₤ #1,818
Cable, connectors, etc.	#682
Repair parts	#545
Maintenance, supplies	#456
Contract maintenance	#682
TOTAL	₤ 9,901

Instructional Supplies

<u>Description</u>	<u>Amount</u>
Charge-out slips	₤ 795
Media repair supplies	#456
Book pockets, label shields, etc.	#1,136
Security strips	#909
Media and film request forms	#909
Video tape	#456
Audio tape	#227
Microfilm reader printer supplies	80
Transparencies, pens, etc.	#125
Slide trays	#45
Multi-media storage containers, film reels, etc.	#773
TOTAL	₤ 5,909

Table 12. (Cont'd.)

Office Equipment

<u>Description</u>	<u>Amount</u>
2-drawer filing cabinets (x1)	# 57
Typewriter IBM Silent Selectric (x1)	# 545
Calculator with tape (x1)	# 68
Calculator with tape and metric conversion (x1)	# 68
Acrylic chair mat 40"x60" (x1)	36
Bay shelving (x1)	182
4-drawer filing cabinet (x1)	# 137
TOTAL	# 2,707
The total sum of capital cost and annual operating budget	# 55,978
Plus 15% cost of shipping and insurance	# 8,397
TOTAL	# 63,375

The total estimated budget for the centre including the salary structure of staff was derived from the current costs, and is subject to increase as a result of inflation.

*Items which will be given priorities in the initial design of the learning resource centre.

It should be noted that in preparing the budget to meet the objectives of the centre's activity:

- 1) the program plans and the budget statements should be prepared by the personnel from the learning resource centre;
- 2) control of management of resources, once allocated, should rest with the personnel within the learning resource centre program;
- 3) cost accounting procedures should be employed with the learning resource centre; and
- 4) learning resource centre programs, as with other institutional programs, should not be based on extramural monies.

The whole process of considering an initial start-up budget (capital and operating budget) should be consolidated not only on present needs; it should reflect both short-term and long-term objectives.

Consideration of Safety Factors in the Planning Process

Safety consciousness is an attitude which must be developed in students along with their training in vocational education. A good safety program is more than just a set of rules. Therefore, from the initial planning of the program, safety facilities have to be considered. One of the important considerations underlying the layout of a learning resource centre should be the concerns of the health, safety, and welfare of students who will be receiving their training there.

Because of the relatively low frequency of accidents occurring in work stations and institutions, personnel and students always

overlook safety as a priority in running the system. Strong (1975, pp. 89-90) emphasized that:

Although there seem to be no adequate data concerning direct relationship between shop layout and accident frequency, there is general agreement among those who are involved in teaching and planning that the manner in which a school shop is arranged and organised has a direct bearing on accident prevention. This seems logical since housekeeping, storage and handling of materials, visibility, traffic flow and general working conditions, all of which are factors in safety planning, are inextricably interwoven with manner of shop planning.

In many cases, the individual teacher or administrator is never involved in the planning processes. However, safety programs should not be ignored during the initial planning. Safety should also be planned bearing in mind the course content, changing enrollment, new materials and equipment.

Planning for a good technology resource centre means that the safety standards should meet the space requirements and acoustical controls appropriate for those situations. This will enable the students to move freely during the production period.

The planning of safety should involve the consideration of panic buttons in strategic locations, provision of enough fire extinguishers, proper placement of machines to give ample room for student movement, traffic flow made for students to move from one production area to the next seminar or conference room without exposing themselves to hazards or interfering with the work of others. Other safety considerations will be local exhaust systems, ventilation and a solid concrete floor.

Actually, the objectives of planning for safety in technology resource centres should not only aim at preventing accidents in the instructional areas, but also enable the students to have training that will help them avoid accidents after entering employment and in their future non-vocational activities, and also help in protecting the life of machines and tools (Yongu, Note 8).

The Organizational Chart

The nature and scope of the services to be implemented by the learning resource centre will be affected by the organization of the administrative units. The proposed centre will recruit many people who will be working in various capacities within the centre. Though the proposed system seems to be very small, it fits well in the environment for which it is being designed.

This model is not a permanent design; it is subject to modification as the centre matures. A suggested plan for the organizational chart is presented in Figure 11. The following discussion elaborates the chart.

The Director of the learning resource centre will serve as the overall manager of the centre. He will serve as a liaison between the instructional designers and developers and other users of production services and the technical personnel under his direction. He will be responsible for the management and overall supervision of the following staff: administrative secretary, instructional design co-ordinator, librarian, hardware media co-ordinator, in-services co-ordinator, instructional evaluator, assistant co-ordinator, secretary, AV service clerk, and printing operator. Other members of staff will include: sound recording technician, photographer, AV technician, graphic assistant,

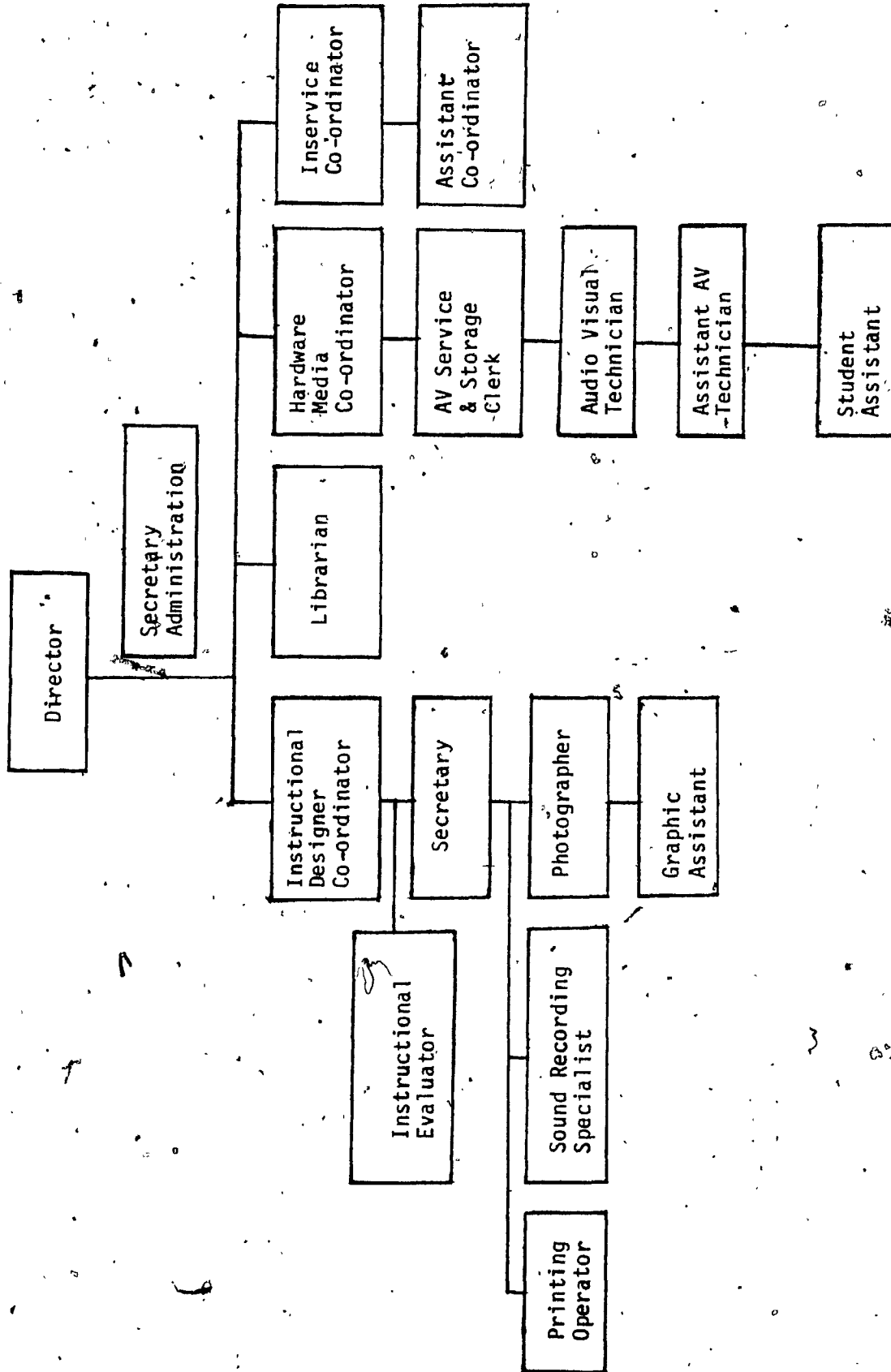


FIG. 11 A MODEL TECHNOLOGY RESOURCE CENTRE PRODUCTION SERVICE ORGANIZATION

assistant technician, and student assistant.

To operate effectively, a technology resource centre must be staffed with personnel who can perform a variety of functions which are related to the trainees' needs. It is essential to recruit qualified staff who can perform the duties assigned to them.

Below are the technology resource centre personnel and job descriptions. The personnel are proposed on the basis of:

- 1) size of the school enrollment;
- 2) attendance pattern of the users;
- 3) instructional levels of trainees;
- 4) types of instructional material and equipment at the centre; and
- 5) qualifications of the staff. (Bureau

of Training, 1977, p. 15).

Technology Resource Centre Personnel: Job Descriptions

The Director. The director of the learning resource centre has a variety of duties to perform.

Work Activities

- 1) budget preparation and accountability;
- 2) formulating policy for the effective use of the centre;
- 3) planning with the learning centre staff for more and better services to teachers and students;
- 4) offering in-service experience in new media and materials to the teaching and administrative staff;
- 5) assisting teachers in the use of instructional materials and equipment;

- 6) coordinating all library, auditory, visual and related instructional materials and equipment services;
- 7) developing systematic procedures for the review, evaluation, and selection of textbooks, trade books, instructional materials and equipment;
- 8) coordinating television and radio productions;
- 9) developing standards and specifications for instructional materials and equipment;
- 10) producing selected instructional materials and providing graphic production for the teachers; and
- 11) providing editing and reproduction services for all printed materials.

Administrative Secretary. The administrative secretary maintains all the records of the centre.

Work Activities

- 1) maintaining the centre's personnel records and providing necessary documents for committee members' use in their regular meetings;
- 2) serving as a liaison and a receptionist between the director and the coordinators; and
- 3) process-orientation from centre to other branches in the faculty and vice-versa.

In-service Coordinator. The in-service coordinator organizes in-service courses and facilitates counselling for faculty in the area of curriculum development.

Work Activities

- 1) selecting the most important areas in the faculty curriculum for which in-service courses will be developed;
- 2) setting up schedules for the development of in-service courses throughout the academic year; and
- 3) seeking information and advice from Nigerian institutions, and if possible from abroad and from international organizations, giving priority to the organization of training courses.

Assistant to the In-service Coordinator. The assistant reports to the coordinator on the different plans and programs for the training courses.

Hardware Coordinator. The hardware coordinator coordinates purchasing, maintenance, repair and storage of all the technology resource centre's equipment, and plans strategies for its effective use.

Work Activities

- 1) maintaining security in storage places to prevent loss of or damage to equipment;
- 2) coordinating maintenance and repair activities of learning resource equipment;
- 3) taking inventory of all equipment in the centre;
- 4) submitting requests for purchase of new equipment;
- 5) coordinating the delivery of audio-visual aids for classroom teaching support; and
- 6) participating as a member in the technology resource

centre committee's meetings and processing through it all plans and programs of the modules.

Audiovisual Service and Storage Clerk. The audiovisual clerk requests, books, and schedules instructional materials for classroom application.

Work Activity

- 1) acting as a delivery person and operator of equipment when required for teaching support in classroom teaching; and
- 2) being responsible for the storage of audiovisual equipment when not in use.

Maintenance Technician. This technician maintains and supervises all items of audiovisual equipment.

Work Activities

- 1) installing newly purchased equipment;
- 2) being responsible for the proper functioning of all the centre's equipment, including that already installed;
- 3) maintaining and repairing simple media equipment;
- 4) participating in budget preparation by recommending equipment and material needs;
- 5) consulting with and giving technical advice to instructors; and
- 6) giving assistance to instructors in classroom media demonstrations.

Qualifications

The maintenance technician must possess a full Technological Certificate of City and Guilds of London Institute (or equivalent) in electrical/electronic engineering with at least two to three years post-qualification.

Instructional Design Coordinator. This coordinator adapts and produces instructional materials for student and faculty use in the technology resource centre as well as for classroom teaching support.

Work Activities

- 1) analyzing and providing solutions to the problems resulting from lack of instructional resources within the faculty educational process;
- 2) purchasing instructional materials from reputable sources to be adapted according to the requirements of the vocational program.
- 3) producing instructional materials based on the needs of the vocational curriculum;
- 4) requesting the employment of new specialized personnel as required to develop top quality learning resources;
- 5) evaluating human resources which can be integrated into the centre's activities; and
- 6) participating in the technology committee meetings as a voting member.

Qualifications

The instructional design coordinator should have an MA in Educational Technology with working experience in various capacities, especially in instructional design systems.

Instructional Evaluator. The instructional evaluator will be responsible for the evaluation of instructional materials and will also work in close contact with the co-ordinator.

Qualifications

S/he must have a good background in educational technology, preferably in evaluation of educational materials, and a minimum of two to three years experience.

Clerical Secretary. This person should be someone who has initiative and judgment to plan, organize, and set up internal administrative matters.

Work Activities

- 1) performing secretarial and related work for the entire centre;
- 2) taking, and transcribing dictations; and
- 3) typing, reporting, and making stencils and other related forms from rough drafts and corrected copies.

Photographer. The photographer will produce a wide variety of still and short motion pictures largely for instructional purposes.

Work Activities

- 1) carrying out routine photographic activities including projects, displays, buildings and scenes;
- 2) processing film and developing slides in black and white negatives;
- 3) preparing enlargements and charts;
- 4) shooting motion pictures for instructional purposes;
- 5) assembling photographic accessories; and

- 6), assisting in production work.

Qualifications

The photographer should have a diploma in photography from a recognized university, and related experience in printing. S/he must have worked for at least two to three years in a studio.

Sound Recording Technician. This person will be in charge of the sound recording unit and will prepare sound recordings for instructional purposes. The person should be capable of operating and maintaining audiovisual equipment.

Work Activities

- 1) recording narration;
- 2) editing;
- 3) mixing audio tracks;
- 4) recording questions over public address systems;
- 5) supervizing and assisting students in studio work; and
- 6) arranging recording facilities for classes, seminars, conferences, and other events sponsored by the technology resource centre.

Qualifications

The sound recording technician should have a Higher National Diploma or Full Technological Certificate in Electrical/Electronic Engineering. Two years experience in industry or on the job is preferable.

Printing Operator. The printing operator produces finished booklets, brochures, and handout sheets from copies prepared by graphic and photographic staff.

Work Activities

- 1) helping students to duplicate, dry mount, wet mount, and thermofax assignments.

Qualifications

The printing operator should have vocational training, with at least three years of extensive working on the job.

Librarian. There will be an educational technology library unit within the centre. All the activities in this library will be coordinated by a full-time librarian, who will be responsible for indexing and cataloging all incoming materials, and will assist students and faculty when using the services.

The library will be stocked with specialized literature and instructional materials adapted, produced and acquired from other institutions. Also included will be slide tapes, video tapes, microforms, periodicals, film loops, 8 mm film, 16 mm film, and learning packages.

The reading area of the library will be equipped with open tables and approximately 5-8 carrels to provide reading space for at least 10-16 persons. A special section of this library will be equipped with 10 individual carrels with electronic equipment to be used for individualized learning.

Assistant Librarian: reports to the Librarian on the indexing and cataloging of all incoming materials.

Qualifications

The librarian must have a minimum of two to three years of working experience in a college library. S/he should be a graduate from a recognized university in library science, preferably with a MLS degree.

Student Assistant. These positions are not permanent. They are created within the learning resource centre. The rotation of students will be carried out in such a way that each and every student is involved in the learning resource centre activities.

The functions performed by the students in the centre do not require a high degree of skills and training, but will acquaint them with the routine services and organization of the centre.

Work Activities

- 1) participating in teaching assignments;
- 2) setting up equipment for instructional presentations;
- 3) operating projection equipment within the classroom; and
- 4) inspecting and cleaning instructional equipment and materials.

Assigning students to the technology resource centre not only alleviates staff shortages, but also contributes to the centre's production. Mitchell (1975) has stressed that educational technology can train selected students in principles, methodology, and practices of instructional design if technical and functional perfection is not adequate. He emphasized that:

by participating in the production of systems, techniques and materials to be used by others, the student producer not only contributes cooperatively to the pool of learning resource, but requires information and skills pertaining to the subject matter, and analytical skills of wide generality for self-education (Mitchell, 1975, p. 315).

It is therefore expected that students who are involved in this assistantship will learn more about the centre's environment and preparation of materials for their classroom presentations and personal assignments involving media materials. It is also expected that some

of the students will be motivated to work full-time at the centre after they graduate from the school. This would increase the number of educational technology staff in the college.

Provision of In-service Training Programs

Educational technology in developing countries is something new to the teachers and students. If a resource centre were to be established, how would the teachers involved become familiar with the potential of such facilities for supplementing and improving classroom teaching and providing instruction? It is thus highly desirable to provide in-service training programs as one of the essential services offered by the learning resource centre. These services will not only be to the in-service trainees, they (services) will be extended to the training of centre's staff as well.

The national Committee for Audio Visual Aids in Education (1970, p. 19) has advised that:

If teachers are to use educational equipment to good effect they must be sufficiently familiar with it to handle it completely and confidently, so that their attention is not distracted from the educational content of their work.

This integral part of the program, incorporated in the Learning resource centre could introduce a new dimension of methodology to teaching in vocational technical education. Teachers who take a long time to produce educational materials for presentation could learn how to cut down this time. Teachers using conventional methods of instructional presentation could broaden their approach. The cost of buying instructional materials could be decreased because both teachers

and students would learn to produce their own materials and be better able to adapt non-Nigerian materials for Nigerian students.

The proposed centre will be designed in a developing country where there are shortages of staff and other problems which have been mentioned in the previous chapters. However, the recruitment of staff and the training of non-professional staff to participate in the functioning of the centre will be another area of concern.

Mitchell (1975) has put forward a suggestion for small centres where there is a shortage of staff:

the producer may have to train non-production personnel to assist from time to time (e.g., a secretary can serve as cameraman or boom operator in a television studio, a librarian might help to design and produce materials, teachers or shop stewards can evaluate materials) (Mitchell, 1975, p. 315).

In a developing country like Nigeria, such an internal organization is a very useful one, because as of now there are few people who are trained in the field of educational technology. And even if the recruitment of trained personnel were possible, it would take a long time to do so. Employing the above strategy will alleviate the shortage of manpower in the country, at least for the short-term.

The in-service training would not have to be limited to staff within the centre; it could extend its services to other various schools in the state. These activities will be co-ordinated by the educational technologist at the centre, who will schedule regular visits to other schools to "spread innovative ideas in instructional methods, advise schools on the acquisition and use of educational materials and equipment" (Farrugia, Note 11).

The Proposed Evaluation Process for Technology-Resource Centre

Evaluation is a continuous process. The goal of evaluation is the early identification and immediate correction of deficiencies as they emerge during the planning and development process as a whole. The process of evaluation is a systematic way of determining the extent to which the functions and the objectives are being achieved. Evaluation is a "built-in" process which must start at the time the contract is awarded and continue through the time that equipment and software are designed, produced, or purchased.

The Systematic Process of Evaluating a Total Program. Evaluation is a tool systematically designed to improve the merit and the growth of a system. Yost and Monnin (1969) developed a framework to provide a specific model for the evaluation of programs. This model, which will be used to evaluate a technology resource centre, was constructed to include delineation, interpretation, collection, and distribution of activities at each of the three stages, namely: baseline, process and product.

Evaluation as a system is divided into these three parts:

- 1) baseline evaluation: describes conditions before project is treated.
- 2) process evaluation: helps the decision-making in day-to-day operation; and
- 3) product evaluation: measures the extent to which the project objectives have been met.

The Educational Technology Office of the U.S. Civil Service Commission (Bureau of Training, 1977) has outlined the systematic process of evaluating a program, which will also be considered as one

of the processes of evaluation in a technology resource centre; the process consists of three basic steps.

Step 1. The identification and establishment of training objectives.

Step 2. The determination of standards of quality. The determination of what is to be considered acceptable achievement on the part of the trainee (and the centre program); the standards of training performance.

Step 3. Systematic evaluation; the determination of whether standards are being met, including:
a) construction of instruments for assessing trainee and centre progress; b) periodic administration of these instruments; c) analysis and interpretation of data obtained; and d) feedback of results for use in making needed course and program adjustments.

It will be stressed that the emphasis on developing the organization is more important than the position of the evaluator inside or outside of an organization. In evaluating a learning resource centre, the evaluator's position will influence the smooth running of the centre's organization by the process of staff and student interaction with the evaluator.

Positive and Negative Feedback as a Process of Evaluation. The concepts of positive and negative feedback are very important in the evaluation of the organizational system. It is always encouraging to

hear that an organization is maintaining its position; and it usually is "good news" to know that a system is growing, "deviation amplifying" (Schoderbek et al., 1975 p. 69). Through the process of feedback, the technology-resource system will receive information which would help it adjust its function (Kast & Rosenzweig, 1976).

The reaction to the information received depends on the type of feedback. If the result is positive feedback, the evaluator would reinforce the system's "strengths" and areas where maximal functionality and relevance have already been achieved (Pastrana-Alvarado, Note 12). However, the positive feedback used in the evaluation of a system sometimes leads to system instability because it blindly reinforces its present functions. Therefore, to constrain and guide the system, negative feedback will be essential in evaluating technology-resource centre.

Negative feedback is an evaluation process of a program in an informational input that indicates to the evaluator that the system is deviating from a prescribed course and should be corrected, improved, or readjusted to a new steady state (Kast & Rosenzweig, 1976).

Negative feedback acts to oppose the system's direction of motion. This opposing action adaptation is "critical" to a system, to provide stable system control (Schoderbek et al., 1975). Figure 12 shows feedback as a process of evaluation. Whatever decision is taken on the program's organization will depend on the knowledge of the result. That is, if the result is a positive one, the evaluator will reinforce the strength of the growth; if the result is negative feedback, s/he will modify, adapt, and implement some changes in the technology resource centre.

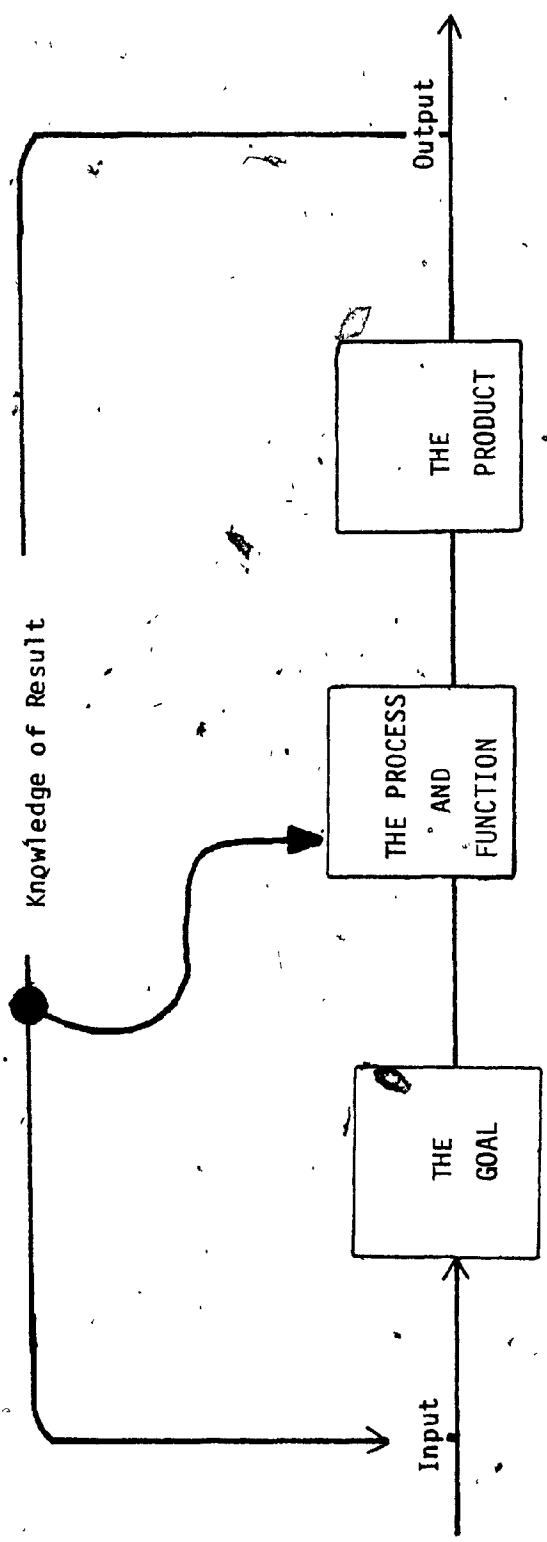


Figure 12. The Input-Output System Model of Feedback as a Process of Evaluation

Evaluation of a Total Program. Evaluation of a technology resource centre should reflect the total organization, its environment, and resources (Figure 13). The centre management should carefully analyze and evaluate the performance of the staff, and the results of those instructional materials and learning activities provided in the centre to determine if the programs are contributing effectively to the achievement of the centre's goals and trainees' objectives.

The search for effective evaluation, adaptation, design and production of instructional materials for the technology resource centre will include the co-ordinator, librarian, technicians, student assistants, students, faculty members, designers, and subject matter experts. Other areas of the evaluation process will also require information on equipment installation and production materials, financial resources, management and decision, instructional rules and policies.

The inputs based on the program evaluation are: instructional design methods and techniques; instructional materials evaluation procedures; information about materials; safety practices; student characteristics (such as number, age, sex, interests, and general background); academic content; financial resources; time scheduling; human resource-faculty members; non-profit organisations; in-service training teachers and AV designers and technicians.

The output of the program evaluation system will be decision transmission, information transmission, policies and rule enforcement and costs, and the strategic decisions on the scope of the program will be based on the knowledge of the result of evaluation.

A checklist of tasks, adapted from the United States Bureau of Training (1977) for evaluating a technology resource centre operation

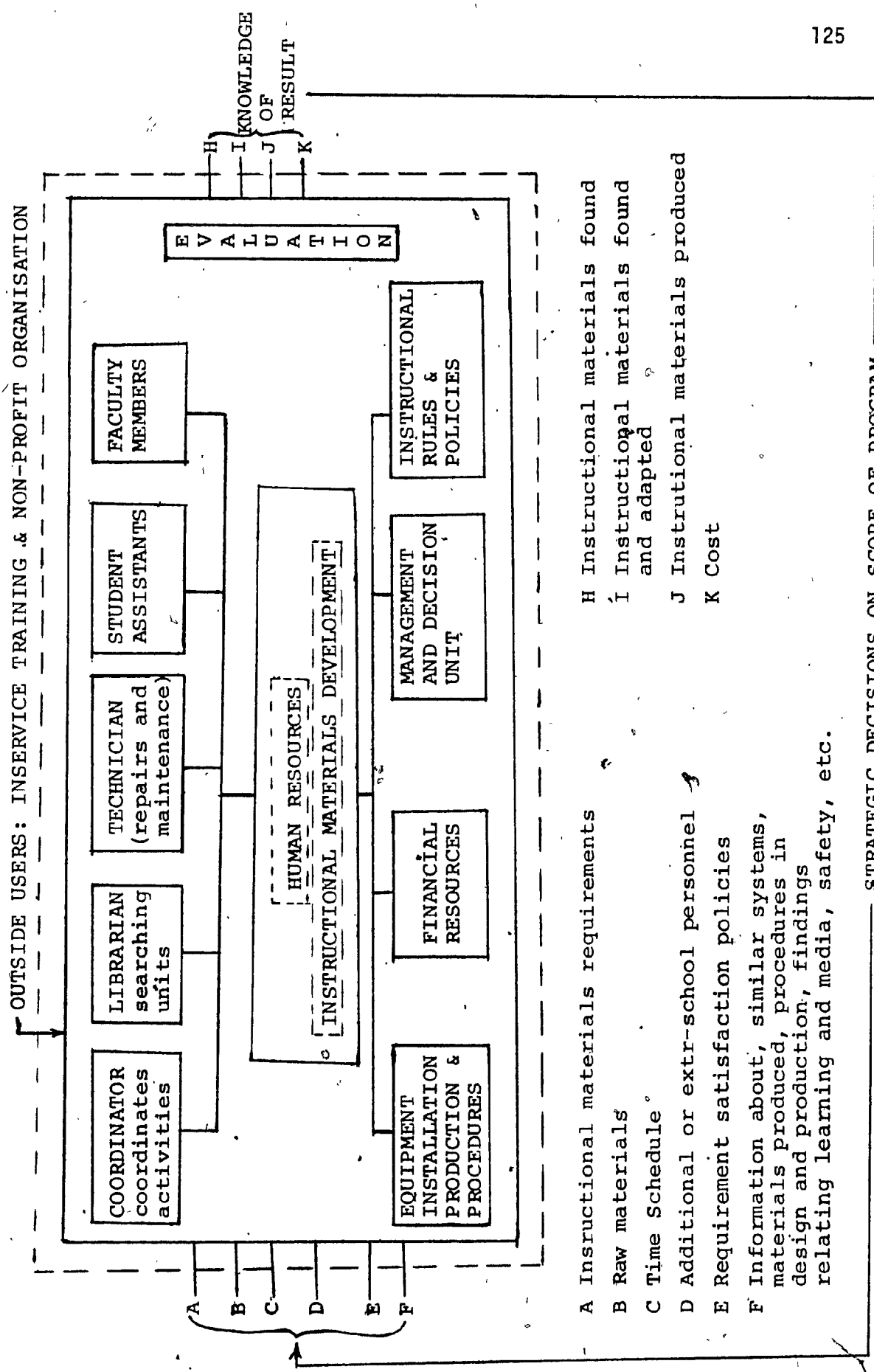


Figure 13. Evaluation of a Technology Resource Centre Model

is presented below. The checklist contains questions on many aspects of effective design and evaluation of any learning resource centre. This would be another useful method of successfully evaluating a technology-resource centre.

ITEM OF TASKS FOR EVALUATING TECHNOLOGY

RESOURCE CENTRE OPERATION

This item contains questions touching on many aspects of effective planning and operation of technology resource centres. It may be used as a guide by the management to evaluate centre operations.

Aspects of the Learning Process

Objectives: Identify and define objectives in terms of desired activities

Facilities: Plan and direct learning experiences in harmony with stated objectives

Courseware

Questions to be considered by the Manager-Co-ordinator

- Were complete centre objectives determined in the initial planning stages of the centre?
- Were centre activities, learning programs, administration and funding carefully planned and objectives determined for each?
- Were the needs of the trainee population determined and were carefully defined objectives based upon those needs determined?
- Were the future considerations for expansion analyzed?
- Do centre facilities and equipment meet the objectives of the individual trainee?
- Do centre facilities meet the objectives of individualized instructional techniques?
- Does the centre budget meet the needs of the centre and its objectives?
- Does courseware design and method of presentation meet the objectives and needs of the trainee population?

Personnel

- Is there enough variety of courseware materials and equipment in sufficient quantity, to meet the objectives of the centre?
- Are centre professional personnel selected on the basis of qualifications for training in an individualized learning situation? (Other qualifications such as personal qualifications, prior experience, etc. should also be considered.)
- Do centre personnel meet the objectives of the centre and of the trainee population?

Safety: Consider all the factors in the operation of the technology resource centre

- Do student assistants participate actively in the centre?
- Is the building constructed with the required specifications? Does it meet the requirements of the Society of Architectural Engineers?
- Is the equipment to be used approved by the Industrial Safety Council?
- Is the relationship in the installation of equipment, placement of materials and furniture good enough to give aisles with free movement in the centre?
- Are all the electrical wirings properly insulated?
- Are emergency exits provided in the centre?
- Are fire extinguishers provided at strategic places?
- Are specific evaluation instruments designed and implemented to test the objectives and efficiency of the courseware, centre programs, centre personnel and students?
- Are all aspects of the centre (facilities, equipment, personnel, policies, budget, administration, etc.) evaluated?

Evaluation: Determine trainee and centre progress toward meeting objectives

Feedback: Use results of evaluation to improve student learning and centre activities

- Is there a variety of evaluation techniques available, i.e., testing, interviews with trainees and staff, questionnaires, observational reports?
- Has consideration been given to the feasibility of utilizing an outside agency to perform centre evaluation?
- Has determination been made that all centre programs and activities are meeting continuing needs of the trainees and of the centre objectives?
- Does the centre determine how its activities may be modified for improvement?
- Based on the evaluation, does the centre determine what further objectives should be set and what plans should be outlined to meet those objectives?

In order to ascertain whether alternative procedures are equally effective in a technology resource centre, the preview of instructional materials before use, and the noting of the frequencies of the students' visit to the centre will be evaluated. Spivock (Note 13) and Shears (Note 2) have both agreed that one of the best ways to evaluate instructional materials is to inspect and preview them thoroughly before accepting them from the dealers/manufacturers. In terms of evaluating the whole centre, they feel that there should be no rigid criteria, but all methods of evaluation should be used.

The users of the centre can provide an important source of feedback by observation: The frequency of students' visit throughout the school year can be determined, and their progress in their courses can be checked. Another way of finding out whether the centre is functioning well is by

getting the "USERS' COMMENTS". This could be carried out once a month or at the end of every term, depending on how often the (information) corrective measures are desired.

In conclusion, the researcher emphasizes that whatever the organization or program of evaluation, it is important to bear in mind that the process of evaluation involves elements and procedures. These elements and procedures are negative and positive feedback, baseline evaluation, frequency of students' visit, comments from users and an item check list. All of these methods should be used to ascertain alternative procedures to evaluate a learning resource centre effectively.

CHAPTER 7

Summary, Limitations, Recommendations and Conclusions

Summary

In this thesis the researcher has examined the problems that currently exist in Nigeria and which would interfere with the functioning of a technology resource centre in Benue State. To suggest ways of implementing an effective centre, relevant books, government documents, and journal articles were reviewed. The researcher also visited several centres that operate resource centres for vocational-technical education, to observe, collect relevant information, and hold discussions that would help in the design of the centre. It was found that the function of a learning resource centre depends on the philosophy of the school. In Algonquin College, classroom instruction is used, so the learning resource centre is centralized to help both the students and teachers in teaching learning situations. In Holland College, all the instruction is individualized, so the resources centres are decentralized with the philosophy of making the learning situations as realistic and as close as possible to learners and the learning environment.

A technology resource centre was designed to serve vocational students and to assist staff and in-service training programs. An organizational chart and a job classification and description for the centre's staff were included.

The steps and stages considered in the establishment of a technology resource centre were budget, space allocation, acoustical, aesthetic, lighting and thermal factors. The researcher also put forward evaluation

criteria such as negative and positive feedback, baseline, frequency of student visits and an item check list which would be used to evaluate the operation and management of the technology centre.

The issues of the transfer of technology, and of appropriate technology, were discussed in regard to what types of instruments, tools and machinery, people, and materials will be used in the centre. Recommendations were presented for the establishment and effective operation of the centre, and for using educational technology in training more teachers.

Although a developing country like Nigeria is struggling very hard for educational innovation and reforms, changes will eventually be fruitful. Hubbard (1976, p. 58) comments that "new developments in education take a long time to bring to fruition; hardtimes like the present may well be the right times for discussing what we will attempt when the clouds lift a little." Carrying out such a study in the area of vocational-technical education is a timely idea in the improvement of the educational system in Nigeria.

The aim of a technology resource centre is not to dominate the present educational processes with technological hardware and software, but to make it possible to improve those methods of teaching which are already in existence. Once the role of educational technology is fully appreciated, the problems associated with planning, designing and selection of instructional materials for vocational-technical education will be simplified.

Limitation

The limitation of this study was that various centres were visited, but only a sample of colleges were selected for the research findings.

It is assumed that the researcher would have had more information on organizational and operational procedures if a sample of more centres were selected for research. Another limitation is that the centres in the colleges visited were established a few years ago. So if the old centres operate differently from the new ones that were visited, then this is an issue for future investigation.

Another limitation is the cultural environment. Because of the shortage of manpower and cultural environment in Nigeria, most of the machines and materials examined will be unsuitable and too sophisticated in the Nigerian situation. As a result of this, only those materials, equipment and machinery which are appropriate to the Nigerian environment will be selected in the establishment of a technology-resource centre.

Recommendations

- i) Ample funds should be provided for the technology resource centre to obtain up-to-date equipment, materials and qualified personnel:
 - a) the equipment should be easy to operate and repair;
 - b) materials should be simple; and
 - c) personnel should have "hands-on" experience.
- ii) Intensive production and use of local materials should be encouraged by all teachers in the state. Seminars, conferences, and orientation courses should be conducted to acquaint the teachers and users of the centre with the concepts of educational technology. The centre should constantly work together with other centres of activity in Nigeria. Appendix G lists some of the instructional technology centres that exist in Nigeria.

- iii) The centre should be provided with more production facilities and resources for students, staff and non-profit organizations.
- iv) The centre's activities should constantly be analyzed for effectiveness and its objectives evaluated.
- v) In the long run, more sophisticated equipment, such as televisions and computers, should be introduced.

Conclusion

The conclusions drawn from this study provided the opportunity to deal with the existing problems of curriculum development, equipment, electrification, and professional attitudes and instructional materials; and examined the stages involved in the design and implementation of a successful technology resource centre. The establishment of such a centre is a good strategy for the future of educational technology in Benue State, Nigeria. This is because the centre will provide more learning resources, so that students, teachers and the community will be able to produce instructional materials and learning packages.

This thesis has called attention to some crucial logistical features, such as acoustics, lighting, thermal factors, budget, equipment, staff and evaluation, which ought to be considered in the design of any technology-resource centre in Nigeria. Whether these logistical features are implemented now or later, the research has put forward all the points--reasons, problems, progress and procedures, significance, limitations and recommendations--for implementing them. This study is thus an approach to an introduction of educational technology in theory and practice, to those who are involved in innovative alternatives in the educational system in Nigeria.

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 - d. Resource Centre, Algonquin College, Rideau Campus, Ottawa, Ontario, Canada, Winter 1981.
 - e. Instructional Media Centre, Department of Education, Charlottetown, Prince Edward Island, Canada, Fall 1981.
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APPENDIX A

Number of Streams of Classes and Enrollment in
Commercial/Technical Colleges in Benue State by
Institutions, Class and Sex 1976/77

COMMERCIAL INSTITUTIONS	No. of Schools	STREAMS										ENROLLMENT											
		1		2		3		4		5		CL I		CL II		CL III		CL IV		CL V		TOTAL	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Kings Commercial College, Mkar	1	6	5	3	3	2	19	179	51	162	36	104	13	96	11	64	8	625	119	744			
Commercial College, Oboko	1	3	2	2	1	1	9	102	18	64	18	74	6	40		32	2	312	44	356			
Secondary Commer. Sch., Idah	1	4	3	2			9	39	21	85	22	61	19				298	62	360				
Adikpo Community College	1	3	2	2	2	2	11	56	24	69	11	73	7	72	8	71	9	381	59	410			
Total	4	16	12	9	6	5	48	534	114	393	87	312	45	210	19	167	19	1616	284	1900			

<u>TECHNICAL INSTITUTIONS</u>																							
Usar Trade Centre, Adikpo	1	2	2	2			6	120		60		60						240					
Govt. Tech. Training Sch., Ankpa	1	3	2				5	99		57								156					
Govt. Tech. Training Sch., Makurdi	1			3	3	3	9					97		100		104		301					
St. Joseph Trade Centre, Makurdi	1	2	1	1			4	48		46		41					135						
Govt. Tech. Training Sch., Idah	1	2	2	4	4	5	17	80		75		53		57		75		340					
Govt. Tech. Training Sch., Odu	1	3	2				5	93		52							245						
Total	6	12	9	10	7	8	46	440		290		251		157		179		1317					

The number of streams of classes and enrollment in commercial/technical colleges in Benue State.

APPENDIX B

A Checklist Designed for On-Site Visits

SPACE ALLOCATION - GENERAL CONSIDERATIONS

Description of Space	Available	Not Available	Area in Sq. Ft./M.
Equipment storage and distribution area			
Maintenance and repair area			
Darkroom			
Preview room			
Sound recording room			
Student production area			
Staff production area			
Technician's office			
Washroom			
Carrel area			
Director's office			
Coordinator's office			
Conference room			
Computer room			
Secretary			
Other			

TYPES OF EQUIPMENT AVAILABLE

Name of Equipment	No.	Not Available	Available but not in use
Overhead projector			
Opaque projector			
Slide projector			
Filmstrip projector			
Filmstrip cassette player			
8 mm loop projector			
16 mm filmstrip projector			
Record player			
Tape recorder			
Cassette recorder			
Cassette slide synchronize recorder			
Video playback monitor			
Video recorder/camera and monitor			
Portapack video			
TV set/studio			
35 mm copy camera			
Film/photo light			
Flash			
Copy stand			
Slide sorter			
Tripod			
Super 8 mm camera			

(continued)

Name of Equipment	No.	Not Available	Available but not in use
Spirit duplicator			
Thermal copier			
Paper cutter			
Laminator			
Hot press			
Microfiche reader			
Typewriter			
Head set			
OTHER			

LIST OF POSITIONS AND NUMBER OF PERSONNELAT THE CENTRE

NO.	POSITION	Qualifi- cation	Part Time	Full Time	Salary Scale
	Learning Resource Director				
	In-Service Course Coordinator				
	Secretary (Admin.)				
	Hardware Coordinator				
	Instructional Evaluator				
	Secretary (Booking)				
	AV Service and Storage Clerk				
	AV Technician				
	Photographer				
	Graphic Assistant				
	Printing Operator				
	Receptionist				
	Student Assistant				
	Other (specify)				

OPERATING COSTS BUDGET

PERSONNEL	COST PER ANNUM
<u>Salary Scale:</u>	
Learning Resource Director	
In-Service Course Coordinator	
Secretary, Administration	
Hardware Media Coordinator	
Librarian	
Instructional Evaluator	
Secretary, Booking	
Audiovisual Service and Storage Clerk	
Audiovisual Technician	
Assistant AV Technician	
Photographer	
Graphic Assistant	
Printing Operator	
Student Assistant	
Social Security	
Retirement Benefit	
Hospitalization	

OPERATING COSTS BUDGET

LEARNING RESOURCES	COST PER ANNUM
Books	
Periodicals	
Stationery materials	
Software	
OTHER EXPENDITURES	
Research projects	
Travel expenses	
Supplies	
NON-RECURRING COSTS	
Equipment	
Furniture	
OTHER	

TOTAL _____

ORGANIZATION

THE BEST WAY TO ORGANIZE THE CENTRE'S VARIOUS MATERIALS

- Shelved by the type of media
- Shelved by grade level of curriculum
- Test various methods and use the best
- Keep professional collection separate
- Shelved by colour code
- Shelved by publisher or distributing agency
- Classify all media together

HANDLING OF USERS' REQUESTS

- Assisted by staff member
- Staff member goes to school to work with users
- Referred to another source, if unavailable for help
- Staff member works through subject supervisor to help users.
- Staff specially assigned for students' request

FUNCTIONS OF LEARNING RESOURCE CENTRE

- Planning series of in-service workshops and classes
- Reviewing materials for centre collection
- Conducting staff meetings
- Planning internship program
- Preparing orders for materials
- Preparing educational television services
- Demonstrating AV equipment
- Materials design, production and processing
- Conducting student assistants
- Making teachers aware of a wide variety of media to enrich teaching
- Supporting work of curriculum consultant
- Distributing media to other schools
- Training staff and adult educators in the use of media
- Providing and stimulating professional leadership among users
- Reviewing and evaluating media operation
- Answering and obtaining items requested by the users
- OTHER (specify)

IN-SERVICE AND ADULT EDUCATION PROGRAMS

IN-SERVICE PROGRAM IS IN OPERATION BECAUSE OF:

- Users' requests
- Observed users' needs
- Requested by centre's staff
- Survey of needs taken
- Recommended by centre director
- Program initiated by supervisor

SERVICES OFFERED TO ADULTS

IN-SERVICE:

- Regularly
- Not scheduled
- Scheduled on request

CONSULTANT SERVICE:

- In centre
- In field

USE OF MATERIALS COLLECTION:

- In centre only
- Limited collection
- Unlimited collection

OTHER (specify)

INSTRUCTIONAL MATERIALS USED IN THE CENTRE

- Movies
- Textbooks
- Records
- Cassette tapes
- Reel-to-reel tapes
- Silent sound loops
- Slides
- Sound film loops
- Pictures
- Posters and charts
- Transparencies
- Video tapes
- Art supplies
- Reference books
- Magazines
- Newspapers
- Pamphlets
- Games
- Maps
- Sculpture and art reproductions
- Microforms
- Individualized learning modules
- OTHER (specify)

MATERIALS USED IN THE CENTRE

- Learning packages
- Print materials
- Audiovisual materials
- 16 mm films
- 8 mm films
- Programmed instruction
- Professional and/or curriculum materials
- OTHER (specify)

SERVICES FOR THE USERS

Serves administrative public relations:

- Regularly
 Not regularly

Serves advertizing needs:

- within the centre only
 both within and outside the centre

Number of faculty/teachers who use the centre:

- all faculty members
 very few faculty members

Number of students who use the centre:

- all students in the school
 half of the students
 only very few students

_____ Total number of technical students on the campus

_____ Total number of clients coming in per day

APPENDIX C

A reply received from Audiovisual Coordinator,
District One, Technical Institute, Eau Claire, Wisconsin, USA .

APPENDIX D

A reply received from the Head of the Electro-Mechanical
Department, Algonquin College, Ontario, Canada

APPENDIX E

A reply received from the Media Specialist, Holland
College, Prince Edward Island, Canada

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there will be, of course, a number of A/V materials: films, film-strips, audio tapes, slides, videotapes, etc. I will be looking at types of equipment we use most a little later.

A note on the users of our centre--when I say centre I am referring to learning centres in departments. The frequent users will be the students in the college. Each department will have X number of students assigned to it; for example, in accounting, there may be 45 students that are registered full-time. In addition, there may be some part-time users who are part-time students and come in and knock off some skills on their learning management chart. (You remember the learning management chart that I described to you in the presentation.)

Occasionally, we do have people from the community coming in to look at materials or to borrow materials, but this is only on an impromptu basis and does not happen that often. In Charlottetown Centre--the location I am most familiar with--the learning resource centres are open from about 9:00 a.m. until about 5:00 p.m. and usually there is a staff member available. On request, a departmental learning centre can be opened in the evening but the individual student has to sign in with the security person at the front door and they have to lock up afterwards. They can presumably stay as long as they want, although, usually they are out before 10 or 11 o'clock. This is the same Monday to Friday, on Saturday and Sunday as well, except on the weekend staff people are not normally in the department.

The equipment within a department will vary substantially depending on the department. Generally, though, I can say that we do find slide-audio tape machines very useful. Machines in this category could include the Bell & Howell Ring Master or could be the Caramate 3300. Both these units we find to be very very beneficial. They can be used as an individual or small group teaching machine but can also be adjusted so that it will project on a screen and can be used for larger groups.

Also we have Dukane filmstrip audio-tape machines and these are very helpful for showing filmstrips and audio-tapes to small groups. These particular machines do not have a projection function. For the projection, some departments have a regular filmstrip projector and possibly an audio-tape machine, a cassette recorder, to go along with it. A number of departments have videotape players, video cassette machines, and corresponding TV or monitors. These are very expensive units. A regular monitor TV and a videotape player will probably set you back about \$3,000. Those items are the

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ones that are found most often; in addition, we have 16 mm projectors. Usually there's one to a department or sometimes several departments share a particular projector and also several tape recorders and tape players. Some people like to make their own lessons, so that the recorders are useful. Sometimes you can buy materials from outside.

I think that pretty well covers it. There would be some ancillary equipment like microphones, extension cables, projection screens and so on. Once you come to visit the college, you can have a look for yourself.

We don't have an organizational chart for the decentralized learning centres; however, again, when you come down, we can discuss this and perhaps put something together.

I do have written job specifications for myself as well as my technician; however, these would be quite misleading for your purposes because we are not in charge of the learning centres, per se; individual instructors are in charge of their centres--we merely provide logistical support.

The major goal for the individualized learning system is to provide the opportunity for learning on an individual basis to students and learners. We design our programs and organize the College with these goals in mind.

There are two or three major activities within the learning centre (again, it's somewhat misleading here). Primarily the centres are to provide resources--printed, audiovisual, and staff resources--to help the students along in their studies. A lot of the time, we find that if you give the students guidance, objectives, and so on, and the materials to accomplish these objectives, then they will by and large be able to work on their own. I think that's the major function the centre provides. Individual tutoring and group tutoring do take place in the department. According to this system, each individual will meet with the instructor to be evaluated every two weeks. He meets with the instructor to assess his progress, to plan studies in the next few weeks, and to be evaluated on his performance for those skills he has been learning. Depending on the need, an individual may meet with his instructor to get extra help. You have to remember that because the system is individualized, classes are minimal. Because of this, the instructor is available and often floats around the department so that anytime a person has a problem, he's right there to help out. It's not difficult to attract students to the learning centre

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because this is where its happening. The students realize that they have a chart and skills on that chart they have to work towards; the material is there to learn with. It's a matter of getting them started in the system, deciding on some learning plans, and then generally we find that there is no problem. If there is a problem, this will be brought to the attention of the student by the instructor during the regular student-instructor meetings.

Item 10: There is a substantial training program for staff; remember that staff at the college are generally brought from industry and commerce and therefore they often do not have any educational training per se. They have to go through what is called the Professional Development Centre. While there, they have to do at least 15 or 16 skills which are skills on the Learning Management Chart. As well, students having DACUM charts to work on, staff also have DACUM charts they have to work towards. When Instructional staff are hired by the College, they have to sign an agreement to the effect that they will work on this chart to develop their skills. Normally, they are given several weeks before the College starts to pick up on these skills so that they will be able to fit in properly. Also, during the course of the year, the A/V Department will provide training programs for them. Additionally, the Professional Development Centre itself will offer other training programs during specified training days. Also, two or three evenings a week are designated as staff development evenings and staff come in at that time to improve their skills.

Item 11: What practical problems do we encounter in the Centre? The problems vary. One of the major problems is keeping the equipment operating properly. We do have a repair unit, but because this repair unit is separated somewhat from the centres, there is a turn around time involved. One of the things that can prevent breakdowns is a regular maintenance program for equipment. I suspect that in Nigeria this might be a problem. Off the top of my head, I would suggest that any equipment you get should be kept to the very simplest type; you can get effective equipment that is quite simple. Other problems, to some extent, would be loss of materials. Sometimes students take out books, learning materials, and even films and they don't get returned. Students are expected to sign out these materials. Most of the time, they do; however, there is a certain amount of loss every year. I would suggest that those are the major problems encountered in the learning resource units.

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Item 12: The percentage of time spent on administration, working with students, etc., it's really hard to say. It depends on the department, but as mentioned earlier, there are very few formal lectures. Most of the time is involved with working with the learners; however, a good deal of time is spent on administration because the materials -- learning binders, learning packages, -- have to be updated, new materials have to be ordered, etc. Sometimes production of A/V materials has to be done in coordination with my department. I suspect that in terms of administration there would be more work on the shoulders of the staff than there would in a traditional system.

There is an orientation program for learners; we usually set aside three or four days at the beginning of the year. Part of this program is to orientate them to the individualized system, to orientate them to their role in the system, and also, to the instructor's role in the system. They are shown around the College to other departments, to the library and other areas that would be of benefit to them in the course. The content of the orientation will make them familiar with the chart. They will go through the chart, become familiar with the learning packages on the shelves, and skim through some of them. Hopefully in the course of those couple of days, they will identify one or two skills that they have mastered; then, possibly they will be able to get ratings on them. The A/V Department is asked regularly in September, to provide training programs to the students on how to use A/V equipment. This is a very important element in their orientation program, because during the course of the year, they will be operating the equipment themselves. A point of interest here is that the instructors should also be given a program of instruction because although they are supposed to become familiar with the equipment as a result of their program of studies in the Professional Development Centre, sometimes they forget the material they've learned because they haven't used it for a while. It is often beneficial to provide a refresher program for staff during the course of the year, in order to avoid students coming down to the A/V Department and asking for advice, when they should be going to their own instructors. It's important to make the instructors aware of how to work these pieces of equipment.

The centre does have workshops on the use of equipment but the question has been answered already, and during the course of the year the A/V Department does offer workshops to instructors on how to use the equipment. In-Service Education programs

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at this centre and actually throughout the College are co-ordinated through the Professional Development Centre. By and large, the instructor in charge of the Professional Development Centre will make a decision on what type of things are available for in-service programs and then perhaps consult with staff to find out what their needs are. This is made a little easier by the fact that each instructor is supposed to have a chart, and therefore, the person in the Professional Development Area, shouldn't find it very difficult to determine what their needs are because they can just go to the charts and see what skills the instructors haven't knocked off. New materials are ordered sometimes at a preview basis by instructional staff themselves. This is somewhat of a bone of contention with me, but I simply do not have the time to look at the materials myself. Normally, they do a pretty good job and if the items are not of benefit, they will send them back and not order them. If they are of benefit, then items will be ordered and paid for from a budget allocated by department. It might be of interest if you are looking at this particular area to set some criteria, and we were finding that this criteria is coming in very handy in new programs coming out. We were talking to the instructors and finding out what kind of A/V needs they are looking for and suggesting some areas of concentration. For example, in the electrical wiring program, they have decided to go with tape slide and videotape and this will eliminate a lot of extraneous material that you would have to buy expensive machines for. The learning resource centres as I said earlier are decentralized; there is no mobile learning resource area. The only mobile group really is the audio-visual production team which will go from centre to centre to work with instructors in the production of audiovisual materials.

Item 18: When the user asks for special or individual instruction, what happens is somewhat difficult to say because this would be the domain of the instructor. Normally, because the system is individualized, the instructor will provide this individual instruction either at that point or at a mutual convenient time. Generally, if a learner is not able to operate the equipment, he will go to the instructor and get his help. Occasionally, if the instructor is not available he will come down to the Audiovisual Department. We are using the individualized system--the DACUM system--learning packages, the DACUM chart and so on for vocational technical students. At the present time, this is kind of a trial basis because we are just starting to individualize those types of programs. It does seem to be working. There are some problems, but I think that it can be recommended for use in Nigeria because the system has a number of advantages and I'm very willing

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to discuss them with you when you arrive.

If the centre would be expanded, and it is expanding all the time, we individualize the programs as we go. I would like to see some expansion in the Media Production area. I don't think we have enough staff to do the amount of work that is required of us. Some of the services that we have offered in the A/V Department have been to catalogue equipment within the College. Now, because of cost of the computer service, we have discarded that for the time being, but with mini computers coming in, we may redo the program and re-activate it again. We've also catalogued all the A/V software, which is a very important point. There has to be a logical system for cataloguing the A/V materials so that people can find them and use them. Of course, the instructors will, with the help of the library, catalogue their own books.

We don't have a regular publication coming out of the learning centres as we said before. The learning centres are there primarily for students and the students know about it. There are monthly centre newsletters; for example, Charlottetown Centre Newsletter, Summerside Centre Newsletter, which highlights some activities that are going on. In addition, the computerized audiovisual inventory is available at all the Centres so that instructors or students who want to find out if there are some materials available can go to that and find the information they want. The learning resource centres and the A/V Department are budgeted with regular budgets. There are no external sponsors, except that a number of our technical programs do get some government help in the form of TIP grants (in the form of Manpower Training grants) and so on. I think that the learning centres and the whole system is geared to students, and I've heard from a number of students that they prefer this system to the traditional lecture-based system because they have more control over what they are doing, and success or failure is more or less determined by what they do.

Item 25: In terms of general recommendations, I would say that you are going to have to look at your facilities very closely. The College, although everyone complains, does have a fair amount of money in terms of buying equipment, maintaining equipment, and so on. In your case--Nigeria--this money may not be available. You are going to have to select your equipment very, very carefully. Don't buy outrageous types of equipment that are going to be impossible to replace because you will just be wasting your money. One type of A/V media that we found useful here is using an audio tape recorder and maybe some laminated printed sheets, or an audio tape recorder and a picture book. That is a group of twenty or thirty pictures that have been bound

APPENDIX F

Task Analysis Chart, Holland College

CARPENTRY

Name _____

	<p>4 CAN PERFORM THIS SKILL SATISFACTORILY AND CAN LEAD OTHERS IN PERFORMING IT</p> <p>4 CAN PERFORM THIS SKILL SATISFACTORILY WITH INITIATIVE AND ADAPTABILITY TO SPECIAL PROBLEM SITUATIONS</p> <p>4 CAN PERFORM THIS SKILL SATISFACTORILY WITH MORE THAN ACCEPTABLE SPEED AND QUALITY</p>
3	<p>3 CAN PERFORM THIS SKILL SATISFACTORILY WITHOUT ASSISTANCE AND/OR SUPERVISION</p>
2	<p>2 CAN PERFORM THIS SKILL SATISFACTORILY BUT REQUIRES PERIODIC ASSISTANCE AND/OR SUPERVISION</p>
1	<p>1 CAN PERFORM SOME PARTS OF THIS SKILL SATISFACTORILY BUT REQUIRES SUPERVISION TO PERFORM THE ENTIRE SKILL</p>

Notings on the chart are based on industrial performance standards. They are confirmed by an instructor (a skilled and experienced person from the occupation) who views and evaluates performance as he would in the role of an employer or supervisor.

Instructor _____

Date _____

A letter of reference attesting to the individual's attendance, punctuality, and work habits, is available from the Registrar's office.

Developed by Holland College, Department of Labour and the Department of Education in cooperation with business and industry.
Prince Edward Island
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COMMUNICATE EFFICIENTLY AND DEVELOP PERSONAL COMPETENCE	MEASURE ACCURATELY	MAINTAIN PUNCTUALITY	ESTABLISH AND MAINTAIN PERSONAL TOOL COMPARTMENT	DEVELOP AND PRACTICE SAFE WORK HABITS	APPLY BASIC FIRST AID	ORGANIZE AND MAINTAIN WORK AREA
OPERATE AND MAINTAIN TOOLS AND EQUIPMENT	USE AND MAINTAIN HAND WRECKING TOOLS	SELECT USE AND MAINTAIN HANDSAWS	SELECT USE AND MAINTAIN MEASURING AND SQUARING DEVICES	SELECT USE AND MAINTAIN BOBS & LEVELS	OPERATE USE AND MAINTAIN HAND DRUMMEL TOOLS	IDENTIFY SELECT AND USE FASTENING TOOLS
IDENTIFY AND SELECT MATERIALS	IDENTIFY AND SELECT TYPES AND GRADES OF PLYWOOD	IDENTIFY AND SELECT TYPES AND GRADES OF FRAMING LUMBER	IDENTIFY AND SELECT SIKING AND WALL SHIMMELS	IDENTIFY AND SELECT FRAMING MATERIALS	IDENTIFY AND SELECT NAILS, SCREWS AND BOLTS	IDENTIFY AND SELECT FORM MATERIALS AND FASTENERS
CALCULATE MATERIAL QUANTITIES	CALCULATE QUANTITIES OF FRAMING MATERIALS	CALCULATE QUANTITIES OF MASONRY PRODUCTS	CALCULATE QUANTITIES OF CONCRETE	CALCULATE QUANTITIES OF FILL	CALCULATE QUANTITIES OF INTERIOR FINISH AND MILL WORK	CALCULATE QUANTITIES OF EXTERIOR FINISH AND CLADDING
LAYOUT AND PREPARATION	ERECT SAFETY BARRICADES	PLAN PLACEMENT OF MATERIALS ON SITE	CONSTRUCT TEMPORARY ENCLOSURES	ERECT BATTER BRACES AND ESTABLISH SUB WALL LINES	LOCATE TEMPORARY BUILDING AND SERVICES	LOCATE AND SQUARE BUILDING ON LOT
FORM CONCRETE WORK AND FORM THE PLACEMENT	STRIP CLEAN AND STORE FORM WORK	PREPARE BASE FOR CONCRETE FOOTING'S PADS AND FLOORS	CONSTRUCT AND PLACE FOOTING FORMS	SELECT AND INSTALL REINFORCING MATERIALS	CONSTRUCT AND FORM FIRE WOODEN WALL FORMS	ERECT STEEL WALL FORMS
WOOD STRUCTURAL FRAMING	CONSTRUCT AND INSTALL CARRYING BEAMS	INSTALL COLUMNS	INSTALL SILL AND FLOOR AND CEILING JOISTS	INSTALL BROWING AND SERVING JOISTS	CONSTRUCT AND ERECT WALLS	APPLY WALL AND ROOF SHEATHING
STEEL CONSTRUCTION	LAYOUT AND PLACE STEEL JOISTS AND BRACING	CUT AND PLACE STEEL FLOOR BEAMS AND DECK	INSTALL STEEL CARRYING BEAMS AND COLUMNS	LAYOUT AND ERECT METAL PARTITIONS	INSTALL METAL WINDOW AND DOOR FRAMES	ASSEMBLE AND INSTALL METAL SHEETING
INSTALL INSULATION AND VAPOR BARRIER	INSTALL INSULATION	APPLY PLASTER LATH AND GYPSUM	APPLY GYPSUM	CUT AND INSTALL METAL CORNER REINFORCING AND BRACE JOISTS	CUT AND INSTALL FLOORING UNDERLAY	APPLY WALL PANELING
INSTALL FINISH TRIM AND CASEWORK	INSTALL FINISH TRIM	INSTALL FINISH TRIM	CUT AND INSTALL FINISH TRIM	INSTALL FINISH TRIM	INSTALL FINISH TRIM	INSTALL FINISH TRIM

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DEVELOP AND FOLLOW DIMENSIONS	PREPARE AND READ SCHEDULES	DEVELOP AND MAINTAIN PROPER WORK HABITS	COMMUNICATE USING TRADE TERMINOLOGY	IDENTIFY ORGANIZATIONS JURISDICTIONS RELATED TO FIELD AND THEIR FUNCTIONS	PLAN AND LAYOUT WORK	EFFECT USE
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OPERATE AND USE CALCULATORS	SELECT USE AND MAINTAIN CHISELS PLANES AND FLASHES	SELECT AND USE PLAN SETS AND SCHEMIS	OPERATE AND MAINTAIN HAND POWER SAWS	OPERATE AND MAINTAIN POWER DRILLS AND SCREWDRILLS	USE AND CARE FOR DROP CONDS	OPERATE
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IDENTIFY AND SELECT WITH PROPER MEASUREMENT PRESERVATIVE MATERIALS	IDENTIFY AND SELECT VAPOR BARRIER AND INSULATION	IDENTIFY AND SELECT CONCRETE MATERIALS	IDENTIFY AND SELECT INTERIOR WALL MATERIALS	IDENTIFY AND SELECT GYPSUM AND PLASTER ACCESSORIES	IDENTIFY AND SELECT ADHESIVES AND LAUNCHING COMPOUNDS	IDENTIFY
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READ AND INTERPRET PLOT PLANS	SUPERVISE ROUGH AND FINISH GRADING	SUPERVISE EXCAVATION WORK
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CONSTRUCT AND INSTALL BEAM POCKETS	CONSTRUCT AND INSTALL ANCHOR BOLT EMBEDMENTS	INSTALL WINDOW AND DOOR SICKS	INSTALL EXPANSION JOINTS AND WATER STOPS	CONSTRUCT CHUTES RUNWAYS AND RAMPS	DAMP PROOF WALLS AND INSTALL DRAIN TILES	CONSTRUCT
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INSTALL PARTIAL AND CURTAIN FRAMES	CUT AND PLACE STRAPPING AND FURRING	CONSTRUCT AND ERECT STAGING	CONSTRUCT TEMPORARY BRACES FOR MASONRY WALLS	CUT AND INSTALL CANT STRIPS	CONSTRUCT FRAMING FOR POCKET DOORS	CONSTRUCT
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INSTALL METAL HOODS AND INSULATION	LAYOUT AND INSTALL STEEL STAIRS AND FLOORING
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INSTALL PREHUNG DOORS	SET AND INSTALL DOOR JAMBS	FIT AND HANG SWINGING DOORS	FIT AND INSTALL BI-FOLD ACCURSION AND SLIDING DOORS	INSTALL DOOR HARDWARE	ERECT FLOORING PARTITIONS	CONSTRUCT
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INSTALL CORNER BRACES	INSTALL WINDOW	ASSEMBLE AND INSTALL DOOR FRAMES	INSTALL LOAD PROTECTORS	INSTALL VENTS AND EXHAUST FANS	INSTALL GUTTERS AND DRAINAGE-OUTS	CONSTRUCT
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INSTALL METAL SHEET	INSTALL	INSTALL	INSTALL	INSTALL	INSTALL	CONSTRUCT
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WORK	EFFECTIVELY USE MATERIALS TO MINIMIZE WASTE	WORK EFFECTIVELY WITH OTHERS	ORGANIZE AND DIRECT WORK LINE	SCHEDULE AND COORDINATE WORK OF SUBTRADES	READ AND INTERPRET SHOP DRAWINGS
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CARE FOR	OPERATE AND MAINTAIN STATIONARY SAWS	OPERATE AND MAINTAIN IMPACT DRILL AND CHIPPING HAMMERS	OPERATE AND MAINTAIN POWER HAND PLANERS AND SANDERS	OPERATE AND MAINTAIN STATIONARY PLANERS AND SANDERS	OPERATE AND MAINTAIN POWER ROUTERS, AND ACCESSORIES
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Y ING	DETERMINE STRENGTH AND TYPE OF CONCRETE	IDENTIFY AND SELECT DOORS	IDENTIFY AND SELECT TYPES OF WHEELS	IDENTIFY AND SELECT ANVILS AND SCRAPERS	IDENTIFY AND SELECT VARIOUS TYPES OF FASTENERS
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PROOF WALLS INSTALL TILES	CONSTRUCT AND ERECT COLUMN FORMS	CONSTRUCT AND INSTALL EDGE FORMS	CONSTRUCT AND ERECT BEAMS, LINTEL AND BAL FORMS	CONSTRUCT AND INSTALL STAIR FORMS	CONSTRUCT AND INSTALL SUSPENSION AB FORMS
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FRONT FRAMING JACKET DOORS	LAYOUT AND CONSTRUCT STAIR CARRIAGES	CONSTRUCT DORMERS	LAYOUT CUT AND INSTALL COMMON RAFTERS AND COLLAR TIES	CONSTRUCT ROOF TRUSSES	LAYOUT CUT AND INSTALL HIP AND VALLEY RAFTERS
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FOR DRG IONS	CUT AND INSTALL JAMB LININGS AND STANDING TRIM	COPE AND MITRE MOULDINGS	LAYOUT AND APPLY FLOOR TILES	LAYOUT AND INSTALL HARDWOOD FLOORING	INSTALL LINEN PARTITIONS
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ALL GUTTERS DOWNSPOUTS	CUT AND INSTALL WEATHER STOPPING	INSTALL STORM DOORS AND WINDOWS	INSTALL FINISHING INSULATED DOORS	PREPARE WALLS FOR STUCCO	CONSTRUCT AND INSTALL EXTERNAL EXISTAIRS
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ESTABLISH COMMUNICATIONS WITH CUSTOMER	INTERPRET AND APPLY BUILDING CODES AND REGULATIONS	READ AND INTERPRET BLUE PRINTS	REI OF BY
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SUPERVISE OPERATIONS OF CONCRETE VIBRATOR	OPERATE AND MAINTAIN POWDER ACTIVATED FASTENERS	OPERATE AND MAINTAIN BUILDERS LEVEL AND TRANSIT	OP AN LE
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IDENTIFY AND SELECT TYPES OF FORMING	IDENTIFY AND SELECT FORM	IDENTIFY AND SELECT FINISH HARDWARE	DE PA
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INSTALL SHIMMERS AND LIFT BRIMMING	CONSTRUCT AND INSTALL ARCHITECTURAL FORMS	SUPERVISE POURING CURING AND FINISHING OF CONCRETE
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LAYOUT CUT AND INSTALL SPECIAL RAFTERS
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CUT AND INSTALL LEIST FROM AND SPRING	ASSEMBLE AND INSTALL PRE-BUILT CANNETS	CONSTRUCT CUPBOARDS AND VANITIES	CO CA PO
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INSTALL FINISH WOOD TRIM	DESIGN AND CONSTRUCT EXISTAIRS	CONSTRUCT AND HANG OUTBURDING DOORS	DE CA GI
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COLLEGE	READ AND INTERPRET BLUEPRINTS	KEEP ABBREVIATED OF DEVELOPMENTS IN FIELD
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FIELD	OPERATE AND MAINTAIN BUILDERS LEVEL AND TRANSIT	OPERATE AND USE LASH LEVELLING EQUIPMENT
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	IDENTIFY AND SELECT FINISH HARDWARE	IDENTIFY AND SELECT PNEUMATIC UNITS	IDENTIFY AND SELECT STRUCTURAL STEEL AND METAL COMPONENTS
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	SUPERVISE POURING CURING AND FINISHING OF CONCRETE
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	CONSTRUCT CLOSET/DOORS AND VANITIES	CONSTRUCT CHINA CABINETS AND ROOM DIVIDERS	CUT AND FIT SHIMS TRIMS AND TRADE	CUT, FIT AND INSTALL BALUSTRADES	CUT AND INSTALL WALL HUNG HAND RAIS	CONSTRUCT BASEMENT STAIRS	INSTALL WASHROOM ACCESSORIES	INSTALL SUSPENDED CEILING
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	CONSTRUCT AND HANG OUT BUILDING DOORS	REPLACE AND GLAZE WINDOW LIGHTS	INSTALL AND ADJUST LUNGE DOORS
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4 of 4

APPENDIX G

The State of the Technology and Directory of Centres
of Activity in Nigeria

University of Ibadan, Dept. of Teacher Education, Ibadan
(Contacts: Professor P.O. Okunrotifa; Dr. T.A. Balogun)

Courses are taught in media and instructional technology to non-degree, undergraduate and postgraduate students of education. Other activities include systems applications to the educational process, curriculum design, analysis and evaluation, and instructional product research; task analysis of African Primary Science Programme (APSP) units; production of AV aids of all sorts, using local materials as well as programmed texts in several fields of the curriculum including the teaching of the Yoruba language; cooperative participation in local, national and international courses and programmes in media use and instructional technology, and consulting services.

University of Ife, Dept. of Educational Technology, Ife-Ife
(Contacts: Dean, Faculty of Education; Head, Dept. of Educational Technology)

The Department of Educational Technology was established in 1976 following the reorganization of the Audiovisual Centre. It is one of seven departments in the Faculty of Education involved in teacher training. The Department is both a teaching and a service unit. Its primary function is academic. Courses are offered for the Master's and Doctor's degrees in Educational Communications and Technology where students may develop expertise in the administration of educational technology, instructional development, and production of resources. Undergraduate courses are offered towards the BA, BSc and BEd degrees in Education, providing potential teachers with skills in the design and preparation of instructional resources. Audiovisual services are provided to the University campus including consultation, design, production and maintenance. The facilities include a CCTV system, audio production unit, photographic unit and a 16 mm film production unit. A comprehensive brochure is available upon request, covering the department and its functions. In addition a newsletter is published quarterly and circulated to interested persons.

University of Jos, Medical Instructional Technology Unit, Faculty of Medical Science, Jos
(Contact: A.J. Brooks, AIMBI, LIIP, DipEdTech)

The Unit was established in January 1978 to advise on economical and efficient learning techniques, and to design self-instructional materials. The Unit will move into 'semi' permanent accommodation in September. The Unit's brief at present includes production of video-tapes, tape/slide programmes, structures learning materials; design of learning spaces; consultation on teaching/learning methods and curriculum design.

University of Nigeria Teaching Hospital, Medical Illustration Unit (Audio-Visual Services), Faculty of Medicine, Enugu
(Contact: Mr. M.O. Nwamoh, LIIP, AIMBI)

Main functions include production and maintenance of instructional materials in the Medical School and Teaching Hospital of the University of Nigeria, as well as offering audio-visual services to other educational institutions. The Unit is equipped to provide video, photographic and graphic services.

Modern Aids to Education Centre, Enugu
(Contact: The Head)

Science Curriculum Development Centre, Science Equipment Workshop, College of Education, Abraka, Bendel State

Science Equipment Centre, 2A Birrel Avenue, Yaba, Lagos

Teachers' Resource Centre, Jos
(Contact: The Head of Educational Services)

Federal Ministry of Education

National Educational Technology Centre, PMB 2027, Kaduna
(Contact: Mr. Francis Z. Gaha, Director)

The Centre (NETC) was established with the following functions: the development and production of instructional aids; the training of educational broadcasters and audio-visual aids specialists; the conducting of seminars and workshops on the application of AV technology to classroom teaching; the development of visual aids materials and equipment through the use of local resources and talents based on the country's educational system; and the provision of auditory services to the State Governments on audio-visual matters.

Educational Services Unit, PMB 2001, Jos, Plateau State
(Contact: Permanent Secretary, for the attention of CIE (eds))

The Unit was established after the introduction of universal primary education in 1976. The main functions are to maintain the quality of classroom teaching; to provide professional support for teachers; to develop relevant curricula; to produce effective materials; and to encourage educational innovation.

(Taken from International Yearbook of Educational and Instructional
Technology 1980/81)