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CONTENTS

EDITORIAL

We are happy to place before you this fourth issue (1987) of the Journal of Technical and Vocational Education. It covers a range of articles on various aspects of technical and vocational education.

The General Articles Section contains three papers on different themes. The one on Vocational Teacher Education in Jamaica describes a short-term institution development project in progress to strengthen the Vocational teacher education in that country. The second article on Distance Education for Staff Development in Technician Institutions emphasises that print materials still remain at the core of staff development programmes in the distance education mode and suggests that a systems approach should be adopted for their design and development to enhance the relevance and usefulness. A systematic approach to occupational analysis is described in the third article with a critical review of various techniques from the point of view of their relative effectiveness for obtaining the data required.

This Issue also includes three research reports. The first paper reports a study analysing the perceptions of Nigerian administrators, teacher educators, technical teachers and graduate students of industrial education on various aspects relating to programme development for formulating a model for undergraduate industrial teacher preparation in that country. In the second paper, development of a measurement model for labour force attachment of American youth is reported. This model has a potential to serve as a useful criterion variable for examining outcomes of public investments in youth employability such as vocational education. The third paper reports the findings of a research study investigating the relative shifts, perceived to be taking place in the tasks and responsibilities of Chairpersons in technical Education in U.S.A.

We are grateful to our contributors for willingly sharing their innovative ideas and research findings with the others in the system. These are the days when new problems of a new age are to be met in new ways. We hope that our readers find the articles intellectually stimulating giving rise to newer thoughts and practices. We look forward to receive continued support from our readers in the form of articles and valuable suggestions for fostering the growth of the Journal. □

JOURNAL OF TECHNICAL AND VOCATIONAL EDUCATION: AIMS AND STRUCTURE

In recent years, many countries have concentrated upon improvement and expansion of their systems of Technical and Vocational Education to keep pace with their programmes of development. This has been achieved through several innovations, projects and programmes and there is a need for sharing such experiences among countries of the world. In this context, an important and challenging task is to provide an effective means of communication between all those involved in this system of education. The 'Journal of Technical and Vocational Education' is intended to serve this purpose. This journal is being published from Technical Teachers' Training Institute, Madras, India. It is currently published annually and there is a proposal to have two issues in a year in due course.

Objectives

The objectives of the Journal are:

1. To share experiences in respect of national policies, norms and standards, course patterns and structures, resources and expertise, trends and issues relating to technical and vocational education in different countries.

2. To publish major advances and innovative ideas and report on current trends in the theory and practice of technical and vocational education.

3. To exchange experiences in the design, development, implementation and evaluation of all types of technical/vocational teacher education programmes.

4. To report case studies and research findings on various aspects of the system in different countries.

5. To promote the recognition and understanding of the interaction of technical and vocational education with other collaborating agencies such as industry, Government and society.

6. To project and report on the emerging trends and futurological studies in the technical and vocational education system.

Main Sections

Each issue of the Journal has the following four main sections:

1. *General Articles Section:*

Dealing with articles of evaluative and/or synthetic nature in all areas of technical and vocational education.

2. *Research Reports Section:*

Dealing with research findings relating to researches in technical and vocational education system. The emphasis in this section will be on publication of applied and application-oriented research of national/international interest.

3. *Innovative Programmes and Projects Section:*

Dealing with reports on developmental work and innovative practices in technical and vocational education system.

4. *Notes, News and Review Section:*

Dealing with information about on-going projects and programmes, news about conferences, meetings, seminars, symposia/workshops and reviews of books and other resources in the area of technical and vocational education.

Major Articles in Previous Issues:

First Issue:

* Decision-Making Skills for Technical Teachers
  Killen R & Richardson E.

* A Conceptual Framework for Developing A Faculty Appraisal System.
  Subbarao T.

Second Issue:

* High Technology in Australia-Rhetoric or Reality.
  Sekhon J. G. & Shannon A. G.

* Technical & Technological Education in Arab States — Problems & Prospects
  Hashim M Sáid Abdul-Wahab

Third Issue:

* Evaluation of Bilateral Education & Training Projects — Some Problems & Issues.
  David Chantrill

* Locally Based Management Development for Technical & Vocational Education Institutions.
  Rob Cuthbert, John Pike and Vernon Trafford.

Vocational Teacher Education in Jamaica—An Example of Incremental Institution Development*

JERRY MCCLELLAND

ABSTRACT

The paper describes a small-scale, short-term institution development project in progress to strengthen the vocational teacher education at the College of Arts, Science and Technology (CAST) in Jamaica. CAST and the College of Home Economics at the University of Minnesota formed a partnership supported by the Agency for International Development to implement part of this project. The model proposed allows teachers with a three year diploma to earn a baccalaureate degree by attending classes during summers and week-end seminars. Benefits of having such a baccalaureate degree in vocational education offered in Jamaica are pointed out along with the challenges remaining to be met by CAST.

Introduction

The building of institutions of higher education in lesser developed countries (LDC) has tended to focus on developing capacities in the areas of medicine, agriculture and management and to a lesser extent in teacher education and still less in vocational teacher education. Private foundations and the governments of the United States, Great Britain and France spent billions of dollars from 1950 through the 1970's on institution-building (Coleman, 1984). These activities typically included scholarships for the future professors who studied in more developed countries (MDC), salaries for expatriate professors who provided leadership and support for the budding institutions, library facilities and teaching and research facilities and materials. Generally the intent of these large and lengthy projects was to develop a critical mass of local scholars who would provide leadership for the institutions being developed.

This article describes small-scale, short-term institution strengthening projects between the College of Arts, Science and Technology (CAST) in Jamaica and two universities in the United States. The focus of the projects was the strengthening of vocational teacher education.

Before describing CAST, two of the author's assumptions, about educational development should be acknowledged First, where a competent faculty exists, the members of that faculty know what is best for their country and second, cultural invasion should be minimized to maintain the integrity of the culture. Balancing change stimulated by expatriates with the sovereignty of the host faculty is, indeed, delicate.

The author a professor of the University of Minnesota, participated in small ways in planning and implementing a baccalaureate degree program, and therefore brings a perspective of the more developed

* *The article is a revision of a paper presented at the World Assembly of the International Council on Education for Teaching, Eindhoven (Netherlands), July* 1987.

world to the discussion of institution development.

Description of CAST

This description of CAST draws heavily from Christian's (1985) work. CAST is the only technical, tertiary educational institution in Jamaica, and it offers programs in engineering, commerce, building construction, science, institutional management and food science, computer studies, and technical teacher education. The College was founded in 1958, and it has grown to a student body of 3,500. By 1982, 136 students were expatriated, indicating that the institution had become a regional college meeting many of the technical educational needs of the Caribbean. As Christian notes, training at CAST is usually cheaper and more relevant to students in the region than training in North America which they perceive to be the other alternative.

In its 30-year history, CAST has had 12 linkages with international institutions and agencies, such as the World Bank; the United Nations Educational, Scientific, and Cultural Organization; the United States Agency for International Development; and the Canadian International Development Agency. Memoranda of agreements with other academic institutions have included Hocking Technical College of Great Britain and Southern Illinois University, Iowa State University, and the University of Minnesota in the United States. There have been less formalized linkages with other academic institutions. CAST has a notable record of forging partnerships and acquiring resources to enhance its capacity to provide for the technical education needs of Jamaica.

The technical teacher education program that began in 1970 prepares teachers in areas of business studies, secretarial studies, home economics, construction technology, electrical technology, and mechanical technology. Graduates from these programs teach prevocational courses, vocational courses, and general technical education courses in the 143 secondary level schools in the country. In the eight technical high schools where some of them teach, the vocational training is more intensive. The country depends on CAST for the preparation of teachers in vocational education, although there are six other teacher colleges in Jamaica which prepare teachers in other areas. All teacher preparation is governed by the Joint Board of Teacher Education, which is under the auspices of the School of Education, University of West Indies, and it is empowered by the Ministries of Education in Jamaica, Belize, and the Bahamas. Originally, CAST granted only certificates and diplomas. In 1982, the Government of Jamaica gave permission to develop a Bachelor of Education (B.Ed.) degree in business.

Bachelor of Education Degree in Business

The B.Ed. degree in business — which is now in place at CAST — was originally conceptualized to build on the CAST diploma, or its equivalent, which is a three-year program. The additional work was to be equivalent to the fourth year in traditional baccalaureate programs and would be completed during three summer terms and 12 week-end seminars that would meet during the regular school year. Entrance requirements include a diploma in the area of specialization (secretarial or business studies) and two years of teaching experience. Students are admitted by cohorts, moving through the courses and seminars as a group. Cohort admissions were made for the summers of 1982, 1984, 1986, and 1987. The first graduates received their degrees in March of 1986.

While the baccalaureate degree in business was being implemented, the possibility of developing a second degree program in home economics was also

being considered. Subsequently, it was decided that a degree program in industrial education should be developed also. Since the author has participated in the development of the B.Ed. degree in home economics, that degree will be described in greater detail.

Bachelor of Education Degree in Home Economics

The rationale for developing the bachelor's degree in home economics was based upon the fact that a significant number of graduates of the home economics program at CAST had completed degree programs in other countries, but with the devaluation of the Jamaican dollar in the 1980's, study abroad was feasible for only a very few. Consequently, home economists either chose other degree options which were not directly related to their work (for example, degrees at the University of the West Indies) or had no other formal, professional development opportunities. Thus, a degree program was considered to be urgent (Christian, 1985.)

The aim of the Home Economics Section at CAST is to prepare teachers to teach occupational skills such as catering, food preservation, and garment construction and to teach homemaking skills. Only teachers who have had their preservice preparation at CAST are qualified to teach in the technical high schools where the home economics curricular emphasis is on income generation and employment. These teachers can also teach in the other secondary schools where more emphasis in home economics might be on homemaking.

Forming a Partnership

At the time CAST was considering the possibility of developing the B.Ed. degree in home economics, the College of Home Economics at the University of Minnesota had a contract with the United States Agency of International Development to provide technical assistance in the areas of home economics and social work to agencies in Jamaica that requested such help. A partnership was formed, and a memorandum of agreement was signed by the President of CAST and the Dean of the College of Home Economics at the University of Minnesota.

During the planning period for the degree, consultation regarding the content of the courses which would be equivalent to the fourth year of traditional baccalaureate degrees took place among persons from these institutions. University of Minnesota faculty are helping to develop the syllabi for the courses that constitute the degree program and to team-teach those courses with a faculty member at CAST the first time they are offered. The head of the Home Economics Section at CAST attended the University of Minnesota to earn a Master of Arts degree in Home Economics Education, and a professor from the University of Minnesota is a member of the advisory council formed to give advice to the home economics program at CAST. Many characteristics of the large and lengthy projects referred to earlier are evident in this smaller project.

The Degree

No change was made in the diploma course requirements because the Joint Board of Teacher Education regulates those syllabi to which CAST and the teacher colleges must adhere. The business education program model and admission requirements were adopted for the home economics program. The courses which were added for the degree were of three types: general education (such as Introduction to Sociology), pedagogy (such as Educational Administration), and subject matter content (such as Apparel Design and Production). The pedagogy courses are common to both the business education and home economics programs. The first admission of a cohort occurred during the summer of 1986. Thirty-three persons were admitted and began their first of three summer sessions.

Advantages of the Bachelor's Degree Being Offered in Jamaica

The degree work which CAST is offering has the potential to be more culturally relevant for students in the region than course work offered in more developed countries. For example, educational systems in the Commonwealth countries are typically more centralized, with curricular decisions being made by ministries of education rather than teachers or curriculum specialists at the local school level, which is more characteristics of schools in the United States. The same knowledge about curriculum varies in importance in these two settings. Likewise, some subject matter knowledge (e.g. aspects of marketing) is also culturally bound. Degrees developed and delivered at CAST can provide content knowledge which is more applicable in Jamaica and the larger Caribbean community.

Many more teachers are provided access to continued professional development when the degree program is offered in an economy that is consistent with their ability to pay and is geographically near them. The continued professional development is thought to result in improved teaching as well as make professional, economic, and social mobility possible for teachers.

To the extent that any society is enriched by an expanded capacity to provide formal education, Jamaica benefits from having professors in the Department of Technical Teacher Education who have improved their capabilities and are, in turn, able to extend schooling opportunities for technical teachers. These faculty members not only contribute directly to the students in the baccalaureate programs, but they can serve as valuable resources to CAST, the Ministry of Education, secondary and technical high schools, and businessses in the private sector. There is also the possibility that they can provide a model for teacher education that is appropriate for other LDC's which can lessen the general dependence on more developed countries. To be sure, this latter assertion is untested and would be difficult to measure.

Fry (1984) enumerates other problems of overseas education that are avoided by CAST in providing baccalaureate degrees. The cost of students studying abroad can be a substantial drain on a country's foreign exchange. A country loses the talent and contribution of individuals — in this case, teachers — if they are absent from their posts for extended periods while they study. Also, students are likely to increase their appreciation for and reliance on consumerism while studying in more developed countries. Some will migrate as a result of studying abroad, and others will face cultural collision when they return home.

A final advantage of students receiving degrees at CAST is related to both economic costs and time, as noted above. Very often, when international students who have earned a diploma attend school in a more developed country, they are faced with the fact that much of their completed work is not accepted toward a degree at the college or university in the host country. Reasons for the unwillingness of colleges and universities in more developed countries to count college work completed include the following: college and university officials lack information about the former institution and the content of courses; courses in the two institutions are not structured similarly so that courses do not appear to be equivalent; and increased specialization in college curricula in the more developed countries results in courses having multiple prerequisites which were not available in the country of origin. The result is that students completing a three-year diploma may receive credit for only a fraction of the work and face one to four years of schooling to complete what is considered a four-year baccalaureate degree.

Benefits of Partnership for More Developed Countries

Three advantages of faculty from more developed countries participating in an institutional partnership such as this are enumerated here. First, helping to develop curriculum and teaching in an institution in another culture provides an opportunity for professors to examine the assumptions underlying their own work and the work of their counterparts in the host country. Concepts, generalizations, and principles which seem universal are found to have cultural biases. For example, when one asks, "which knowledge is most valuable?" one finds that the answer is, to some extent, culture-specific. This opportunity to examine assumptions underlying one's work is an under-utilized opportunity for renewal for professors who have been in their posts for some time.

Second, upon return to their posts in their own university, these professors can improve services to international students. The capacity to empathize with the cultural adaptation students must make could be increased. Ability to make instruction more relevant might be improved. The transition of students from a type of institution different from the professors' own can be made smoother in a couple of ways: by explaining unfamiliar expectations of the host institution to the students and by explaining to professors and registrars in their own institution the conditions of study and achievements of students in their countries of origin.

Third, research opportunities can emerge from the partnership. Selection of research problems, opportunities for collecting comparable data across cultures, and the testing of theory for a much broader kind of universality than is possible in a single culture can improve the body of knowledge in a field and professors' research capabilities.

Remaining Challenges for CAST

There are three particular challenges that CAST still faces in developing its degree programs. They are outlined below.

Program Expansion With Few Resources

The first challenge is to offer the degree programs with few additional resources. The Ministry of Education in Jamaica has indicated that no additional moneys will be forthcoming to support the added degree programs. So student fees and training contracts with the private sector and the military will be the primary source of funding. Essentially, the faculty are being stretched to both create degree programs and then to deliver them with the addition of only a few adjunct faculty members. Expansion of the CAST programs is consistent with trends in other LDC's (Coombs, 1985). Despite their declining resources for higher education, many post-secondary schools continue to add to the functions and services they provide. In the post-secondary schools, this is often in response to national strategies to bolster development or to free the institution from dependence on educational systems in the MDC's.

The expansion may aggravate already difficult conditions for professors. Avalos (1985) states that teachers — and no doubt college instructors as well — in LDC's face "problems of even greater harshness than those in the industrialized world: the effects of poor material conditions of teaching, of pupil learning difficulties, and of an often miserable wage structure" (p. 297). Providing increased services with only modestly increased resources must be balanced delicately for the structure to remain strong. One mechanism CAST could use to moderate the demand on faculty resources is the frequency with which it admits cohorts and begins the baccalaureate program cycle.

Dependency on the Northern Rim for Knowledge

Dependency on the Northern Rim — northern Europe, North America, and Japan — for knowledge is not unique to the baccalaureate program at CAST. It is present in most educational programs in LDC's. According to Altbach (1982), most research is done in and textbooks and journals are published in the industrialized nations. The knowledge developed and the materials printed are almost always driven by the needs of those nations. Many professors in LDC's have earned their degrees in Northern Rim countries and use models from there to develop their own educational systems. Hence, the methodologies, ideologies, and fashions of the West dominate knowledge and education around the world.

At CAST, the most significant challenge is that of providing a culturally relevant degree while still being partially dependent on the Northern Rim for knowledge. While the degree program at CAST is obviously offered in the Jamaican setting, mostly by Jamaicans, much of the content knowledge for vocational teacher education will likely remain "imported." That is, many aspects of the relevant content knowledge — most often conveyed in printed educational materials — is developed by and for other cultures and may be inappropriate for the Caribbean. The most desirable state of affairs would seem to be to use knowledge from more developed countries which is valid for Jamaica and to develop indigenous knowledge where there are gaps. The issue of validity of vocational knowledge across cultures should receive more attention from educators.

Recognition of the Degree by Other Institutions

One indicator of acceptance of the CAST degree programs is recognition of the degree by graduate schools at other colleges and universities. A transcript of a graduate of the business education baccalaureate program was reviewed in the Graduate School at the University of Minnesota to "test" the admissibility of a CAST graduate.

Graduate School representatives indicated that they had insufficient information about the college to render a decision (A. Lucas, personal communication, January 9, 1987). The Graduate School's Admission procedures are typical of major colleges and universities in North America. Handbooks on degree granting institutions around the world are routinely used for admissions decisions. Because the *Commonwealth Caribbean* (Fisher, 1979) was published prior to CAST's initiation of a baccalaureate degree program, the Graduate School could not rely on that source of information. Alternatives suggested by the Graduate School for CAST included the following: provide information on the transcript about its charter from the Ministry of Education or provide some official indication that the University of the West Indies routinely admits CAST graduates, if that should occur. In this case, admission of a CAST degree holder appeared to be a question of the *authenticity* of the baccalaureate degree, rather than one of the *quality* of the degree. This distinction is important; the issue concerns providing sufficient information, rather than Northern Rim elitism.

Other challenges remain for CAST, but a note regarding the success of the baccalaureate programs thus far is in order before discussing implications for teacher education in other LDC's. Two characteristics of CAST's situation have been alluded to, and should be stated explicitly. First, most of the faculty capacity was in place at the time the bachelor degree programs were being considered. Not only was the faculty capable of developing and implementing programs, they also had experience — as did the College administrators — in acquiring and utilizing assistance from other agencies. CAST's faculty is well educated, with many professors in the Technical Teacher Education Department holding graduate

degrees. The second characteristic is that CAST maintained control of the process of designing the programs and implementing the degrees. We turn now to implications of the CAST example for teacher education in other LDC's.

Implications for Vocational Teacher Education in Other LDC's

Reflection on the CAST example raises two questions: "Should LDC's develop baccalaureate degrees in teacher education?" and "What are the transferable features of the CAST model for development?"

Should Programs Be Upgraded?

The point of departure for further development of any teacher education program begins with the question: "Should a program be upgraded to offer a higher qualification?" There is no assurance that a teaching cadre with degrees will necessarily improve the quality of schooling in a country. Two Malaysian studies (Beebout, 1972 & Isahak, 1977) suggest that teachers' higher qualifications influence secondary school students' performance, but other studies (Avalos, 1985) have shown conflicting results. Teachers' skills and the quality of education in a country might be improved by instituting a degree program, but other alternatives might result in equally good or better service to teachers and, in turn their students. For example, changing the quality or focus of the present teacher education program to increase prospective teachers' awareness of the importance of their philosophies of education, characteristics of their teaching practices, and the contexts in which they will teach (Avalos, 1985) might do more to enhance the quality of education.

Related to the decision to upgrade programs is a perennial, cross-national concern of balancing the educational needs of differing segments of a citizenry (Coombs, 1985). For instance, using resources to extend tertiary education for a few teachers at the baccalaureate level should be contrasted with the possibility of using the same resources to expand access of the masses to elementary schooling. The demand for schooling from preschool through graduate programs has increased more during the last three decades than most poorer countries can provide for (Ramirez & Boli-Bennett, 1982). Equity for individuals and attainment of national goals for development compound the difficulty of deciding whether to extend teacher education to a higher degree.

Although the "brain drain" to the Northern Rim appears to have ebbed in the 1960's (Coombs, 1985), attainment of a baccalaureate degree may increase the "pull" of employment opportunities in other LDC's. That is, individuals may perceive that higher credentials will improve their employment opportunities abroad and, thereby, their standard of living in other countries, and they obtain a degree and migrate. Conversely, if individuals perceive that a degree might improve their upward mobility in their own country, they may be motivated to earn the degree and remain. In the latter case, individuals might stay in the teaching profession or they might leave teaching for other more prestigious and lucrative jobs in their own country.

Instructions from the CAST Example

If a decision is made to upgrade a teacher education program, the process used at CAST illustrates one way for institutions to build on their present program structures. Assessment of the present program and specification of the desired program enables educational leaders to develop the program structure to bridge the gap between the two.

Incremental increases in capacities in vocational teacher education programs appear to be relatively unobtrusive. In the CAST example, the equivalent of one academic year was added to the three-year diploma program which was already

in place. Expanding a program in this manner requires less staff development, fewer additional resources, less planning and implementing time, and it does not affect the rest of the educational system in drastic ways, as would be the case in either reorganizing the present program or in originating a new post-secondary program. The logistics of implementing the equivalent of a fourth year are also more manageable. Offering courses during times of the year that teachers are free from their teaching responsibilities allows them to continue earning an income and prevents disruptions in schools. Simultaneously, college faculty time can be devoted to teaching the advanced courses for the bachelor's degree. Further, the use of college facilities can be extended without much additional cost. Of course, in some educational settings incremental increases are not sufficient to meet national goals or societal demands.

By forming partnerships with expatriate professors for short periods, cultural intrusion can be minimized. And when the cultural backgrounds of the expatriate professors and the host institution are similar, less intrusion is likely to occur. In those instances where persons of vastly different backgrounds are to work together and are culturally flexible, collaboration will also produce harmonious outcomes. Often the professoriates of paired institutions will have shared experiences in the higher education sub-culture in more developed countries. To say it another way, professors from LDC's are likely to understand the cultural and intellectual background of the guest professors. When expatriate professors work for only a few weeks with the host institution and work with colleagues as a team to develop syllabi and teach courses, and the decision-making remains in the hands of the host faculty, the intrusion can be expected to be minimized at the same time that assistance is maximized.

Short-term partnerships of two to five years between institutions have several advantages in an incremental, institutional strengthening process. Presumably, a faculty in a more developed country would have sufficient depth and breadth of expertise to provide the needed assistance for the further development of the structure of a teacher education program in an LDC. But, in addition to developing structures to achieve the designated goals, the potential of engaging the personal commitment of a critical mass of professors in a more developed country long enough to implement change is also needed. Earlier in this paper, reference was made to testing the admissibility of a graduate of the CAST program into a graduate school in the United States. Without counterparts working together inside the two institutions over time, the last steps toward recognition of the degree in the MDC's would be more cumbersome. Coombs (1985) notes that in instances where the choice of the project and its design and management is left in the hands of the host country, small projects have been very successful; but where larger scale changes are desired, the longer-term programs of development seem to be more effective.

Conclusion

The CAST example, as well as other examples, of teacher education strengthening projects should be examined by educational leaders in LDC's who have decided to extend professional development opportunities for teachers within teacher training institutions. Providing vocational teacher education programs within their own countries allows leaders to exercise more control over the shaping of their educational systems and lessens their dependence on the Northern Rim. Increased access to baccalaureate degree programs in vocational education provides teachers with an oportunity for continued professional development and upward mobility. However, assumptions regarding the positive influence of higher qualifications on the efficacy of vocational education should be tested in both lesser developed and more developed countries.

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Distance Education for Staff Development in Technician Institutions

G. R. MEYER

ABSTRACT

The paper refers to the rapid growth of distance education mode for staff development in technician institutions in Asia and the Pacific. It indicates that newer technological media involving telephone systems, communication satellites and microcomputers have facilitated this development. It points out that, inspite of this development, print materials still remain at the core of such programmes. It is emphasised that such materials are most effective, if a systems approach with concern for adult learning is adopted in their design and if they are packaged as modules.

Introduction

Staff development programmes in technician education institutions in countries of Africa, Asia and the Pacific have greatly expanded in recent years but in some educational systems they have been somewhat restricted by lack of resources. (Unesco 1980). Effective staff development, however, is vitally important if teachers at technical and vocational institutions are to keep up to-date with (*i*) the technologies and content of their subject areas; and (*ii*) changing employment patterns. As well, many technician training institutions rely very much on on-job staff training for the development of basic pedagogical skills such as lesson planning, presentation techniques and assessment procedures. (Unesco, Apeid 1984a and b, 1987).

Programmes of staff development designed to meet needs can be facilitated by distance education. For most of its history, however, distance education in all educational sectors, has relied very heavily on printed resources involving the dispatch of materials through the mail. At best this has involved a two-way postal correspondence but at the minimum it has involved only the posting of printed materials to institutions or individuals with no two-way communication at all. (Holmbergh 1977).

The approach adopted by The Open University in Britain, however, has moved educators away from the idea of equating distance education with correspondence education. (Pentz and Neil 1981). The Open University pioneered the use of integrated learning packages. These involved printed booklets and notes, audio and video taped materials and other resources. In addition, broadcast media, especially broadcast television, were utilized in association with these integrated learning packages.

The launching of communication satellites, improved telecommunication networks and the advent of personal microcomputers, however, have opened up new and challenging possibilities for distance education. These possibilities are particularly important in the fields of technical and vocational education. This article reviews some recent developments in Australia but attempts to relate them

to needs and trends in other countries. The author acknowledges two critical sources, namely two recent preliminary articles by Morrison Hammond of Macquaire University, Sydney. (Hammond 1987 a and b).

The Concept of Distance Learning

A helpful definition of distance education is that it is education involving "methods of teaching, which because of the physical separateness of learners and teachers, present the pre-active and interactive phases of the teaching by means of print, mechanical or electronic means" (modified from Hammond 1987 a) The significance for educational systems with limited resources is that distance education allows learning materials produced by relatively few teachers or instructors to be (*i*) used by large numbers of students, e.g. the staff of a national technical education system and (*ii*) distributed over a dispersed geographical area. Distance education, therefore, is especially useful for large and unevenly populated countries such as Australia, Canada, China, India, Iran, Saudi Arabia and island countries such as Indonesia, Japan, the Maldives and The Philippines.

The approach has the following obvious advantages:

- It can train large numbers of people more rapidly than traditional methods alone
- It is highly cost effective
- Capital costs are greatly reduced because large numbers of learning centres are not needed
- It can reach people in rural areas and so reduce costs of travel to urban centres
- It can be integrated with on-job learning with minimum disturbance to daily routines
- It can influence wider audiences than originally visualized.

Distance education should be seen as a powerful agent for facilitating national development. This is not to say that it should replace traditional approaches to staff training. Distance education should be organized in association with traditional methods so that each approach complements the other.

The Characteristics of Effective Distance Learning

In order to be effective any programme of distance education for staff development should have the following characteristics:

(*i*) The staff receiving training should have some degree of independence in relation to their choice of times and locations for study

(*ii*) The materials should be developed for what is perceived to be a target population needing access to training that otherwise would be difficult to obtain

(*iii*) The content of the training should be arranged in flexible units — a modular approach is ideal

(*iv*) The training materials should be designed for self-instruction and so should include clear statements of objectives, self assessment devices, clear structure and provision for feedback

(*v*) The system should utilize the expertise of more experienced members of staff of any given institutions as supervisors and facilitators

(*vi*) Materials should be centrally produced

(*vii*) Local resources such as libraries, workshop facilities of institutions, meeting rooms and so on should be fully utilized

(*viii*) The costs to those members of staff participating in the programme should be considerably

lower than if they were trained only by traditional means

(*ix*) While distance learning is effective in any type of country — highly developed or less developed — it should make maximum use of existing communication networks and be geared to the facilities and resources realistically available

(*x*) It should be based on a careful needs analysis and be designed to provide basic knowledge and skills required by all technical and vocational teachers of a given system and the specific knowledge and skills required by specialist teachers

(*xi*) The types of learning experiences included should stress interaction between learners and materials and between learners and other learners.

Basic Educational Media

In order to achieve a high quality of distance education possessing the characteristics outlined above, the media for conveying the content of the training programme must be chosen very carefully. The following table (Table 1) summarises the basic media that tend to be utilized in distance training programmes (modified from Teather 1976).

TABLE 1: Classification of Educational Media Frequently Used in Distance Education.

(Based on but not a copy of Teather 1976)

Function	*Sight*	*Sound*	*Sight + Sound*
(*a*) *For Presenting Information*			
(*i*) Immediate one-way communication	Computer network (one-way)	broadcast radio	broadcast TV
(*ii*) Immediate two-way communication	printed materials, colour slides	audio cassette	film slide-tape video cassette
(*b*) *For Feedback*			
(*i*) Immediate two-way communication	teleprinter remote writing (e.g. fax), computer network (two-way)	telephone	video-link, remote writing + telephone, computer + telephone
(*ii*) Delayed two-way communication	written assignment	audio cassette	video cassette

Of the media listed in Table 1 those which allow immediate feedback — that is, which provide for immediate two-way communication — clearly have a very important role. That is not to say, however, that all aspects of a distance education programme should be presented by these means. Clearly, much information can be sent in the form of printed materials preferably as self instructional modules. (Meyer 1984). The media which allow on-the-spot two way communication can then be reserved for short critical interactions in cases where interpretation is required or where participants seek clarifications of concepts or techniques.

Recent Developments

Many countries of Asia and the Pacific now have access to new technologies such as communication satellites, public availability of videotex services and the extension in the general market place of international data bases and communication systems such as *Midas* and *Minerva*. (Hammond 1987b). All of these systems can be utilized through microcomputers owned by individual students or by educational institutions linked through the telephone system. *Midas* is an international data retrieval system. In Australia, for example, Midas is a service provided to various educational institutions for accessing information from international data banks such as *Dialog*, *DowJones*, *Chemical Abstracts* and many others. This service is especially valuable for the staff of vocational and technical institutions needing direct access to up-to-date data in areas of their speciality. *Minerva* is an electronic mail service. It enables people to send messages to and from individuals and groups within a country and internationally. Conferences can also be conducted using the *Minerva* system. In Australia the system is now being used to communicate with (and between) isolated children enrolled in the state departments of education correspondence schools. It would be equally useful however, for the staff of technical education institutions. The advantages include (*i*) the rapid transmission and return of assignments, (*ii*) obtaining quick answers to questions posed or to designated problems, (*iii*) being able to leave messages for teachers when they are not available, and (*iv*) to communicate cheaply with others enrolled in a particular programme.

In Australia a videotex system called *Viatel* is now available from the national telecommunications agency Telecom. The system allows those with access through a microcomputer to obtain a wide range of information from data banks and agencies providing information services. *Viatel* can also be used for electronic mail. Also it can be used interactively, that is, individuals can request further information from specified sources or can videotape transactions. A special value of systems such as *Viatel* is that arrangements can be made for certain defined groups to interchange information not available to others outside those groups. That is, staff or students enrolled in a particular course or institution can interchange information and messages not available to the general users of the national videotex system. A particular institution can therefore run its own independently accessed system.

In Australia *Viatel* is being used successfully by certain universities to supply information to the community at large about the availability of and enrolment procedures for selected courses. Some Colleges of Advanced Education are using a videotex service for instruction and assessment. In New South Wales the State Correspondence School is employing *Viatel* on a trial basis to enhance communication with children in remote areas. Other countries, such as Canada, use videotex very widely for all levels and in all sectors of education.

These newer technologies all require some form of user terminal and of the various possibilities in this regard the microcomputer is the most appropriate in

terms of cost and versatility. (Baath & Mansson 1982). All that is required is the microcomputer itself and a modem and a suitable software packet. Present (1987) prices on outright purchase of such a system could cost considerably less than US $ 500 per person. In systems where microcomputers are already owned by educational institutions only small additional outlays are needed to utilize them for distance education.

At the simplest level any system of distance education can utilize networks of microcomputers to establish an electronic "bulletin board" service. This can be used to give individuals information about programmes; for setting assignments; for delivering material; for notifying students about administrative aspects and course changes, and for actually transmitting text and computer software. In these ways an electronic bulletin board can provide most of the content of a training programme while at the same time monitoring the progress of each individual. Identifier codes can be used so that confidential messages can be transmitted between specific individuals and the instructors. (Hammond 1987b).

Other Possibilities

While microcomputers are likely to be the main user terminals for most systematically organized distance education programmes of the future, they may well be supplemented by other electronic devices. Slow scan television (SSTV) and facsimile machines (fax) may well be used for the transmission of visual materials and Loud Speaking Telephones (LST) for teletutoring and other form of two-way audio communication. In Australia these techniques have been investigated for use in distance education by the South Australian Department of Education. (Dunnett 1980, 1981). The use of electronic devices such as microcomputers, fax machines and so on is now very much a possibility since high quality telephone communication with television and radio reception in remote areas is now possible via satellite.

Printed Materials

Inspite of these more recent technological advances, it is likely that printed materials will continue to provide the basic core of information for most distance programmes of staff development. In order to satisfy the criteria for effective distance education, however, these materials must be carefully designed. It is unlikely that the distribution of conventional textbooks or sets of printed notes would themselves bring about any meaningful improvement in knowledge and certainly would be unlikely to enhance pedagogical skills.

Printed materials for distance education should be designed to encourage maximum activity and involvement by all participants. The use of modules is advocated as the most suitable form of printed resource because modules meet most of the criteria for effectiveness in distance education. A module can be defined as an essentially self-contained, self-instructional package, which allows learning to be paced by each individual according to needs and ability. A module covers a carefully defined unit of knowledge or skill and has clearly defined educational objectives. (Meyer 1984). The characteristics of modules which make them especially suitable for distance education in staff development are briefly outlined below.

(*i*) *Essentially Self-contained.* Most modules contain within them all the material needed to achieve their educational objectives. This does not imply that modules should stand entirely alone. They can be integrated into learning sequences involving other media such as the recent electronic computer-based systems described above. But this characteristic of being able to stand on their own is especially useful in the administration of distance programmes. Participants can select topics

or skills relevant to their needs, and not waste time, money or effort in obtaining extended materials such as elaborate textbooks much of which would be irrelevant.

(*ii*) *Self-instructional.* Modules can be designed to be used away from an instructor or teacher. Self-instructional materials are of course necessary for effective learning at a distance where emphasis necessarily moves from the instructor to the learner. Self-instructional systems should demonstrate to users the techniques of learning so that users "learn to learn." Modules can be designed with these principles in mind. A further aspect is that learning by means of modules can be self-paced and is not necessarily linked to the average pace of a group. This aspect is important for distance education programmes for staff development since needs may vary a great deal from individual to individual.

(*iii*) *Clearly Stated Objectives.* Distance education programs need to be very clearly defined. Students must clearly understand what is expected and which goals to achieve. Learners in such programmes need to be goal-oriented. Well designed modules clearly identify the educational objectives of each unit of work and so provide a clear "curriculum map" for users.

(*iv*) *Optimal Sequencing.* There is a well-known principle of learning which implies that the more closely associated in time and space are the elements to be learnt, the more effective will be the total learning. Modules link together elements such as workshop experience, practical skills and theoretical material and also enable multiple sources such a variety of communication media to be integrated. Modules also require ideas and concepts to be sequenced in appropriate and optimal hierarchies. Information or skills are presented in small easily absorbed steps. Since students in distance education do not have the benefit of a teacher-at-hand to correct errors, this type of "fail-safe" design is especially important.

(*v*) *Provision of Immediate Feedback.* Students in conventional correspondence programmes usually receive comments on their assignments and other work through the mail. This delayed feedback is very unsatisfactory since, by the time errors are corrected, weeks of subsequent effort may have been wasted and motivation endangered. Modules are designed so that feedback is provided on each learning step as the learning proceeds. This is possible by providing quizzes and other types of practice tasks which are immediately answered or by listing criteria and standards against which the students can compare their own work.

(*vi*) *Immediate Reinforcement.* Learning is enhanced as achievement is recognized and rewarded. In conventional classrooms or training situations the teacher can reward with a smile or a quick verbal acceptance of a response or of work completed or underway. In conventional correspondence situations recognition of success is delayed — sometimes by many days or weeks — and its "reinforcing" value is diminished. Because the material in modules is presented in small stages it is easy to build-in opportunities for reinforcement. In-text questions, extended quizzes and other simple tasks can be provided which can be "answered" by immediate and "ready reference" to the text and the inevitable chain of success builds the learners' confidence, increases motivation and consolidates learning.

(*vii*) *Active Participation.* Students working at a distance must themselves decide when to move ahead, when to study a particular aspect of the program, when to answer particular questions, or complete assignments and so on. In this way distance learners must be actively involved in the management of their own learning. But modules also promote active learning because of their design. By continuing asking questions, giving instructions for

activities and challenging learners to achieve specified objectives, active participation is virtually guaranteed.

(viii) Mastery Learning Strategy. In distance education continuous monitoring of standards by both learner and instructor is especially important. Mastery learning approaches are therefore very appropriate since the learners are expected to "master" the material, that is, reach a prescribed standard of competence or knowledge in a given unit of work before proceeding to the next. This ensures that virtually all students will succeed and it ensures that all work is thoroughly consolidated before new work is attempted. Modules utilize mastery strategies. It is generally assumed in modules that students will master each module in a series before proceeding to the next. Distance education programmes frequently build in mastery tests at the conclusion of each unit of work to ensure that this principle is applied.

The Systems Approach

Modular or other distance learning materials, including many programmes and resources packages for electronic transmission, are probably best designed utilizing a systems approach. (Meyer, 1979, Unesco APEID 1984 a and b). All teaching involves modification of the behaviour of each individual learner. Good teaching achieves this in a systematic way. The systems approach comes mainly from engineering and more recently from computer technology. Learning sequences can be thought of as linear chains of INPUT-PROCESS-OUTPUT (IPO) cycles, linked together as shown below (Figure 1).

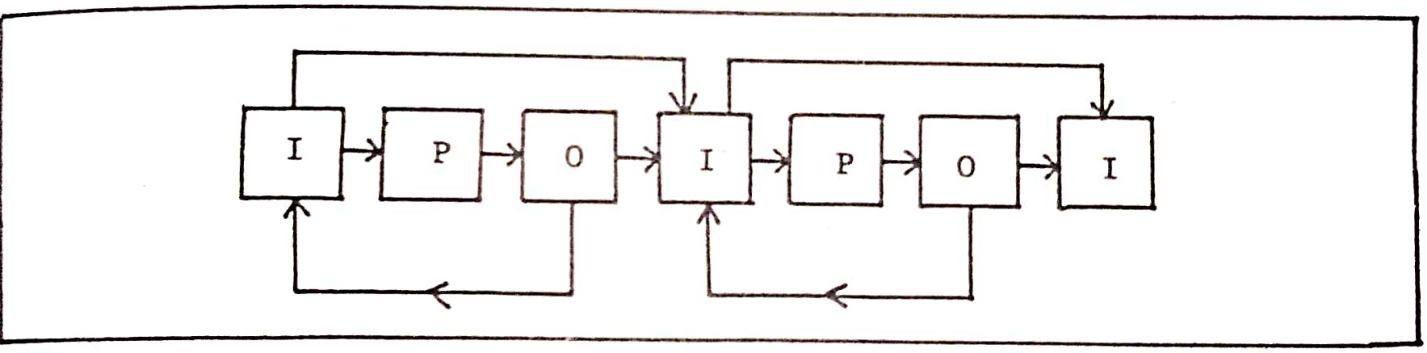

Figure 1 : A systems approach to the design of learning materials.
I=Input; P=Process; O=Output. (Meyer 1979).

In any given module designed, say, for three hours of active involvement, there may be as many as six IPO cycles.

By "input" is meant information presented to the learner for consideration or action — the objectives and/or content of a segmment of work. By "process" is meant some form of interaction between the learner and the content. "Output" means a demonstration of achievement by production of something tangible — the demonstration of a new skill, construction of an object, writing a report and so on.

A simple example of an IPO cycle would be the following:

INPUT – Listening to a five minute audio recording of a lecturette on how to prepare a script

PROCESS – Identifying and /or rating certain characteristics of the programme with the aid of a checklist

OUTPUT – Outlining the headings for a script for an original five minute audio programme.

As Figure 1 implies, the output of one IPO cycle "feeds" into the next. Also the output of one cycle "feeds back" to the input phase of that cycle because the output phase is a virtual practical manifestation of the input phase. That means that the "input" of each IPO cycle is not only the underlying generator of its own cycle but also of the next cycle as well.

This simple design for the linear events in a learning sequence has very important advantages. These are as follows:

- Each IPO cycle is a form of stimulus-response dyad with the Input representing the stimulus and the Process and Output representing the combined elements of the response.

- It is easy to see, therefore, that reinforcement can be built into each part of the response phase. That is, that "rewards" can be provided (e.g. through encouragement or success) during the processing and output phases.

- Awareness of IPO cycles in designing learning resources ensures that the material to be learnt is broken into small steps and that all relevant elements are brought together in time and space.

- As each IPO cycle involves at least two stages involving overt behaviour (processing and outputing) it is very easy to ensure that the learner is provided with feedback on performance.

- Variety of learning experience can be built in and as variety sustains interest and motivation it enhances learning. In any learning sequence the way information is presented at the input phase, the method used for processing and the type of output required should vary as much as possible from one IPO cycle to the next. Structuring any sequence of a distance learning programme around IPO cycles, therefore, ensures variety and so enhances the learning.

This type of design is effective for programmes packaged in almost any medium from printed modules through, say, tele-tutoring experiences and computer programmes. If distance learning materials are based on these principles they will almost certainly succeed.

Principles of Adult Learning

Educational media can also help to ensure that programmes of distance education for staff development are optimally designed to take maximum advantage of what is known about how adults learn. (Meyer 1976, 1979). Table 2 lists some conditions for effective learning and comments on how educational media in distance education programmes can either capitalize on or enhance these conditions.

Staff Development in Technical Education

Technical education institutions have an especially important need for effective programmes of staff development because of the rapid changes in content of modern technology. In addition, many teachers come to such institutions because of the excellence of their practice within a given area of technology or within a particular trade. They have had little or no pre-service training in pedagogy.

If technical education is to maintain standards and keep ahead of the changing needs of society all teachers in this sector should have access to an on-going programme of staff devlopment. In the past much staff development has been ad hoc and reflexive — for example, teaching workshops may have been designed to help with the introduction of a new curriculum. Also, much staff development has been purely "on-job" by learning from other — a system which usually perpetuates conservative and traditional approaches.

TABLE 2: Conditions for Effective Learning and The Use of Media for the Effective Design of Distance Education Materials for Staff Development.

Conditions of Learning	*Implications for Media in Distance Education*
1. Learning is most effective where the products (outcomes) are immediately required.	Staff development programmes focus on immediate overt needs. Media should be selected which relate to those needs and which are applicable to the institutions and circumstances where the distance learning is to occur.
2. Learning is most effective when objectives are clear and explicit.	All learning resources, whether utilizing print or electronic media, should state the anticipated learning outcomes in the form of a list of behaviourally toned objectives.
3. Learning is most effective when material to be learned makes use of the experience of the learner.	Staff development programmes in technician institutions should build on the knowledge and skills of those involved. Carpenters, for example, should know their trade but not necessarily be skilled in teaching. The distance media should draw on these trade skills to illustrate pedagogical issues.
4. Learning is most effective in safe, supportive and non-threatening environments (see also 7).	Staff development should be seen by participants as contributing to their personal growth rather than as something imposed on them by employers. Therefore the media chosen should give as much "control" to the learner as possible.
5. Reward rather than reprimand enhances learning (see also 12).	Whichever medium is chosen the messages should be accompanied by maximum positive reinforcement.
6. A democratic atmosphere increases enthusiasm and commitment.	If printed media alone are to be used opportunities should be provided for learners to make independent choices and to select appropriate alternative materials. If two-way electronic communication media are to be used, objectives and learning sequences should be democratically negotiated.
7. The absence of anxiety in learning situations usually has beneficial effects (see also 4).	The learning situation should be totally non-threatening. The media chosen should present the messages in such a way that learning is fail-safe.
8. Active participation in learning enhances its effectiveness.	Processing and output phases should be prominent features of any resource design. The medium most likely to solicit an active response should be selected for each input.

Conditions of Learning	*Implications for Media in Distance Education*
9. Involvement of learners in the planning and operation of a learning situation enhances the effectiveness of the learning.	In staff development programmes it is important for participants to perceive that they are in control and that they can select only those aspects relevant to their genuine needs. Each institution forming part of a distance training network should have a management committee which specifies the resources and types of media most appropriate for their local circumstances.
10. Learning is more effective if learners receive information on their rate of progress towards goals and objectives.	Apart from the types of built-in feedback devices characteristic of modular design, print materials used in distance staff development programmes should be supplemented wherever possible by interactive electronic media which allow participants to receive instant feedback on the quality of their work.
11. Frequency of repetition is important in acquiring a skill.	It is especially important in distance education to use a concentric curriculum design with the same idea or skill being reintroduced in different contexts. The use of a range of contrasted media is particularly helpful in this regard since the same "message" conveyed by a contrasted medium consolidates a skill. or concept while maintaining interest through variety.
12. Reinforcement through recognition and reward for achievement enhances learning (see also 5).	In staff development programmes participants should be encouraged to share achievements and to have opportunities to accept the approval of peers and supervisors. In programmes of distance training this can sometimes be achieved by establishing support groups within the institutions involved and by using two-way communication media.
13. Provision of feedback on the nature of a specific response enhances learning.	The processing and output stages of each IPO cycle should be followed by activities which enable participants to check their work. This is especially important in distance programmes where all feedback cannot be immediate. For example, media such as video taped programmes should demonstrate skills and so provide comparative standards.
14. Structuring a learning sequence into logical and overt steps and hierarchies enhances learning.	Messages should be presented in clearly designed stages and a variety of methods should be used throughout. The organization of the materials in the learning hierarchies should be made clear to all participants.

Conditions of Learning	*Implications for Media in Distance Education*
15. Variety in methods and media enhances learning.	Wherever appropriate the various steps of an IPO cycle should be conveyed by contrasted media and/or methods. In particular, the input phases should be presented in varying formats or by using different media.
16. Learning can be achieved through the imitation of the behaviour of others (modelling).	Modelling can be provided in distance education by using model audio or video taped programmes and by presenting exemplary printed materials.
17. Learning can best be achieved when the teacher displays enthusiasm and interest.	The learning materials sent to participants should be well-written in an interesting style. The vocabulary should not be unnecessarily technical and positive outcomes should be stressed.
18. Long-range goals influence the effectiveness of achieving short-range objectives.	Wherever appropriate, the ideas and skills developed in a distance staff development programme should be placed in an overall career context. Long-term gains and advantages of the new knowledge and skills should be stressed.
19. Learning is influenced by cultural background.	While in most cases it would be uneconomical to cater for all minority cultural differences in a given group of technical teachers, the media used for the distance programme should be sufficiently varied in terms of cultural factors to allow each group to feel that its specific interests and concerns have been taken into consideration.
20. Membership of a small group engaged in a common learning experience frequently enhances learning by an individual.	Each institution involved in the distance education network should form learning groups or "learning cells". One member of the staff should be appointed liaison officer and group coordinator. Regular meetings should be held to discuss progress in the self-paced material. At times these meetings can be enriched by teletutoring experiences coordinated by the central supervisory agency.
21. In small group work, learning is enhanced if the processes involved are made overt.	These two aspects can be catered for by having a special instructor's manual for the group or "learning cell" leaders for each institution. This manual should describe and explain group processes, especially the effect of leadership styles.

Conditions of Learning	*Implications for Media in Distance Education*
22. The group atmosphere of learning influences its effectiveness.	
23. Proximity in time and space of elements to be learnt enhances learning.	This would appear at first consideration to be a counterproductive aspect of distance training. However, the use of self-paced modular materials and the integration of theory and practical activity can compensate for the fact that the overall programme is directed from a "distant" centre.
24. Learning is more effective if individual differences are catered for in the learning situation.	This aspect is also catered for by the self-paced nature of the materials and by the use of a wide range of media and methods. Further, participants in any distance programme should be free to choose those items perceived by them to meet their specific needs.

Another problem with the conventional approach is that the few centrally organized programmes that have been mounted are based on a "withdrawal" model. Staff attend an intensive one week or one day course usually in a centre away from their own institution. When they return they find it difficult to apply the new knowledge and skills which were acquired out of context and frequently without the sympathy and understanding of colleagues who did not share the training experience.

Distance staff development allows the programme to be on-the-job; but it can inject new ideas and new approaches not possible when such learning is purely incidental. Further, distance training programmes can be continual and so be on-going throughout the professional life of the individual teacher.

A combination of well-designed self-paced printed materials preferably in the form of modules, and a range of the newer electronic media, can fully capitalize on the conditions known to promote effective learning. By designing such materials on a systems model and by encouraging the formation of self-help learning cells in all participating institutions distance staff development is maximally effective. (Percival and Ellington 1981).

All countries depend on effective technical education for their economic development and for the improvemnt of the quality of life. Staff development is therefore the key to ensuring that technical education is relevant to the true needs of the nation and is optimally efficient and effective.

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Occupational Analysis—A Critical Review

GRAHAM D. HERMANN

ABSTRACT

A systematic approach to occupational analysis (job analysis) is described in terms of three phases: describing the nature and scope of the occupational area, developing a list of occupational competencies and collecting data on each competency. Within each phase it is shown that the objectives need to be specified and then the relevant techniques can be selected. Some data are also presented indicating the relative effectiveness of various occupational analysis techniques for obtaining different kinds of data.

Need for Occupational Analysis

Occupational courses need to be relevant. They need to assist course graduates to function effectively both on graduation and into the foreseeable future. Occupational courses need to reflect the present and future needs of industry and to provide graduates with the principles and problem-solving procedures which will allow them to participate in the changes occurring in industry. (*Industry* is used here to refer to all enterprises, including government, commerce, and self-employment. *Occupation* is used to refer to all vocations, including skilled and technical).

However, relevant occupational information is frequently not readily available from local industry. There are a number of factors possibly involved:

- Many industry spokespersons know their own enterprise, but have only limited knowledge of other enterprises in their industry sector.
- Most industry spokespersons have been promoted away from the jobs performed by many workers in the enterprise, and may not be up-to-date concerning the detailed competencies needed for many jobs.
- Assessing the occupational needs of industry can be a complex task.

There may also be political agendas which tend to prevent employer and union spokespersons from stating the occupational realities. These often relate to 'demarcation' issues.

An *occupational analysis* (OA) is used to determine the education/training needs of a specific occupational area. An OA aims to provide data able to be used by course developers, and may produce the following:

Step 1.1 – a statement of the nature and scope of an occupational area;

Step 2.1 – a list of competencies presently performed by persons in an occupational area;

Step 2.2 – a list of competencies which could be performed by persons in an occupational area in the near future;

Step 3.2 – data concerning the performance of each competency;

Step 3.3 – a clustering of competencies (so that distinct clusters can form the basis for separate courses, or for a course core plus a number of electives).

The term *competency* is used in a comprehensive sense; it may include tasks or skills, and includes behaviours demonstrating cognitive competencies (such as cognitive procedures, diagnostic procedures, planning, problem-solving), knowledge, and/or an attitude. The competencies determined from an OA are *occupational* competencies: the performances expected on the job for the specified occupational area.

An occupational analysis may be considered as one aspect of a needs analysis. **OA data are needed for the development of all new courses, and for the revision of existing courses.**

Conducting an Occupational Analysis

The procedure of occupational analysis is described in some detail by Hermann (1987). As indicated by the types of outcome data listed above, three phases (major steps) can be identified:

Phase 1: Describing the nature and scope of the occupational area;

Phase 2: Developing a list of occupational competencies (indicating what the person has to be able to *do* in the occupational area);

Phase 3: Collecting data on each competency (such as importance and extent of performance, to assist in prioritizing competencies with respect to their inclusion in the course).

These phases are conceptually separated from each other to seek to ensure that relevant questions are asked in each phase, and that relevant OA techniques are used in each phase. They are logically sequenced to seek to ensure that data needed for a latter phase have been obtained in an earlier phase.

A large number of OA techniques have been devised. They can be categorized as (Hermann, 1987):

* Desk methods (e.g. information search — an extended literature review);
* Field methods (e.g. observation, daily work diaries of job incumbents);
* Inventory methods (e.g. seeking data on each competency in an inventory of competencies);
* Introspection (e.g. interviewed individuals; course advisory committee; DACUM – 'Developing A Curriculum' — a group method involving about 12 job incumbents/supervisors using structured procedures to obtain grouped lists of competencies).
* Indirect (e.g. evaluating existing courses; analyzing career paths of ex-students; Critical Incident Technique: the analysis of incidents with critical consequences (e.g. death of a patient, loss of a contract), which are able to be rated as a success or a failure, in terms of the competencies likely to ensure that such incidents can be successfully negotiated).

Descriptions of many OA techniques and data concerning their utility are available in Anderson and Jones (1986) and Hermann (1987).

Activities of Phase 1

The activities of **Phase 1** (describing the nature and scope of the occupational area) have most of the characteristics of the 'exploratory methods' discussed by Anderson and Jones (1986).

There are three major outcomes from Phase 1:

(*i*) a description of the *scope* (boundaries) of the occupational area;

(*ii*) an analysis of the *context*, including key factors acting on and *changing* the occupational area (such as technological, economic, social and

environmental, legal and industrial, including work organization), and the implications of these for development of the curriculum.

(*iii*) a list of the *branches* (subsets) within the occupational area. Branches of nursing include geriatric, psychiatric, community, and intensive care. It is necessary to identify such branches to determine which competencies are common to all nurses and which are specific to a specialism; and to ensure that all branches of nursing are involved in the occupational analysis (i.e. that the sampling is representative).

A combination of OA techniques can be used in Phase 1. It is believed that an information search should always be used. Other recommended techniques for this phase are observation, interviews with managers and supervisors, interviews with trendsetters, and, for an existing course, interviews/questionnaires of past and present students.

Activities of Phase 2

Phase 2 consists of developing one or two lists of competencies. It is virtually always necessary to develop a list of existing competencies. Depending on the contextual data obtained from Phase 1, it is often advisable to attempt to develop a list of possible future competencies.

Conventional competencies, such as psychomotor procedures and cognitive procedures (e.g. accounting procedures) tend to be reasonably readily detected. However, some competencies tend to be *refractory*, i.e. much harder to detect, and should be specifically probed for; these include communication, interpersonal, management, planning, diagnostic problem-solving, safety, and attitude-related competencies.

In developing a list of *existing* competencies, it is considered that at least two OA techniques should be used. Information search should normally be used, together with such other techniques as DACUM (involving job incumbents and/or their immediate supervisors), interviews of job incumbents, critical incident, and/or observation. It is also suggested that:

* at least one data source should be job incumbents and/or their supervisors;

* at least one method, if at all possible, involve group interaction, since data may be generated and questions raised which are not always obtained from individual interviews; DACUM is an appropriate group interaction method;

* at least one method is comprehensive and highly structured;

* the data be presented as a profile, consisting of some 8 to 12 Genera, Areas of Competence listed as a column on the left hand side of a page, and the specific competencies be listed alongside the relevant General Areas of Competence; for example: see Fig. 1

In developing a list of possible *future* competencies, it is considered that appropriate OA techniques include information search and interviews with persons in 'trendsetter' organizations (those which tend to be early adopters of innovations.) It would be very useful to develop an on-going capability to anticipate and to monitor technological change, as discussed by Pulsford (1984).

Activities of Phase 3

Using the list of competencies (inventory) developed in Phase 2, **Phase 3** involves the collection of data *on each competency*. Such data may include:

* the extent of performance;
* importance;

* difficulty in learning (with respect to time taken to learn competency);

* where competency was learned;

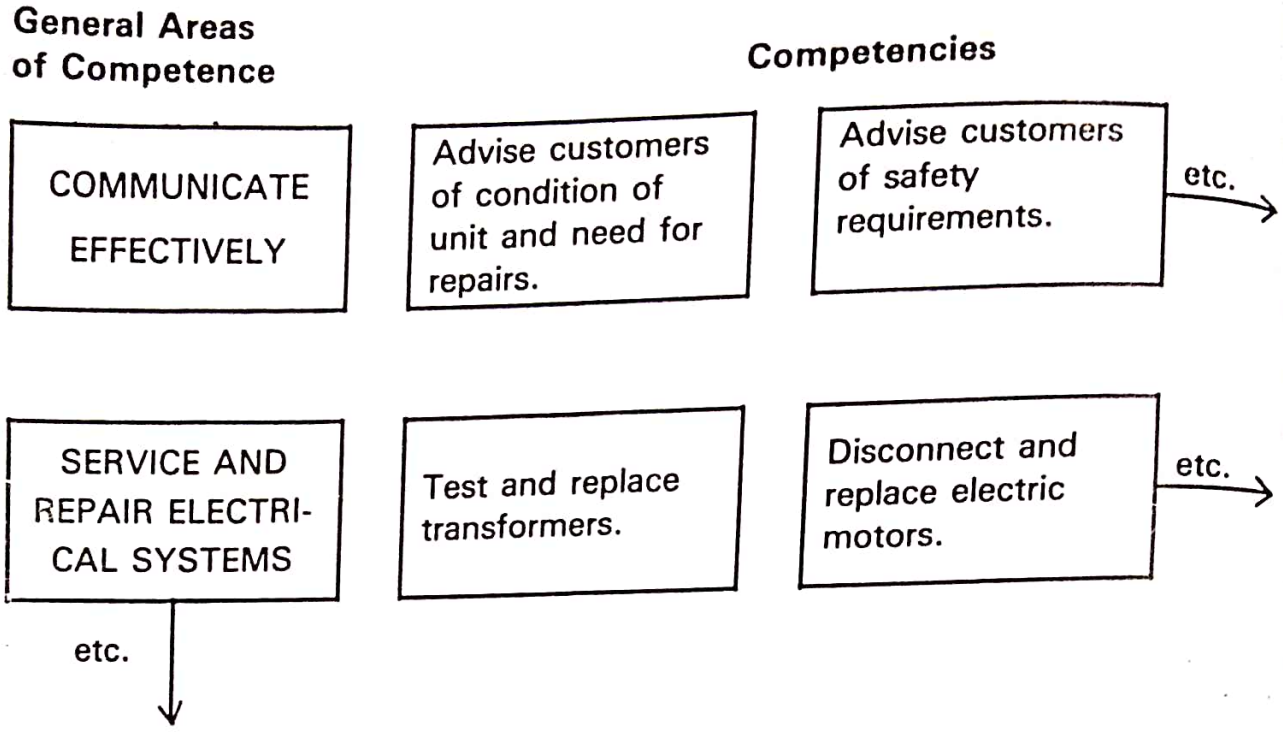

Figure 1

* immediacy (i.e. weeks after appointment that the job incumbent will need competency for use on the job).

Such data are typically collected from job incumbents or their immediate supervisors via questionnaires. Ratings can be obtained from individuals or by group consensus. The competency inventory can be given to DACUM participants before they disperse, or sent to a large representative sample of respondents. The size of the sample will tend to be large (and should be representative) if there are a number of branches in the occupation; however, limited time and/or limited resources will reduce the size of the sample.

If the occupation is large, and especially if it is suspected that there are many branches, it is very useful to undertake a cluster analysis, to assist in identifying branches, and in allocating competencies among courses and to subjects/modules within courses.

It is useful to identify the necessary curriculum decisions whi h could be assisted by the collection of OA data; such a procedure leads to the specification of which OA data could be collected in this phase, as shown in Table 1.

Relative effectiveness of OA techniques

There have been many studies which discuss the effectiveness of a particular OA technique. However, there has generally been no objective criterion against which the effectiveness could be measured. Without data from a second source (i.e. a different OA technique), such judgements have only limited validity.

There have been very few studies in which an attempt has been made to compare the effectiveness of different OA techniques, on the same occupational area. However, there have been attempts to compare OA techniques on a rating scale..

On the basis of their own personal experience, Holden and Lescop (1978) rated the perceived effectiveness of nine OA techniques for obtaining different kinds of data. They used a six-point scale:

Value	*Description*	*Definition*
5	Critical	Represents a breakthrough — changes the viewpoint of the job.
4	Essential	Reliable and relevant data — cannot design the training without it.
3	Very useful	Good information — reliable and directly relevant — what we are looking for.
2	Useful	Routine information — normally useful — needs to be substantiated.
1	Slightly useful	Can be used if available — may substantiate other data — should not expend effort specifically for this data.
0	Useless or harmful	Cannot be used — a waste of time — give wrong impression.

The ratings of Holden and Lescop are presented as Table 2. For Phase 1, subject matter expert is rated highly, for Phase 2 competencies list, DACUM is rated highly, and for Phase 3, the questionnaire was given the highest rating.

Holden and Lescop have also produced some cost information (of a rather generalized nature) for some OA techniques.

Halfin and Nelson (1982) rated a set of OA techniques in terms of their effectiveness in identifying competencies in each phase of their emergence and adoption (see Table 3). Most of the techniques listed are described in Hermann (1987).

There have been extremely few *empirical* studies of the relative effectiveness of OA techniques. In part, this has been due to the difficulty of finding appropriate criteria against which effectiveness can be measured. In part, this has been due to difficulties in defining the occupational area, and in ensuring that each technique is used with a matched representative sample. In part, this has been due to the OA techniques themselves, as each technique tends to have several variations, including different classes of respondents (e.g. managers tend to give different responses from job incumbents and from immediate supervisors of job incumbents).

Levine, Ash and Bennett (1980) conducted an empirical study of four OA techniques: critical incident ("Job knowledge experts delineated important job dimensions and described incidents of job behaviour illustrative of poor, average, and exceptional performance on that dimension" (p. 525); job elements ("In a group session, job knowledge experts generated skills, knowledge, abilities, and other worker characteristics.. required to perform the job in question" (p. 525); Position Analysis Questionnaire (PAQ); task analysis. However, they were interested in collecting information for personnel selection rather than for curriculum development. Burnet and McCracken (1982) showed that task inventory analysis is more specific in identifying exactly what a worker does than is the PAQ.

In investigating the communication competencies needed in the workplace by auto mechanics apprentices in their final years, Rayner (1987) sought to determine the comparative effectiveness of three OA techniques: DACUM (involving supervisors); Observation and Expanded Information Search (Information Search used to develop a draft list of competencies, to which were added additional competencies suggested by auto mechanics, teachers of auto mechanics, and teachers of communications). With respect to the Phase 2 (list of competencies) data, the Expanded Information Search was found to produce the most comprehensive valid list. The DACUM method produced comprehensive data, but there was a possible validity problem with

some of it — probably relating to the involvement of supervisors rather than to the involvement of job incumbents. Difficulty was experienced in obtaining sufficient participants to undertake the DACUM method. The Observation method took the most time and produced the least comprehensive data. For Phase 3 (data on each competency), the completion in class and via mailing of the competencies inventory was the most effective technique, due to the large and more representative sample.

Many more research data are needed.

Conclusion

For the first two phases of an OA, at least two OA techniques should be used in each phase. The selection of a combination of OA techniques will normally be based on the *aims* of the OA (by asking the question: what data are required?), and on the *constraints*, such as *time*, *cost*, and *acceptance of the results* by the stakeholders. Acceptance is enhanced by having large numbers of participants, and/or by having a representative sample of participants, and/or by personal involvement of the stakeholders (for example, by employers and/or course advisory committee members acting as participants and by teachers acting as observers in a group method such as DACUM). Also, the *rate of change* in an occupation will be a major consideration in undertaking an occupational analysis.

TABLE 1: Specification of Potentially useful OA Outcome Data Based on Needed Curriculum Decisions

Decisions to be made	*OA data which could be useful*
(*a*) Should course have core plus electives?	Clustered data.
(*b*) Should competencies be omitted, placed in initial course, placed in subsequent course, placed in core, and/or placed in an elective?	Importance; extent of performance; difficulty; clustered data
(*c*) Should competencies be learnt in the college segment and/or concurrent enterprise segment and/or internship?	Importance; extent of performance; difficulty; where competency learnt.
(*d*) Should competencies allocated to the college segment be taught at occupational level, or college level (involving less stringent criteria than are needed on the job?	Importance; extent of performance; difficulty; immediacy.
(*e*) How should the program be sequenced?	Immediacy; clustered data; extent of performance; difficulty
(*f*) Which attendance patterns should be provided?	Where competencies learnt; immediacy.

TABLE 2: Effectiveness ratings on some OA techniques

Phase	*Kind of Data Generated*	*OA TECHNIQUE*							
		Information search	*Observation*	*Questionnaire*[1]	*Subject matter expert*	*Open Interview*[2]	*DACUM*	*Critical incident*	*Job product analysis*[3]
1	Roles[4]	*		3	4	3	4	4	
	Job problems		2			3	2	2	
	Work flow process	4	3	1	4	3	3	1	
2	Competencies list	3	2	3			4	3	2
	Competency standards	3		2	3	4			
3	Competency frequency	2		3		2	2		3
	Comptency difficulty			3		2	2		
	Competency importance	2		2		3	2		

Notes: 1. It is not clear whether the questionnaire was primarily a competencies list, or of some other type, or a combination of both.

2. An unstructured interview technique, completely different to the type presented in Hermann (1987).

3. An analysis of the job output.

4. A manager, for example, may have several roles: eg. production efficiency, product quality, training.

* A blank cell indicates a lack of data on which a rating could be made.

Source: Holden and Lescop (1978).

TABLE 3: Relative effectiveness of techniques for identifying emerging competencies at each phase of the adoption and use of innovations.

Technique	**PHASE* I	II	III	IV	V	VI	VII
Advisory Committee	2	2	2	1	1	1	1
Creative Insight	1	1	1	2	3	3	1
DACUM process	0	2	2	1	1	1	0
Delphi Process	1	1	1	3	3	3	1
Evaluating existing courses	0	3	3	2	2	2	2
Teachers working in industry	0	0	2	2	1	1	2
Labour Market Survey	0	0	0	3	3	3	3
Study, Survey or Conference	3	2	2	3	3	3	3
Task Analysis	0	0	3	2	1	1	0

Relative Effectiveness		**Phase*	
Extremely Useful	(1)	I	Applied research
Useful	(2)	II	Early Transfer to industry on a trial basis.
Somewhat Useful	(3)	III	Transfer
Not Applicable	(0)	IV	Early Adoption
		V	General Adoption
		VI	Stable Use
		VII	Declining Use

Techniques:

Evaluating existing courses — Follow-up studies of graduates and their employers.

Labour market survey — Study of the number of available jobs in specific job categories.

Task analysis — "may be completed through observation, interview, or mail survey" (p. 10).

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New Perspectives in Nigerian Industrial and Technical Teacher Education

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ABSTRACT

Recently, Nigeria adopted a comprehensive educational policy which strongly emphasized vocational and technical education at the secondary level. The success of this policy, however, is being hampered by acute shortages in the supply of qualified technical teachers, thus calling for steps to improve teacher preparation programs in qualitative and quantitative terms.

This paper reports a research study involving the analysis of the perceptions of Nigerian administrators, teacher educators, technical teachers and graduate students of industrial education on thirtythree variables related to program development for formulating a model for undergraduate industrial teacher preparation. It is concluded from the study that there is a dire need for more programs of industrial teacher preparation in Nigeria and that the program variables perceived to be **very important** *by the respondents should be emphasized in the programs.*

Background of the Study

As the concern for the appropriateness of the technologies either imported or generated in the developing countries mounts, some writers (e.g., Fretwell, 1981; Jequier, 1976) believe that primary and secondary schools should form the bedrock for creating appropriate technology in these countries. It is, perhaps, this line of thinking that motivated the Federal Government of Nigeria in its present and unprecedented emphasis on technology education particularly at the secondary level and in the major steps taken to accelerate the preparation of technology teachers.

Nigeria, a West African country of an estimated 100 million people, emerged from the British rule in 1960. For several years after Nigeria's independence, the system of education that was inherited from Britain continued to dominate educational practice in the country even when such education no longer served the country's needs. The perceived irrelevance of the inherited system was most apparent in vocational and technical education where, for example, students were required to memorize British Building Codes and construction techniques that were clearly not applicable to Nigerian climatic and technological circumstances (Okoro, 1979).

In response to growing public disenchantment with the educational system, a national curriculum conference was held in 1969 and, subsequently, a National Policy on Education was adopted in 1977 by the Federal Government. The policy featured, among other things, a six-year secondary education scheme with a strong technology emphasis at the junior and senior secondary levels. This aspect of the policy became operational in 1982 but is facing serious problems because of previous

neglect of vocational and technical education in Nigeria. In particular, the country lacks the required competent and qualified technical teachers to teach the prevocational and vocational courses prescribed by the policy. In recognition of this problem, the government embarked upon a crash program of overseas training of Nigerian teachers in 1981. This measure has at least two limitations. First, the number of teachers that could be trained this way is limited by availability of funds. Right now, Nigeria can ill afford the huge expenditure demanded by this program. A second, and probably more serious, problem is that the training acquired oveseas by these teachers may find very little local application — a major problem that beset the technical crash programs undertaken by the Federal Government in the 1970s.

Nigeria, during 1985, had about 20 three-year institutions that offered non-degree programs in vocational (industrial) and technical education. At the same time, there were sixteen federal universities in the country but only one of them offered degree programs in industrial and technical teacher education. This single university produced an average of 13 graduate teachers annually between 1980 and 1984. This number is grossly inadequate for a country that is introducing vocational and technical education in all the classes of a child's possible six-year secondary schooling. It may, therefore, prove more economical and technically expedient to expand and strengthen the local institutions and their curricula so that adequate numbers of qualified teachers could be trained using local resources.

Apparently, many Nigerian universities are reluctant to establish programs of vocational and technical teacher preparation. This reluctance has been blamed on Nigeria's colonial experience (Fafunwa, 1974; Okoro, 1979) and the attitude of Nigerians educated in British universities who believe that vocational education has no place in the universities. Perhaps a more plausible explanation might be that there is no highly successful local program from which the other universities can learn or adopt. The establishment of vocational and technical programs at any level can be quite costly and so, few institutions may be willing to "risk" their resources on an industrial and technical teacher education program without proper guidelines based upon successful models.

Although some studies have been conducted on vocational and technical education in Nigeria, none has addressed the problem of formulating a framework for developing industrial and technical teacher education programs in Nigeria. Wolansky (1974), a consultant with the Ford Foundation conducted a study of vocational teacher education in Nigeria in the early 1970s and proposed a five-year plan for the Department of Vocational Teacher Education at the University of Nigeria, Nsukka. Overall, the literature indicates that vocational teacher education programs in Nigeria have relied largely on models based upon foreign environments and this accounts for their ineffectiveness (Aina & Beecroft, 1982; Okoro, 1979). It is important, therefore, that any model being proposed for establishing new programs of industrial and technical teacher education or for revising existing ones must be based upon the perceived needs and aspirations of Nigerians themselves.

Purpose of the Study

The purpose of this study was to obtain comprehensive information from Nigerian administrators, teacher educators, technical teachers, and graduate students of industrial education programs that could be used to formulate a model for developing industrial and technical teacher education programs in Nigeria. Specifically, the study sought to determine (1) the areas of specialization, (2) program objectives, and (3) the program components to be

emphasized in Nigerian industrial teacher education programs.

Procedure

The mail survey was used in gathering data for this study. The development of the instrument was a multi-stage process which began with a review of the literature. Thirty-three variables related to industrial and technical teacher education program development were identified and a rating scale from 1 to 99 was employed in gathering the perceptions of the respondents. The scale was structured as follows: 1 =unimportant; 50 =undecided; 99 =very important. The certainty rating scale allows for a wide range of responses to each item and represents a more sensitive scale than, say, the five-point Likert-type scale (Wolins & Dickinson, 1973; Liu, 1971).

The instrument was validated by a five-member panel of experts including two statisticians and three industrial teacher educators at Iowa State University. Based upon the recommendations of the panel, the instrument was revised several times, before a final draft was produced. The final draft was pilot-tested with a sample of eight Nigerian graduate students of industrial education at Iowa State University. Based on the revisions and pilot test results, the authors were satisfied with the face and content validity of the instrument; no effort was made to determine the instrument reliability.

Sample

About 70% of the respondents in this study including department heads, teacher educators and technical teachers were resident in Nigeria. Thirty percent were Nigerian graduate students in American universities. Educational institutions and individuals in Nigeria who were involved in the study were identified from lists obtained from the National Board for Technical Education in Kaduna, Nigeria and the Federal Ministry of Education, Science and Technology in Lagos. Contact persons were identified in 21 Nigerian and ten American colleges and universities and thy assisted in administering and collecting the questionnaires for subsequent return to the investigators. The sample of the study included: (1) 21 department heads (DEOs) of industrial and technical education programs in Nigerian colleges and universities, (2) 70 industrial and technical teacher educators from the 21 institutions identified in Nigeria, (3) 40 industrial and technical teachers selected from six secondary and technical schools in Nigeria, (4) 40 Nigerian graduate students of industrial education from ten randomly selected American universities.

The questionnaires were mailed to the contact persons in February 1986. Out of a total of 171 questionnaires sent out, 122 (71.3%) were returned. Thirteen DEO's, 47 teacher educators, 25 technical teachers, and 37 graduate students responded.

Data Analysis

The Statistical Analysis Systems (SAS) was used in analyzing the data. In analyzing questionnaire items in which the 1 to 99 response scale was employed, the original responses were non-linearly transformed (PROBIT) using the scale of normal deviates (Z) as described by Wolins and Dickinson (1973). With this transformation, a response of 99 was coded +2.326, 75 as +0.674, 50 as 0.000, 25 as −0.674, and 1 as −2.326. The transformation has the effect of "spreading out" the tails of the scale and "pushing together" the scores occurring near the middle (Warren, Klonglan, & Sabri, 1969).

Judgement as to the program variables to emphasize in Nigerian undergraduate industrial teacher education was based on a predetermined cut-off point set at the 70th prcentile (0.53 on the transformed scale). Mean ratings less than 0.53 were considered low and, therefore, unimportant.

Results

One hundred twenty-two respondents provided the data for the study. There were 13 administrators (representing 10.7% of the total sample), 47 teacher educators (38.5%), 37 graduate students (30.3%), and 25 technical teachers (20.5%). Eighty-five respondents (69.7%) were resident in Nigeria. Thirty-seven (30.3%) of the respondents were resident in the United States. Only two females participated in the study. The sample was, therefore, predominantly male (98.4%). Nine of the respondents indicated that they had earned doctorate degrees; 43 had master's degrees; and 54 had bachelor's degrees. Sixteen respondents possessed "other" non-degree qualifications including the Nigerian Certificate in Education (NCE) and the Higher National Diploma (HND).

Need for Degree Programs in Industrial Teacher Education

As a background for the major questions of the study, the perceptions of the respondents were sought regarding the need for Nigerian colleges and universities to provide degree programs in industrial and technical teacher education. The respondents were asked to rate their perceptions on a scale of 1 to 99. The results showed that the four groups of respondents considered it *very important* that the colleges and universities offer degree programs in industrial teacher education ($\bar{X}=1.36$; S.D. $=0.88$)*.

Areas of Specialization

The perceptions of the respondents were further sought regarding technical specializations that should be emphasized in undergraduate industrial teacher education programs in Nigeria. The identified areas of specialization and the respondents' mean ratings of their importance are presented in Table 1. Table 1 shows that relatively high ratings were recorded for all the three areas identified. Trade and industrial education ranked highest with a mean rating of 1.28.

TABLE 1: Means (by rank), standard deviations, and analysis of variance of perceived importance of identified areas of specialization.

	Areas of specialization	*Overall mean*	*Std. dev.*	*F-value*
1.	Trade and industrial education for teachers of vocational subjects in secondary and technical schools.	1.28	0.79	3.65*
2.	Industrial technology for industrial trainers.	1.08	0.84	2.50
3.	Industrial arts for teachers of prevocational programs in Nigerian secondary schools.	0.94	0.81	1.15

*Significant beyond the 0.05 level.

**Note that the means and standard deviations reported throughout this paper were computed from transformed (Z) values and not from the original 1 to 99 responses.*

Program Objectives

It was considered necessary to determine the importance of objectives to be pursued in industrial and technical teacher education programs in Nigeria. The results are shown in Table 2.

Table 2 shows that all the nine objectives identified in the study were rated above the 70th percentile cut-off point meaning that they were perceived as *very important* objectives. "Producing qualified technical teachers in sufficient numbers to meet national needs" received the highest rating ($\bar{X}$=1.62).

TABLE 2: Mean ratings, standard deviations, and analysis of variance relating to the importance of objectives to be emphasized in programs*.

General Objectives	*Overall mean*	*Std. dev.*	*F-value*
1. Producing qualified technical teachers in sufficient numbers to meet national needs.	1.62	0.68	0.32
2. Providing technical knowledge and vocational skills necessary for effective technical teaching.	1.38	0.71	1.12
3. Enhancing and promoting students' interest and attitude toward the profession of industrial and technical teaching.	1.13	0.71	1.12
4. Providing opportunities for the development of independent thinking and problem-solving skills.	1.12	0.74	1.22
5. Providing a balance between the theory and practice of contemporary industrial teaching.	1.10	0.78	1.58
6. Creating in students an awareness of the impact of industry and technology on society.	1.07	0.71	3.34**
7. Providing educational experiences to meet the needs and interests of individual students.	1.07	0.81	2.55
8. Providing a balance of general, technical, and professional education.	1.01	0.82	0.89
9. Providing extra curricular activities which enhance students' potential for further professional development.	0.79	0.74	2.61

*Mean ratings are in rank order.
**Significant beyond the 0.05 level.

A third objective of this study was to determine the program components to be emphasized in industrial and technical teacher education programs in Nigeria. Seventeen variables which describe the pedagogical, technical, and general education components of industrial and technical teacher preparation were identified and the respondents were asked to rate how important each of them was for Nigerian programs. The results are presented in Table 3.

The results presented in Table 3 indicate that item 1, "Practical application of technical skills.." was ranked highest in importance compared with the other items. And generally, variables describing the technical and pedagogical components of teacher preparation received relatively higher ratings than those related to the general education component (items 15 and 17). It is equally important to note that there were significant differences in the perceptions of the respondents in respect of twelve items, seven of which were beyond the 0.01 level. Further analysis of the significant F-values using the Scheffé's multiple range test revealed that teacher educators and graduate students differed significantly in their mean ratings of all the items. Graduate students and DEOs differed over items 4, 7, and 13; teacher educators and technical teachers differed over items 6 and 13. The only item in which differences existed between DEOs and technical teachers was 13. All the pairwise comparisons for item 13 resulted in significant differences among the four groups of respondents. The item received a particularly low rating ($\bar{X}=0.36$) from the DEOs implying that Nigerian administrators do not consider follow-up studies, and perhaps program evaluation generally, as an important component of teacher preparation programs.

Discussions

The major purpose of this study was to gather the perceptions of Nigerian administrators, teacher educators, technical teachers, and graduate students of industrial education regarding certain variables considered essential in developing undergraduate industrial and technical teacher education programs in Nigeria. Three program variables that were addressed by the study included: (1) areas of teaching specialization, (2) program objectives, and (3) program components to be emphasized in Nigerian industrial teacher education programs.

Respondents in the study were asked to rate on a 1 to 99-point scale how important it was to provide more degree programs of industrial teacher education in Nigerian colleges and universities. The results showed that the respondents were strongly in favour of establishing such programs. This was inferred form the high mean response to that question ($\bar{X}=1.36$ on the transformed scale). The need for more programs to train competent technical teachers has been highlighted in Nigeria's educational policy (1981) as well as in the literature (e.g. Aina & Beecroft, 1982; NERC, 1980).

Based on the premise that the teacher is the key element in any educational program, Aina and Beecroft (1982) blamed the poor performance of Nigerian vocational school graduates on the quantity and quality of the nation's technical teachers. These writers specifically pointed out acute shortages in the supply of qualified technical teachers in Nigerian schools and colleges. It seems logical to conclude that Nigeria's recent emphasis on vocational and technical education may not yield meaningful results unless adequate steps are taken to improve industrial teacher (graduate) output in both quantitative and qualitative terms.

Traditionally, industrial teacher education programs in most universities provide specialization in three major areas, namely, industrial arts/technology education, trade and industrial education, and industrial technology. The respondents in this study were asked how important it was to emphasize these specializations

TABLE 3: Mean ratings, standard deviations, and analysis of variance relating to the importance of components to be emphasized in programs.

Program components (in rank order)	*Overall mean*	*Std. dev.*	*F-value*
1. Practical application of technical skills, knowledge and attitudes to real life situations.	1.49	0.70	2.80*
2. Measuring and evaluating student progress.	1.21	0.72	2.02
3. Conducting and supervising students' industrial work experience in co-operation with employers	1.13	0.74	3.40*
4. Designing and utilizing appropriate teaching aids.	1.11	0.74	5.75**
5. Planning and implementing instruction.	1.10	0.70	4.94**
6. Organizing group discussions, demonstrations, field trips and other instructional strategies.	1.06	0.78	6.59**
7. Managing the industrial education laboratory or shop.	1.06	0.73	5.42**
8. Familiarity with research methods, techniques, and practices, and utilizing them to improve instruction.	1.04	0.79	1.66
9. Conducting and supervising students' practice teaching experience.	1.03	0.73	2.44
10. Understanding the theoretical bases of the major industrial or technical teaching speciality.	0.99	0.76	2.67*
11. Applying the theories and principles of teaching and learning to classroom situations.	0.98	0.78	5.91**
12. Applying the principles of guidance and counselling and communicating same to students.	0.83	0.76	1.63
13. Conducting follow-up studies of program graduates.	0.82	0.83	7.38**
14. Managing classroom resources and problems.	0.78	0.73	3.05*
15. Mastery of other subject areas related to technical speciality.	0.73	0.72	4.44**
16. Knowledge and understanding of the historical, social, and philosophical foundations of vocational and technical education.	0.62	0.68	0.77
17. Developing student interest and awareness in the contemporary social, economic, and political life of the community.	0.61	0.72	2.83*

*Significant beyond the 0.05 level.

**Significant beyond the 0.01 level.

in Nigeria. The results presented in Table 1 showed that trade and industrial education received the highest rating ($\bar{X}$=1.28). Interestingly, the least rated area was industrial arts/technology education, regardless of the prominent place of this area in the junior secondary schools. In interpreting this finding, however, it should be realized that trade and industrial education is the area most frequently offered in Nigerian schools and colleges. It is, therefore, likely that most of the respondents in the study had trade and industrial education backgrounds and that, probably, explains the high importance they attach to that area of specialization.

It was considered necessary to determine the broad objectives that should be emphasized in Nigerian teacher preparation programs. The results of the analysis as shown in Table 2 indicate that all the nine objectives identified for Nigerian industrial teacher education were considered *very important*. A ranking of the objectives showed that the respondents recognized the exigency of producing qualified technical teachers in sufficient numbers to meet the increasing demand for them in Nigeria. It was proposed in the country's educational policy document that "Where necessary, local craftsmen will be used to teach pupils" (Federal Rep. of Nigeria, 1981, p. 20). This proposal reinforces the observation by Adamsky and Cotrell (1979) that a common practice in industrial education is the lowering of certification standards in order to cope with teacher shortages. And according to these authors, when people who have little or no formal teacher preparation are recruited as teachers, the question of quality attracts attention (p. 13).

The third objective of the study was to determine the program components that should be emphasized in Nigerian industrial teacher education. The literature (e.g. Corrigan, 1983; Hauenstein, 1977) suggests that an industrial teacher education program should consist of at least three major components: (1) professional education, (2) technical teaching subject, and (3) liberal arts or general education. Seventeen elements of the above components were identified in the study and all 17 elements were considered *important* as inferred from their overall mean ratings. However, there were significant differences in the degree of importance of most elements as perceived by the respondents. Through a process of rank ordering (Table 3), it was found that elements that describe the technical subject and the professional education components received relatively higher ratings than those describing the general education component. Similarly, items related to theoretical learning received relatively lower ratings.

This pattern of responses can be understood from the growing feeling among many Nigerian educators who recognize that greater emphasis should be placed on the practical aspects of the country's technical education needs. This feeling might be a carry-over from the desire to part with the grammar school emphases of the colonial era. It is not unlikely that this feeling is being stretched too far. For example, it seems that even vocational and technical educators do not consider it of much importance to stress "Knowledge and understanding of the historical, social, and philosophical foundations of vocational and technical education" in teacher education programs. This is inferred from the low rating of that item in Table 3. Inasmuch as the present level of Nigeria's economic and technological development calls for a strong practically-oriented technological education, it is doubtful whether a total neglect of socio-cultural or liberal arts studies is desirable even in vocational and technical education programs.

Another striking finding from the analysis related to program components was the relatively low rating noted for "follow-up studies" (item 13, Table 3). Particularly, it was found that administrators and

teacher educators assigned very low ratings to this item (DEOs — 0.36, teacher educators — 0.52). One can safely conclude that Nigerian administrators and teacher educators do not consider program evaluation through follow-up studies as an important component of program development and improvement. This probably explains why it seems that the quality of vocational teacher education in Nigeria has been at such a low ebb. If the programs are not evaluated on an on-going basis, it will be difficult to know where problems exist or where improvements need to be made.

Recommendations

Based on the findings of this study, it was recommended that the Federal Government of Nigeria should concentrate its efforts and resources on strengthening local institutions so that competent teachers can be produced locally. The findings of this study will be valuable to Nigerian universities or colleges that want to start degree programs in industrial teacher education.

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A Measurement Model for Labor Force Attachment of American Youth*

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ABSTRACT

The paper examines the problems surrounding measurement of youth labour force activity. A new measure of the labour force attachment of youth is developed and applied to the data from the Youth Cohort of the National Longitudinal Surveys of Labour Market Experience. Implications of this measure for research on youth labour markets are then detailed. It is indicated that this measurement model can act as a useful criterion variable for examining outcomes of public investments in youth employability such as vocational education.

Introduction

Concern about youth employment are pervasive among policymakers, politicians and the public throughout the world. Labour force statistics, especially the unemployment rate, are used throughout industrialized nations to signify the economic condition of labour forces. Yet substantial refinements are required to reduce current problems in the measurement of youth labour force activity to provide clearer guidance for youth employment policy, practice and research. The aims of this paper primarily are methodological and exploratory. A new measure of the labour force attachment of youth is developed that is one solution to some of the problems surrounding measurement of youth labour force activity.

First, the issues leading to the need for these new methods are examined by outlining common methods for measuring labour market activity and their flaws and by reviewing alternative measures that have been proposed. Second, a theoretical and empirical measure of labour market attachment of youth is detailed. Third, the measure is estimated and evaluated with data from the Youth Cohort of the National Longitudinal Surveys of Labour Market Experience. And, fourth the implications of this new measure for research on youth labour markets are described.

The Problem

Common Labour Force Measures

A common way to measure the performance of an economy is through examination of the status of its workers in the labour force. For instance, the labour force activity of the United States population is catalogued through responses to the Current Population Survey (CPS),

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a monthly household survey.[1] The CPS is a major source of information in the United States for economic policy analysis and debate and for deciding how public moneys should be distributed to meet economic and social needs. Similar definitions of labour force activity to those applied in the CPS are used throughout the world to inventory the economic well-being of people in countries and regions.

Respondents to the CPS are categorized as either out of the labour force or in the labour force. People not working for pay during the week the CPS is administered and who did not actively seek work during the previous four weeks are classified as out of the labour force. People in the labour force are either employed or unemployed. Employed people are those who work at least one hour for pay in the CPS survey week in their own business, professions, or farms or who work at least 15 hours or more as unpaid workers in a family enterprise. Volunteer work and own-home repair are not considered employment. Unemployed people do not work during the CPS survey week, are available for work, and tried to find work within the previous four weeks.

From the distribution of people into these categories are derived a variety of policy-relevant measures, some of which include:

* *The Civilian Labor Force*—Total of noninstitutionalized civilians age 16 and over who are employed or unemployed;

* *The Labor Force Participation Rate*—Percentage of the civilian noninstitutional population that is in the labor force; and

* *The Unemployment Rate*—Percentage of the civilian labor force that is unemployed.

Flaws in the Measures

Of all of the measures derived from CPS data, the unemployment rate probably receives the most attention. Yet, considerable debate occurs about the usefulness of the unemployment rate as an indicator of the performance of an economy (see, e.g., Summers, 1981). A fundamental element in this debate are concerns over the quality of measurement of labor force status, especially for youth. These concerns, a few of which we outline in the remainder of this section, were reviewed in detail by Passmore (1981) and Passmore and Blake (1983).

Based upon reanalysis of 1976 CPS data, Poterba and Summers (1984) found that 10% of those truly unemployed was classified as out of the labor force and an additional 3.6% was recorded as employed. About 75% of the unemployed inconsistently reported the duration of their unemployment, with new entrants and reentrants to the labor force having the greatest tendency to overstate the duration of their unemployment. Compounding the problem for measurement of youth labor force activity is that CPS respondents may not be youths themselves, but rather simply are responsible members of sample households. Errors in recall or reporting, then, could especially affect youth labor market data if proxy respondents are interviewed.

The distinction between the categories of *unemployed* and *out of the labor force* applied in the CPS is weak. Clark and Summers (1979) found spells of unemployment separated by brief periods outside the labor force to be common. Assessments of labor force status at a point in time fail to account for the dynamics of youth labor force behavior. Poterba and Summers (1984) found that 26% of CPS respondents who moved out of the labor force from an unemployed state and then

[1]See U. S. Department of Labor (1976) for a complete account of CPS concepts, methods and procedures.

back again failed to report accurately that they started a new spell of unemployment. Moreover, Flinn & Heckman (1983) asserted that there are few differences between the labor market behaviour of youth who are unemployed and those who are out of the labor force. From these studies we conclude that errors of categorization and of attribution of meaning occur between unemployed and out of the labour force states. These errors probably are significant in youth labor market data.

Some Alternative Measures

Dissatisfaction with traditional labor force statistics, particularly the unemployment rate, led to the quest for new measures in the United States. For instance, The Joint Economic Committee of the United States Congress pressed in the mid-50's for a measure that would include part-time workers (who are employed according to standard definitions) with the count of the unemployed. The Office of Statistical Standards of the United States Bureau of the Budget rejected this measure because its usefulness was unproven and because it failed to counterbalance for offsetting overtime work (Bancroft, 1962)[2].

Havens (1977) proposed a Labor Force Attachment Index to measure employment conditions of women because traditional labor force measures fail to account for the intermittent,, seasonal, and part-time nature of female labor force participation. This Index was composed using the number of weeks since leaving school, weighted by the average hours worked per week, divided by the total weeks elapsed since school leaving.

From a focus on refinement of unemployment measures, work progressed to development of indexes of hardship caused by lack of employment or by low income employment. Data from the 1966 *Urban Employment Survey* of the United States Department of Labor was applied to create a Subempoyment Index (described in Harrison, 1972) to compare income and unemployment in urban ghettoes with their surrounding metropolitan areas. The Subemployment Index included:unemployed people; people working part-time for economic reasons; heads of households under 65 years old, who earned less than $60 per week; and people who are *not* heads of households, are under 65 years old, and earned less than $56 per week. The Index also included one-half of all male discouraged workers (people out of the labor force because they stopped trying to find work) between 20 and 64 years old, and an estimate of one-half of the "unfound males" missed by survey enumerators.

Levitan and Taggart (1974) created the Employment and Earnings Inadequacy Index to describe the amount and distribution of labor market hardship in the economy. The index is the ratio of the number of unemployed people, discouraged workers, employed heads of households with earnings less than poverty level, and people working part-time for economic reasons to the number in the civilian labor force (to include discouraged workers). The Index excluded full-time students between 16 and 21 years old as well as people older than 64 years.

Labor market statistics in the United States have not changed, for the most part, to accommodate refinements proposed to enrich their meaning, although interest in such changes seems to rise and fall with the unemployment rate. In developing and third world nations, however, statistics characterizing labor market hardship are strongly in demand. Much interest has centered on development of measures of underemployment, which is defined by the Eleventh International

[2]See also, Gilroy (1975) for similar measures based on labor force time lost due to part-time work.

Conference of Labor Statisticians in 1966 as existing when:

> "A person's employment is inadequate to specified norms or alternative employment, account being taken of his occupational skill (training and work experience). (cited in Clogg. 1979, p. 33)".

Two forms of underemployment were identified by the statisticians. Visible underemployment is an insufficiency in the volume of employment and is measurable by labor force surveys. Invisible underemployment refers to a misallocation of labor resources and to the weak degree of balance between labor and other production factors. Low income, under-utilization of skills, and low productivity are main indicators of invisible underemployment.

Clogg (1979) defined and tested a measure of underemployment using CPS data from 1969 through 1973. His measure was based on a definition of invisible underemployment in which time spent in employment, income derived from work, the productivity of work, and workers' skill utilization were used to operationalize the measure of underemployment. His approach is a strong analytical tool, because it allows his mathematical model of underemployment to be rejected given the characteristics of the observed data. Also, his methods allow various hypotheses to be examined about the relationships between underemployment and explanatory variables such as race, sex, and school experience.

Focus of Present Research

The model described in the next section of this paper is a new measure of labor force attachment that remedies several problems with the measures previously reviewed. First, it explicitly estimates and accounts for error of measurement — which, as we have observed, can be quite substantial — that attenuates relationships between observed measures of labor force activity and other variables. Second, it accumulates information about labor force activity over time rather than assessing labor force status at a point in time. Third, the model includes information about labor force activity and about attitudes toward paid employment which may influence actual labor force behaviour and may be a significant factor in career development.

Methods

Target Population and Sample

Data for this study are from the Youth Cohort of the National Longitudinal Surveys of Labor Market Experience (NLS) (Center for Human Resource Research, 1983a). The NLS sample represents the labor market experience of non-institutionalized youth in the continental United States who were 14 through 21 years old as of January, 1979. The probability sample selected consists of 5,700 men and 5,700 women, with overrepresentation in the sample by blacks, Hispanics, and economically disadvantaged whites. An additional 1,300 young people serving in the armed forces also are sampled. The NLS Youth Cohort was interviewed for the first time in early 1979 and subsequently has been interviewed annually[3]. For computational convenience, we select 8,887 youths for our study from the total NLS Youth Cohort by deleting sample members with missing observations for any variable included in our model of labor force attachment. The sample selected for our analysis contains 49% males and 70% whites. Also, 61% of sample members were less than 21 years old as of January 1979.

[3]See Center for Human Resource Research (1983b) for more information about sampling and interview design for the NLS Youth Cohort.

Variables[4]

Our model of labor force attachment of youth consists of two major components: work experience and commitment to work. Our reasoning is that attachment to the labor force by youth not only is developed by actual experience with finding, obtaining, and keeping a job but also by holding preferences and tastes for paid employment rather than nonmarket activity. Table 1 contains the means, standard deviations, and intercorrelations of 13 observed measures of work experience and commitment to work examined in this study.

WORK EXPERIENCE

The work experience component measures a youth's current labor market status as well as labor market participation over a three-year period. The first variable, LF81, in the work experience component is an indication of whether the youth was employed during the 1981 NLS survey week (coded "1" if employed; "0" otherwise). Two other work experience variables, W79 and W80, are the number of weeks the youth spent in the labor force (that is, weeks employed and unemployed) in 1979 and 1980, respectively.

COMMITMENT TO WORK

We divide commitment to work into two aspects. The first aspect includes the youth's stated preference to work or to seek education to prepare for work over other nonmarket activities. Although the majority of youths in the United States have a strong taste for work over nonmarket activities (Andrisani & Parnes, 1983), low preference for paid employment often can result from unfavourable first labor market experiences (Andrisani, 1978).

Preference for work over nonmarket activity is expressed in our model by three variables measured in the 1979 wave of the NLS. One variable, COM1, is created from response to the question, "Would you seek more education if you were unable to support your family?" Another variable, COM2, is derived from response to the question, "Would you enter a training program if you were unable to support your family?" The third variable, COM3, is formed by responses to the question, "Would you still work if you could live comfortably without working?" COM1, COM2, and COM3 are coded as "1" if a "yes" response is given and as "0" if any other response is given.

The second aspect of commitment to work covers what labor economists term a youth's "reservation wage", that is the threshold wage which a youth feels must be offered before the choice is made to seek work rather than to remain idle. Anderson (1980) contended that lack of willingness to work at the minimum wage level accounts for a significant portion of high minority youth unemployment rates in the United States. Borus (1981) found, however, that the reservation wage for non-white youths was lower than for white youths in a number of jobs commonly held by adolescents.

Seven variables are used to estimate the NLS respondent's reservation wage. Each youth respondent to the 1979 NLS survey was asked whether they would accept seven hypothetical jobs at various thresholds — $ 2.50 per hour (coded "1"), $ 3.50/hour (coded "2"), $ 5.00 per hour (coded "3"), or at none of these wage levels (coded "4"). Jobs were doing cleaning (CLEAN), washing dishes (DISH), working in a factory (FACT), making hamburgers (HAM), working in a national park (PARK), working for neighbours (NEIGH), and working in a supermarket (SUPER).

[4]Variables names and formats from the NLS data tapes are available in Ay (1985, Table 2).

TABLE 1: Intercorrelations, Means, and Standard Deviations of Variables Used to Measure Labor Force Attachment of United States Youth (n=8,887).

Observed Measures	*Observed Measures*												
	COM1	COM2	COM3	CLEAN	DISH	FACT	HAM	NEIGH	PARK	SUPER	LF81	W79	W80
	Intercorrelations												
COM1	1.000												
COM2	.453	1.000											
COM3	.107	.093	1.000										
CLEAN	−.026	−.061	−.062	1.000									
DISH	−.044	−.048	−.061	.815	1.000								
FACT	−.022	−.081	−.035	.674	.679	1.000							
HAM	−.034	.069	−.051	.722	.771	.656	1.000						
NEIGH	−.035	−.074	−.110	.701	.672	.558	.610	1.000					
PARK	−.015	−.083	−.071	.349	.339	.383	.349	.495	1.000				
SUPER	−.024	−.053	−.030	.632	.655	.615	.795	.548	.388	1.000			
LF81	.026	.084	.059	.130	.158	.114	.177	.113	.015	.164	1.000		
W79	.009	.043	−.016	.256	.305	.239	.381	.201	.108	.310	.426	1.000	
W80	0.24	.061	.028	.220	.251	.197	.302	.163	.074	.254	.634	.661	1.000
	Means												
	.881	.954	.821	2.718	2.639	2.539	2.371	2.709	2.348	2.189	.717	24.664	31.125
	Standard Deviations												
	.324	.210	.383	1.181	1.193	1.123	1.221	1.187	1.223	1.139	.451	22.031	20.808

The Model

EMPIRICAL SPECIFICATION

Let x represent a vector containing the 13 observed measures of labor force attachment for each youth. We propose that the observed measures are generated through the following relationsip:

$$x=\Lambda\xi+\epsilon, \quad (1)$$

where:

ξ = a vector of Q latent, unobserved measures of youth labor force attachment hypothesized to generate the observed measures of attacment;

Λ = a $13\times Q$ matrix of coefficients of regression of x on ξ, with some elements of Λ equal to zero by hypothesis; and

ϵ = a vector of length 13 produced by measuring the Q latent variables with a fallible vector of x.

Let R represent the 13×13 symmetric matrix of intercorrelations among the observed measures in x for the 8,887 youths in this study (shown in Table 1). The diagonal elements of R are equal to one. The off-diagonal elements of R are a mixture of three types of correlation coefficients. Correlations among continuous variables are computed as common and familiar Pearson product moment correlations. However, this type of correlation is not appropriate when categorical variables are involved. Rather, elements of R are polyserial correlations, when categorical variables are correlated with continuous variables, and polychoric correlations, when categorical variables are correlated with other categorical variables.[5]

R can be decomposed as follows:

$$R=\Lambda\Lambda'+\theta_{\epsilon}, \quad (2)$$

where $\theta\epsilon$ is a 13×13 diagonal matrix containing variances of the elements of ϵ. Specification of θ_{ϵ} as a diagonal matrix indicates our simplifying assumption that the ϵ's are not correlated, which also implies that no latent variables are omitted from the set of latent variables hypothesized.

An element of θ_{ϵ} is the error variance associated with estimating a latent variable from an observed measurre of labor force attachment. Therefore, the reliability of an observed measure, say x_1, is computed from 1 minus the error in estimating λ_1 or, in general, the reliability of any of m observed measures is equal to:

$$1-\theta_{mm'} \quad (3)$$

The measure of reliability computed in this way is equivalent to the squared multiple correlation between the latent variable and its observed measure, the same concept introduced in standard works on measurement methodology (cf. Gulliksen, 1950).

If the model for measuring labor force attachment represents the data adequately, then R should be closely represented by Σ, a 13×13 symmetric matrix created by $\Lambda\Lambda'$. This means that, for example, $r_{12}=\sigma_{12}=\lambda_{11}\ \lambda_{12}$ if the model fits the data perfectly. This relationship between the elements of Λ, which must be estimated, and the correlations in R, which are observed, provides the basis for determining the fit of the hypothesized model of labor force attachment to the data.

Correlations among latent variables are estimated in Φ, a $Q\times Q$ symmetric matrix. Elements of Φ represent "pure" relationships in the sense that they are based upon the latent variables, not on the fallible measures. This avoids the problem of attenuation, or underestimation, of the magnitude of relationships between vari-

[5]Consult Jöreskog and Sörbom (1984) for a description of polyserial and polychoric correlations and for references to the statistical literature describing theory and practice behind these types of correlations.

ables that can occur when variables are measured with error. For instance, a correlation between whether youths are labor force participants in 1981 and the number of weeks they spent in the labor force in 1980 will be smaller than its true value if either variable is measured with error. Of course, most measurements of human behaviour and activity contain substantial errors of measurement which, if not taken into account, can bias inferences from observations severely.

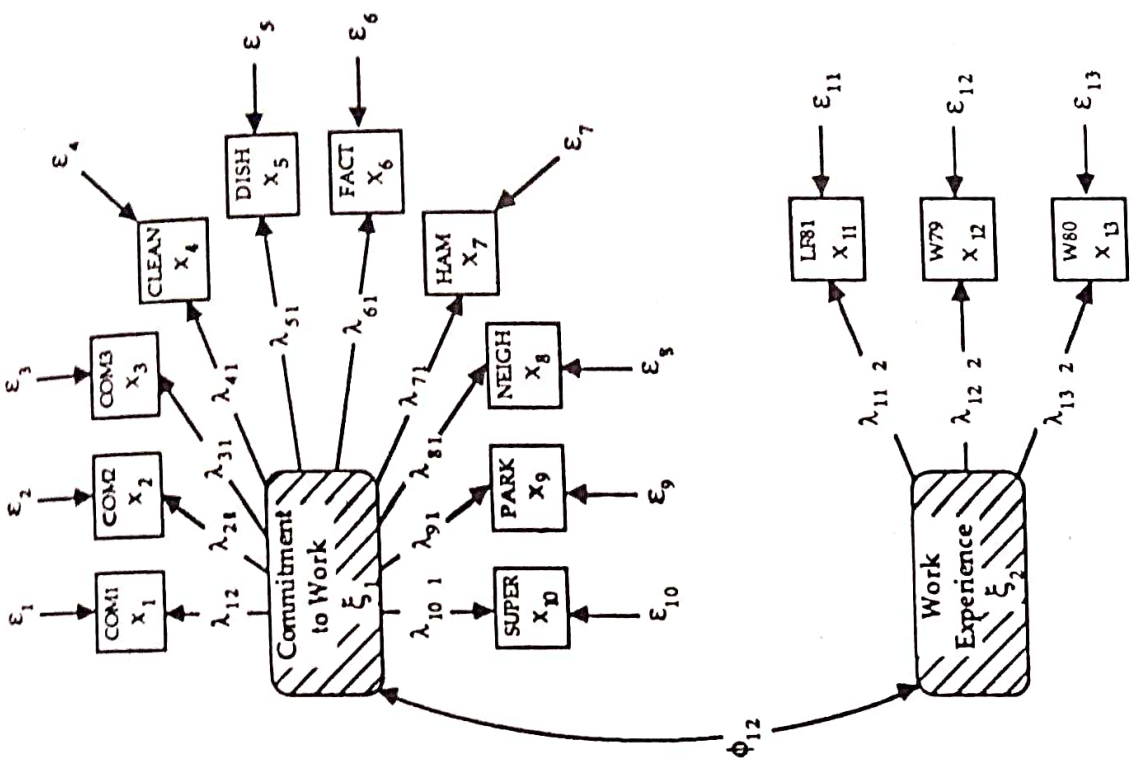
Equations (1) and (2) describe the classic factor analysis model outlined by Harmon (1947), Mulaik (1972), and many other authors — with one important difference, however. The classic factor analysis model is described most appropriately as an exploratory analytical tool because every observed measure estimates a latent variable. Exploratory factor analysis is something of a "dustbowl" technique in the sense that lack of a theoretical structure for the data can result in the number of latent variables estimated actually being equal to the number of observed measures. The purpose is to explore the underlying structure of the data. The factor analysis methods applied in this research are best described as confirmatory analytical tools because observed variables are hypothesized to measure only particular latent variables. The purpose is to evaluate a hypothesis about the structure of the data. A confirmatory factor analysis model sometimes is called a "measurement model" because it allows the estimation of the measurement errors made in substituting observed measures for "true" measures of phenomena. Confirmatory factor analysis methods are applied in this research which originally were developed by Jöreskog and Sörbom (1984).

In this research, two confirmatory factor models, shown in Figure 1, are estimated and evaluated. One specification hypothesizes two latent variables to describe labor force attachment of youth in the United States (the Two Latent Variable Specification, or 2LVS); the other specification hypothesizes three latent variables (the Three Latent Variable Specification or 3LVS). Small squares in Figure 1 represent observed variables; shaded rectangles represent latent variables. Unidirectional arrows from latent variables to observed variables indicate a postulated influence of a latent variable on an observed measure. The degree of influence is indicated by coefficients in Λ, also shown on the figures. Unidirectional arrows without sources that point to observed measures indicate the influence of error of measurement, estimated in θ_ϵ on the observed measures, that is, the error made substituting the observed measure for the "true" value of a variable. Bidirectional arrows indicate simple, although not necessarily causal, relationships, estimated in Φ, between latent variables.

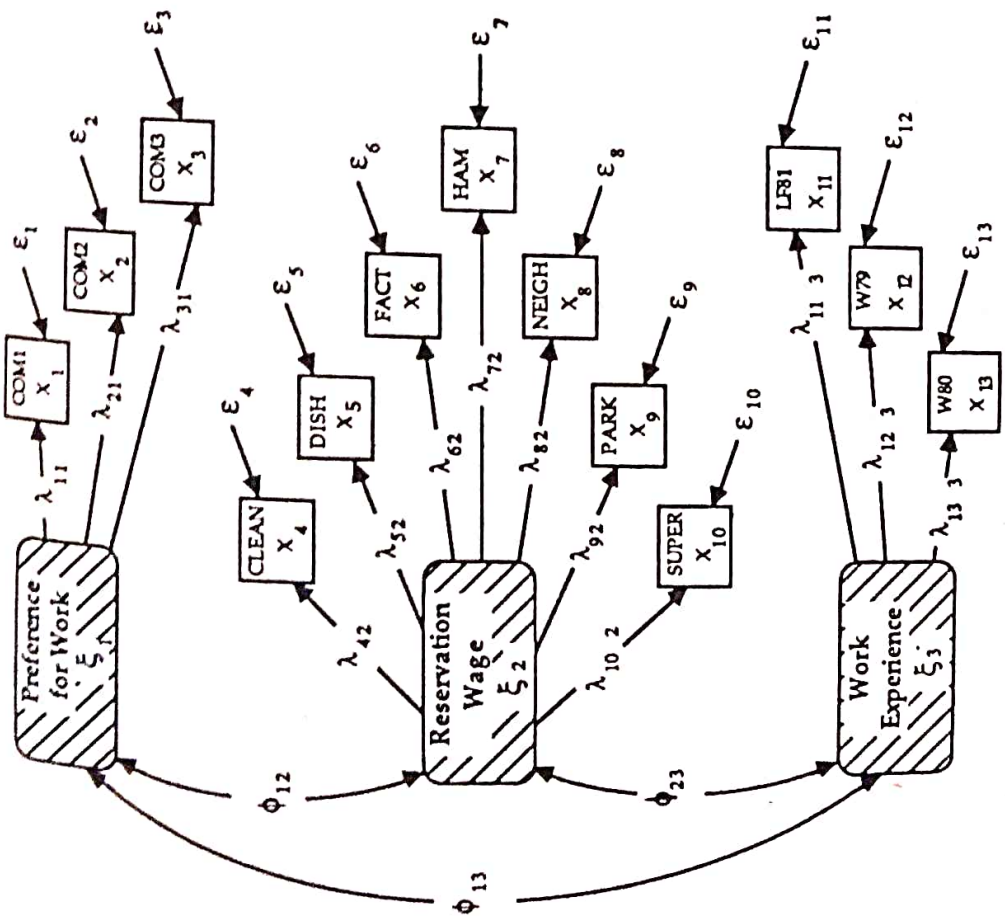
Thirteen equations are estimated in each confirmatory factor analysis model represented in Figure 1. Matrix equation (1) is estimated for each observed measure in each specification. The 2LVS (where $Q=2$) contains latent variables which we describe as Commitment to Work and Work Experience. Commitment to Work is measured by COM1 COM2, COM3, CLEAN, DISH, FACT, HAM, NEIGH, PARK, and SUPER. Work Experience is measured by LF81, W79, and W80. In a slight variation, the 3LVS (where $Q=3$) treats the notion of Reservation Wage (measured by CLEAN, DISH, FACT, HAM, NEIGH, PARK, and SUPER) as a latent variable separate from Preference for Work (measured by COM1, COM2, and COM3). Work Experience is measured in the 3LVS in the same way as in the 2LVS.

Identification

Stated simply, the identifiability problem is one of determining whether the unknown parameters of the measurement models in Figure 1 (Λ, θ_ϵ, and Φ) can be estimated uniquely. Any given specifica-



Two Latent Variable Specification



Three Latent Variable Specification

Figure 1. *Hypothesised Model of Labor Force Attachment of U. S. Youth by Specification.*

tion generates one, and only one, Σ, but many different specifications could generate the same Σ. If two or more specifications generate the same Σ, then the specifications are said to be equivalent, and the parameters of the model cannot be identified uniquely. A consistent estimate of a parameter is not available if the parameter is not identified.

A necessary condition of identifiability is, loosely stated, that the number of non-redundant elements of R must be at least equal to the number of parameters estimated. The 2LVS and the 3LVS both meet this criterion because R contains 91 non-redundant correlations and far fewer parameters are estimated in both specifications. However, sufficient conditions for identifiability are complex to evaluate a priori[6]. Fortunately, though, it is virtually impossible to compute estimates of any of the parameters if these conditions are not met.

Estimation

Parameters for the specifications shown in Figure 1 are estimated through iterative, unweighted least squares techniques. These techniques minimize a fitting function composed of one-half of the sum of squares of the diagonal elements of a matrix formed by $R-\Sigma$ using a computing program called LISREL VI (USERPROC LISREL, 1984). The program selects initial values for the iterative process in a manner detailed by Jöreskog and Sörbom (1982). It makes use of first order partial derivatives and approximations to the second order derivatives of the fitting function to generate successive parameter estimates until a convergence criterion is reached.

Because R contains polyserial and polychoric correlations, maximum likelihood methods of estimation cannot be used. The method of unweighted least squares estimation does not require assumptions such as multivarariate normality, about the joint distribution of the observed measures. However, null hypothesis testing methods common to maximum likelihood procedures cannot be applied in this study to evaluate the fit of the two specifications of our model of labor market attachment of youth.

Evaluation

A number of aspects of each of the confirmatory factor analyses conducted in this research are examined to determine the appropriateness of the 2LVS and the 3LVS for description of labor force attachment of United States youth. Several summary indices portray the fit of the model specifications to the NLS Youth Cohort data. And, a number of consistency checks are made to uncover faulty analyses.

An adjusted goodness-of-fit index is formed by computing:

$$1-[\mathcal{J}(\mathcal{J}+1)/2df](1-g), \quad (4)$$

where:

$\mathcal{J}=$ number of observed measures of labor force attachment ($\mathcal{J}=13$ in this study);

$df=$ degrees of freedom in the specification computed as $.5\mathcal{J}(\mathcal{J}+1)-h$, with h equal to the number of parameters estimated; and

$g=1-[tr(R-\Sigma)^2/tr(R^2)]$, where tr indicates the trace of a matrix.

Equation (4) is termed an *adjusted* goodness-of-fit index because it is the discrepancy between observed and hypothesized relationship among measures of labor force attachment that is adjusted by the degrees of freedom. This index varies between zero and one, with index values close to one indicating a stronger

[6]These involve whether the probability limit of the matrix of second order derivatives of the fitting function to solve equation (1) is positive definite.

fit than those nearer to zero. Unfortunately, the statistical distribution of the adjusted goodness-of-fit index is not known; so there is no known probability distribution to compare with the computed index.

A coefficient of determination indicates how well the observed measures jointly serve as instruments to measure latent variables of labor force attachment. The coefficient is computed by

$$1 - |\theta| / |R|, \quad (5)$$

where:

$|\theta|$ = the determinant of $\theta\epsilon$, the diagonal matrix of error variances of ϵ; and

$|R|$ = the determinant of R, the symmetric matrix of intercorrelations of observed variables.

The coefficient of determination varies between zero and one, with large values associated with well-fitting specifications of the model.

The root mean square residual is defined as the average of the variances and covariances of the residual matrix formed by $(R-\Sigma)$. Average values close to zero indicate small average discrepancies of the correlations between observed measures and the correlations that would occur if the hypothesized specification of labor force attachment considered actually is true.

The relative appropriateness of the 2LVS vs the 3LVS is examined in this research by comparing adjusted goodness-of-fit indices, coefficients of determination, and root mean square residuals produced by each specification. However, because no explicit statistical hypothesis tests are available to compare the two specifications, the relative fit of specifications to the data are determined by comparing the magnitudes and signs of parameters estimated between specifications.

For matters of consistency, lack of fit of the specifications to the data is indicated by values of ϵ outside the range between zero and one, R matrices that are positive definite, and squared multiple correlations of observed and latent variables that are negative.

Findings

Both specifications fit the data well. Adjusted goodness-of-fit indices are close to one — .935 for the 3LVS and .966 for the 2LVS. The coefficient of determination for the 3LVS is .994 and for the 2LVS is .976. Root mean square residuals are close to zero — 0.43 for the 2LVS and .066 for the 3LVS. No problems are evident with the identifiability of either specification, nor are any inconsistencies in the estimations observed.

Estimates of confirmatory factor analysis parameters displayed in Table 2 reveal, however, at least two reasons why the 3LVS is a richer and more useful empirical specification of the labor force attachment of United States youth than the 2LVS. First, the reliabilities of three observed measures of Preference for Work — COM1, COM2, and COM3 — are higher in the 3LVS when they are separated from observed measures of Reservation Wage than when they are lumped together in the 2LVS with observed measures of Reservation Wage — CLEAN, DISH, FACT, HAM, NEIGH, PARK, AND SUPER — to form a global measure of Commitment to Work. Of course, the complement of this first reason is that values of λ are greater for COM1, COM2, and COM3 when are used by themselves to measure Preference for Work than in the 2LVS as parts of a global measure of Commitment to Work.

The second reason that the 3LVS is preferred over the 2LVS is revealed through analysis of the pattern of correlations in Φ, the matrix of disattenuated correlations between latent variables, shown in Table 2. The 3LVS yields richer interpretations of the labor force attachment of youth than does the 2LVS. The

2LVS contains a weak negative correlation between Commitment to Work and Work Experience, leading to the conclusion that youths with less commitment to work are more likely to have previous and current labor market experience than youths with little work experience. Note that the λ's for CLEAN, DISH, FACT, HAM, NEIGH, PARK, AND SUPER are all negatively related to Commitment to Work in the 2LVS.

TABLE 2: Estimates of Parameters for Measurement Model of Labor Force Attachment of United States Youth by Specification.

	Λ *and* Φ			
	For ξ_1	*For* ξ_2	*For* ξ_3	$1-\theta_\epsilon$
	3LVS			
Observed Measure	*Preference for Work*	*Reservation Wage* Λ	*Work Experience*	
COM1	.547	—	—	.299
COM2	.809	—	—	.655
COM3	.168	—	—	.028
CLEAN	—	.857	—	.735
DISH	—	.880	—	.774
FACT	—	.765	—	.585
HAM	—	.885	—	.782
NEIGH	—	.751	—	.564
PARK	—	.452	—	.205
SUPER	—	.797	—	.635
LF81	—	—	.593	.352
W79	—	—	.822	.675
W80	—	—	.861	.741
Latent Variable		Φ		
Preference for Work	1.000			
Reservation Wage	−.101	1.000		
Work Experience	.082	.349	1.000	

	2LVS		
Observed Measure	*Commitment to Work*	*Work Experience*	
	Λ		
COM1	.041	—	.002
COM2	.073	—	.005
COM3	.069	—	.005
CLEAN	−.858	—	.736
DISH	−.880	—	.775
FACT	−.765	—	.585
HAM	−.884	—	.782
NEIGH	−.752	—	.565
PARK	−.453	—	.205
SUPER	−.797	—	.635
LF81	—	.590	.381
W79	—	.825	.681
W80	—	.860	.739
Latent Variable		Φ	
Commitment to Work	1.000		
Work Experience	−.346	1.000	

A different pattern emerges when Reservation Wage is separated from Preference for Work in the 3LVS. The relationship observed between Commitment to Work and Work Experience in the 2LVS is shown in the 3LVS actually to be the result of a weak positive correlation between Reservation Wage and Work Experience, while almost no correlation between Preference for Work and Work Experience is evident. Moreover, a negative correlation between Reservation Wage and Preference for Work is observed in the 3LVS. Note that the λ's for CLEAN, DISH, FACT, HAM, NEIGH, PARK, AND SUPER are all positive in this specification. One conclusion from the 3LVS is that Reservation Wage is higher among youths who accumulate work experience than among those with little work experience.

For reasons of economy, comparisons of the 2LVS and the 3LVS by sex, race, and age[7] are not reported. However, the 2LVS and the 3LVS fit the Youth Cohort

[7]Full tables and figures showing results of estimation and evaluation of the 2LVS and the 3LVS by sex (for males, for females), race (for whites, for non-whites), and age for youths $\geq$21 years old, for youths $<$21 years old) are available through Ay (1985).

data for specific sex, race, and age groups as well as for the entire sample. In addition, the sizes, signs, and patterns of coefficients in Λ, θ_{ϵ}, and Φ for separate sex, race, and age group analyses are remarkably similar to these shown in Table 2. In no subgroup analysis does the sign of a coefficient differ from those in Table 2, nor does the rank ordering of the size of coefficients differ from the ordering in Table 2. In fact, the size of most coefficients in sex/race/age subgroup analyses are quite close to those shown in Table 2. Substantial differences by sex, race, and age are evident in the body of research literature on youth employment and its determinants.

Implications

The two specifications of the measurement model of youth labor force attachment that we created in this research fit the NLS Youth Cohort data well and are generalizable over sex, race, and age groups. We prefer the 3LVS over the 2 LVS for empirical and practical reasons. The model we evaluated has at least three desirable measurement properties: (*a*) it treats measurement error explicitly, (*b*) it examines labor force attachment over time rather than at a point in time, and (*c*) it contains attitudinal components as well as components measuring actual labor force activity. One practical use of this measurement model is in a structural equation system of the type defined by Jöreskog and Sörbom (1984). For instance, the measurement model of labor force attachment could act as a criterion variable for examining the outcomes of public investments in youth employability such as vocational education. Blake (1986) created a confirmatory factor analysis model of participation in vocational education with the NLS Youth Cohort that is ideally suited for as an idependent variable in such a structural equation system. The purpose of the structural equation system would be to estimate the disattenuated correlation between participation in vocational education and subsequent labor force attachment, which is the subject of a large volume of policy-relevant research in the United States (see, i.e., Mertens, McElwain, Garcia, & Whitmore, 1980).

The model of labor force attachment specified in this paper is the product of analysis of existing NLS Youth Cohort data. This is an economical approach for model development. However, as a result, our model was limited to NLS variables only, none of which were designed and collected to explicitly measure the latent variables in our model of labor force attachment. For instance, a major limitation in this study is that we must assume that components of Commitment to Work, measured in 1979, do not change over the period of labor force activity studied (1979 through 1981). Perhaps researchers with more resources can obtain richer data than this to measure the same or similar concepts of labor force attachment. However, it is noted that large data sets are required to allow for case-wise deletion for missing values for any variable and for stable estimation of parameters.

Summary

We specify and identify a new measure of labor force attachment of a national probability sample of 8,887 youths who were 14 through 21 years old in 1979 using measures from the 1979, 1980, and 1981 waves of the National Longitudinal Surveys of Labor Market Experience. Two specifications of the model are estimated from 13 observed measures of labor market activity and attitudes. One specification contains two latent variables, Commitment to Work and Work Experience. In the other specification, Work Experience is measured, but Commitment to Work is divided into two aspects, Preference for Work and Reservation Wage. Both specifications fit the data well, and, although not reported in detail in this paper, both specifications are genera-

lizable over sex, race, and age groups. The model for measuring youth labor force attachment developed in this paper would be a useful criterion variable in structural equation systems that examine the relationship between investments in youth employability and labor force attachment.

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The Roles, Responsibilities and Powers of the Chairperson in Technology Education*

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ABSTRACT

The paper reports the findings of a research study undertaken by the author to investigate the relative shifts perceived to be taking place in the tasks and responsibilities of the department heads/chairs of Technology Education. Data were collected from practising departmental executive officers (DEOs) to document specific responsibilities in key academic roles. The exercise of powers by the DEOs was not included in the study.

The findings indicate that DEOs devote on the average 53 hours per week to their teaching and administrative roles and associated tasks. According to their perceptions, the major role categories rank ordered in the top five were: 1. General departmental governance, 2. Curriculum development, 3. Budgeting and control, 4. Faculty development and 5. Student matters. It is also seen, that DEOs with 11 to 15 years of administrative experience viewed the importance of public relations differently from other groups. Those with the most formal administrative preparation also tend to place greater importance on faculty development. There were no significant differences regarding demographic characteristics or perceptions of roles and responsibilities when regional comparisons were made.

Introduction

Department chairpersons constitute the largest proportion of administrators in universities. Arthur Coffin (1979) observed: Of all the administrative posts in academic institutions that of the chairman, I believe, is the most taxing, the most challenging, the most hazardous in several ways, and the most important (p. 81). Whether one wants to readily accept this observation or parts of it, will depend on one's experience and situation. Nevertheless, there is a certain validity found in the research evidence to the above statement. While numerous and helpful expository articles are available on the selected topic, there are fewer articles stemming from a normative data research base.

Specifically, this article will include: (1) a brief instroduction and review of pertinent articles (2) a description of the methodology (3) the findings of the research and (4) the author's observations and summary.

Review of Articles

Responsibilities of Chairpersons

The responsibilities of chairpersons grow

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continually in magnitude and complexity, yet little effort is made to prepare them for these responsibilities. As Murphy (1934, p. 349) critically noted: Advances in technology are drastically altering manufacturing processes, communication networks, and the very nature of work. Perhaps Departments of Technology Education are impacted more by such changes than are other disciplines.

Department heads/chairs of Technology Education recognize the facts of academic life; we are on an accelerating treadmill and we have to run reasonably hard just to keep in place. Yet a department head has to continually scan the horizon to anticipate needed changes and potential opportunities. The chairperson cannot escape the responsibility in serving as the advocate for the department and identify with the emerging needs of faculty and their discipline.

John Bennett (1982, p. 53) made a similar observation when he wrote: Serving as a department chairperson has become both more important and more difficult in recent years. Many of the factors that have given the position greater significance have also aggravated its burdens.

Lee and Vanhorn (1983) observed that the increasing sophistication and costs of academic programs have been aggravated with inflation and decreasing government financial support, and thus have led to a much stronger demand for greater attention to operational efficiency.

Coffin (1979) noted one of the realities that every chairperson discovers. He stated: The Chairman finds himself in a kind of buffer zone that simultaneously absorbs energies from opposite directions while somehow facilitating a peculiar Hegelian dialectic that not only attempts to meet the expectations of both vectors, but also endeavours to achieve some positive advance (p. 81). Yet the commitment to the department and the faculty and students must be the energizing force which has to be directed by the chairperson to garner the resources and support of central administrators somewhere in the larger priority list while also serving as an advocate for faculty growth and development.

Roach (1976) noted that 80% of administrative decisions are made at the department level. He also notes that even as the head/chair shifts from a purely subject-matter specialist to a planner and developer of department programs, he still remains an instructional catalyst, and resource allocator, an arbitrator/human relations expert, and a partner in shaping the institutional goals and missions (p. 15).

Paradoxical Roles

Wolanksy (1978) made a particular note of the fact that:For the most part, the departmental executive officer (DEO) is appointed principally by virtue of his/her academic achievement and intellectual standing rather than proven managerial ability (p. 55). During an earlier encounter, with a distinguished professor and chair, the author recalls that after several days devoted to numerous meetings, unexpected graduate student questionnaires, and other routine tasks, the question was asked: Is it not a waste to employ able scholars in the role of a chair? His response based on extensive experiences and acknowledged leadership success was — think of the consequences if we had the least able to serve in that position.

The chairperson's constituencies include students, parents and alumni, colleagues, faculty employers, taxapayers, legislators, and other central administrators. He/she must deal with the expectations of each and this calls for administrative and political astuteness in order to reach viable responses and rational compromises on critical academic issues. There is the political dimension to the DEOs job that is less discernible in many situations,

which often alters one's goals and achievements.

Frequently faculty and students are not sensitized to the enormous demands, expectations, and pressures made on their formal leader. There are personal costs in serving on the fast track whether they are acknowledged or not.

Bennett (1982, p. 53) devotes an entire article to the ambiguity and abrupt transitions in the department chairperson's role. He explicates the ambiguity by stating: Although the chairperson is described fundamentally as a faculty position, reference to the heavy responsibilities reflects the underlying ambiguity (p. 54).

Yet documented research, particularly longitudinal shifts in responsibilities of departmental executive officers is scarce at present. Unless we can identify what the predominant and priority responsibilities are of a DEO, it is not likely that appropriate administrative academic preparation will be provided.

Research Design and Outcomes

The primary purpose of the study was to investigate relative shifts perceived to be taking place in the tasks and responsibilities of the department heads/chairs of Technology Education. The dependent variables consisted of department heads/chairs grouped according to type of department, years of administrative experience, and extent of formal administrative experience. Nine broad categories of responsibilities were also identified. These included: curriculum development; general department governance; budgeting; public relations management; student matters; faculty development; facilities management; quality of work life; and fund raising skills. These categories seemed most inclusive in viewing the DEOs role in its broadest context. Of course, it is recognized that there are many sub-tasks such as working with committees, coping with departmental and campus politics, and building interdepartmental alliances.

This study is intended to serve as a data base for future studies which can be conducted to observe what shifts, if any, are occurring with regard to the roles and responsibilities of the chairperson in Technology Education.

This research was undertaken to collect data from practising departmental executive officers (DEOs) to document specific responsibilities in key academic roles. Comparisons of the findings of this study will also be made with findings from previous research where such information is available.

Sample

A total of 58 questionnaires (58%) of the sample of 100 were returned by DEOs from the three regions in the United States: Eastern region, Mid-West, and Western region. It was recognized, as a limitation of the study, that the variations in departmental organizations, sizes and diversity of programs, may affect the range of roles and responsibilities of the DEO.

Demographic Data

A brief description of the demographic data may be of interest to the reader. First, thirty-one of the DEOs were designated as department chairpersons (53.4%), and 18 as department heads (31%). The remainder (15.6%) were designated as directors or coordinators. The interesting finding is that chairpersons are much more prevalent than heads are at this time, which may also confirm that fewer DEOs are willing to commit themselves to indefinite appointment period as heads of departments.

Regarding their age, the largest percentage 37.9 of the sample was between the ages of 45 and 49 years: 34.4% between 40 and 44 years; 17.2% between

35 and 39 years. Only 10.3% were over the age of 50 and no one was under the age of 29 years. Approximately 72% of the DEO's are between the ages of 40 and 49 years.

Regarding their administrative experience 17 or 29.3% had five or fewer years of experience; 15 or 25.9% had six to ten years of experience; 11 or 18.9% had eleven to fifteen years of experience; and 15 or 25.9% had fifteen or more years of administrative experience. While the largest percentage (29.6) of the DEO's have one to five years of administrative experience, this is understandable if chairpersons are appointed for 3 or 5 year terms and may be reappointed for second or third terms. However, the distribution reflects a less diversified dispersion of administrative experiences. It was also indicated that 25 or 44.8% of the DEO's had administrative experience prior to their appointment to their current position. This finding may also imply some mobility from one administrative position to the next.

Examining the type of program(s) that the DEO's were administering, it was surprising to identify that only 4 or 7% administered single program departments: 40 or 68.9% administered multi-program departments; and 14 or 24.1% administered a division of several degree program departments. The above data reveal that most (93%) DEO's can anticipate and prepare to administer diverse program departments.

The type of degree program administered by the DEO's also varied. It was reported that 10 or 17.2% administered only bachelor degree programs; 34 or 58.6% administeed bachelor and master degree programs; while 13 or 22.4% administered the bachelor, master and doctorate programs. Only 1 or 1.7% administered a certificate program. The above findings indicate that the majority of DEO's are administering bachelor and master degree programs.

The extent of formal administrative preparation was encouraging. Twenty-nine or 51% of the respondents reported having taken 12 or more semester credits of administrative courses; and 15 or 22% had completed 8-12 credits, while 13 or 23% reported having taken 0 to 8 semester credits. These findings differ with earlier reports that department heads do not receive extensive administrative preparation.

Regarding the method of appointment, the largest number 19 or 32.8% were elected and recommended by the faculty to the Dean and other CEO's; while others followed rotation of chair positions, or other internal institutional arrangements. It was of interest to the researcher to note that only 9 or 15% were appointed to a DEO's position as a result of a national search. Also of interest was the finding that 33 or 57% were motivated to accept a DEO position because of the potential for leadership opportunities.

Only 11 or 19% indicated that they were motivated to accept a DEO position by the prospect of added income. Perhaps, added income does not always accompany added responsibility in some departments. Strydom and Bitzner (1984, p. 7) observed that the salaries of the department heads/chairs do not substantially exceed those of ordinary professors despite additional responsibilities or functions they perform.

Role Categories

The researcher attempted to assess the DEO's perceptions of their assigned priorities to the nine identified administrative responsibilities. The top five duty categories included: (1) general departmental governance, (2) curriculum development, (3) budgeting and control, (4) faculty development, and (5) student matters (see Table 2).

TABLE 1. Distribution of Department Heads/Chairs by Demographic Variables.

Characteristics	*Number*	*Percentage*
A. *Official Title*	31	53.4
Chair	18	31.0
Head	6	10.3
Director	3	5.2
Coordinator		
TOTAL	58	100.0
B. *Years of Experience*		
1. 1 to 5 years	17	29.3
2. 6 to 10 years	15	25.9
3. 11 to 15 years	11	18.9
4. 16 and over	15	25.9
TOTAL	58	100.0
C. *Years of Previous Administrative Experience*		
1. Yes	26	44.8
2. No	32	55.2
TOTAL	58	100.0
D. *Highest Degree Offered*		
1. Bachelor's	10	17.2
2. Master's	34	58.6
3. Doctorate	13	22.4
4. Certificate	1	1.7
TOTAL	58	100.0
E. *Type of Department*		
1. Single-program	4	7.0
2. Multi-program	39	68.4
3. Division of several degree programs	14	24.6
TOTAL	58	100.0
F. *Extent of Administrative Preparation*		
1. 0 to 8 semester hours	13	22.8
2. 8 to 12 semester hours	15	22.3
3. 12 or more semester hours	29	50.9
TOTAL	58	100.0

TABLE 2. Mean-ranks of the Duty Categories

Duty Categories	*Number*	*Mean-rank**	*S.D.*
1. Gen. Dept. Governance	58	2.621	2.09
2. Curriculum Devlopment	58	3.207	2.01
3. Budgeting & Control	58	3.621	2.08
4. Faculty Development	58	4.069	1.89
5. Student Matters	58	4.448	2.59
6. Quality of Work Life	58	5.310	2.50
7. Public Relations Mgmt.	58	5.431	2.66
8. Facilities Management	58	5.448	2.27
9. Fund-raising Activities	58	7.172	2.64
10. All added categories	7	6.429	4.08

*Mean-rank was computed using a scale of 1 through 9, with 1 representing the most important priority.

It was encouraging to discover that during this period of rapidly changing technologies, that the department heads/chairs perceive accurately their responsibilities to provide leadership in planning, directing, and catalyzing the process of curriculum innovation and development as a very high priority. This finding is consistent with Hodgekinson's (1979) call for strong administrative and instructional leadership. It was not surprising to identify that budgeting, faculty development, and student matters were included in the top five priority roles of DEOs. The present economic constraints, technological impacts, and increased diversity of student groups all contribute to the need for their greater attention by a DEO.

Time Distribution for Various Categories

Another objective of this research was to derive the proportion of time the DEOs were devoting to the various categories of responsibility. Table 3 summarizes the mean-time distribution DEOs devote to the various categories. It should be noted that some respondents elected to omit this section of the questionnaire, thus the *n* ranges from 42 to 46.

It was revealing to note that the heads/chairs devote a mean-time of 53.2 hours per week to the nine identified duties. Central administrators (CEOs) should be informed of this research result. The weekly time devoted to the five most time consuming categories included: (1) general departmental governance, (2) student matters, (3) public relations, (4) quality of work life, and (5) faculty development.

It is interesting to observe that attending to student and public relations, and

TABLE 3. Mean-weekly Time (hours) per Duty Category.

Duty Category	*Number*	*Mean-time (hrs)*	*S.D.*
1. Gen. Dept. Governance	44	9.375	4.86
2. Student Matters	43	7.474	3.84
3. Public Relations	43	7.307	4.73
4. Quality of W/Life	44	6.725	4.19
5. Faculty Development	46	5.996	4.09
6. Budgeting	45	4.964	3.51
7. Curriculum Development	45	4.776	3.16
8. Facilities Management	42	3.793	3.06
9. Fund-raising	43	2.858	2.76
TOTAL	—	53.268	—

consideration for quality of work life of faculty and staff are among the more time consuming activities and are perceived critical to early and effective intervention to maintain effective social relationships. Since chairs depend on their relationships with faculty and staff for their support, this finding is not surprising. People problems are more difficult to relegate to computer processing.

Testing Hypotheses

The primary purpose of this research was to investigate perceived shifts taking place, if any, in the roles and responsibilities of DEO's. The independent variables included: (1) type of department, (2) years of administrative experience, and (3) extent of formal administrative preparation.

It should be noted that the respondents were asked to rate each item on a scale of 1 through 9 with a value of 1 representing the most important. The SPSSx statistical procedures were used in testing all the hypotheses.

In testing the first hypothesis, whether differences existed between DEOs with varying years of administrative experience and the weekly time devoted to the nine administrative categories of responsibilities, no overall significant difference was found at the 0.05 probability level.

However, in testing sub-hypothesis 1, using a single classification analysis of variance procedure, Table 4 shows the results of the test.

The results of the analysis show that there was a significant difference between the groups regarding the time they devoted to public relations. Applying the Scheffe multiple range test revealed that DEOs

TABLE 4. Means and Standard Deviations for Time on Public Relations Management by Years of Experience

Experience	*Number*	*Mean-time Hrs/week*	*S.D.*
1 to 5 years	13	7.85	4.62
6 to 10 years	10	5.37	3.53
11 to 15 years	8	11.44	5.34
16 or more years	12	5.58	3.80

Analysis of variance of time/week on public relations management by years of experience:

Source	*df*	*Mean Squares*	*F-value*	*F-prob.*
B/W groups	3	71.1464	3.8197*	0.017*
Within groups	39	18.6264		

*p=0.017

with 11 to 15 years of experience tend to spend significantly more time in public relations than DEO's with 6-10 years or 16 and more years. It may be that the more experienced and still highly motivated DEO's view public relations as vital to the sustained support for numerous aspects of their departments.

Only one other hypothesis produced significant results. Hypothesis 3 stated: There are no significant differences among classification of DEO's by years of experience regarding the way relative shifts in administrative tasks were perceived.

The above hypothesis was tested using a single classification analysis of variance procedure, with tasks in which relative shifts were perceived as the dependent variables.

Tables 5a and 5b show the results of the analysis using task 7. This task read: Seeking additional sources of funding such as graduate assistantships through grants/projects, or gifts from friends and alumi of the department.

Results showed that there were significant differences among classifications of DEO's by length of experience regarding relative shifts in task 7. Using the Scheffe multiple range procedure, revealed that DEO's with 11 to 15 years of administrative experience tended to perceive relative shifts differently from other groups.

It was found by applying the Pearson Product-moment correlation procedure that there was a statistically significant relationship between years of administrative experience and ranking of the public relations duty as displayed in Table 6.

TABLE 5a. Means and Standard Deviations of Perceived Shifts in Task 7 for Years of Experience.

Groups	*Number*	*Mean-shifts*	*S.D.*
1 to 5 years	16	3.56	0.51
6 to 10 years	14	3.71	0.61
11 to 15 years	11	3.00	0.45
16 or more years	16	3.13	0.83
TOTAL	56		

TABLE 5b. Analysis of Variance of Perceived Shifts in Task 7 by Years of Experience

Source	*df*	*Mean Squares*	*F-value*	*F-prob.*
B/W groups	3	1.53	3.88	0.014*
Within groups	53	0.39		

*p=0.014

TABLE 6. Pearson Correlation Coefficients for Broad Duties by Years of Experience or Administrative Training

Independent Variable	*General Admin.*	*Budgeting & Control*	*Curriculum Development*	*Public Relations*
Years of Experience	0.165 (n=58) p=0.21	−0.086 (n=58) p=0.52	0.097 (n=58) p=0.46	0.296 (n=58) p=0.02*
	Faculty Development			
Formal Admin. Training	0.32 (n=57) p=0.018*	0.148 (n=57) p=0.27	0.146 (n=57) p=0.28	0.066 (n=57) p=0.63

*Significant at 0.05

A further analysis of the data reported in Table 6, regarding the relationship between formal administrative training and the broad categories of duties revealed that there was a statistically significant relationship between the degree of formal administrative training and the ranking of faculty development.

It was apparent that the DEOs with the highest levels of administrative preparation also ranked faculty development as a higher priority than other groups. Pearson correlation coefficient $=0.32$, $p=0.018$.

There were no significant differences regarding demographic characteristics or perceptions of roles and responsibilities when regional comparisons were made.

Summary Discussion

It was not surprising, but it was revealing that DEOs spent on the average of 53 hours per week attending to their roles and responsibilities. This finding is collaborated by Coffin (1979, p. 88) and Sharpe (1955, p. 159). This type of schedule implies extended hours per day or extended hours per week and possibly both.

It was somewhat surprising to discover that the largest percentage (30.6) of the Technology Education DEOs were between the ages of 45 and 49. Since the largest percentage (25.9) of the sample had one to five years of experience, this finding implies a robust turnover in DEOs.

Another finding was that 68.4% of the DEOs administered multi-program departments. This finding reveals a diversity of programs now administered by DEO's of Technology Education and may require special attention to this fact in our administrative courses. Perhaps the most encouraging shift, was the finding which revealed that 51% of the respondents reported having taken 12 or more semester credits of administrative courses. This finding has positive implications for graduate programs dedicated to the preparation of future leaders for Technology Education.

One finding which was not anticipated was that only 15% of the DEOs were selected as a result of a national search. Perhaps the economic constraints placed on Higher Education in the 80s had contributed to this occurrence. On the more positive side, it was encouraging to find that 57.1% of the DEOs were motivated to accept the DEO position because of the potential for leadership opportunities rather than personal status or monetary gains.

Statistical analysis of data reported in Table 2 indicates that the top five duty categories in the 1980s were: (1) general departmental governance, (2) curriculum development, (3) budgeting and control, (4) faculty development and (5) student matters. It is encouraging to discover that curriculum development was perceived as a relatively high priority in the nine responsibility categories by the DEOs.

While hypothesis testing yielded very few significant results, this research was productive. Statistically significant differences were found between DEOs with 11 to 15 years of administrative experience (group 3) and those in groups 2 and 4 (6 to 10 years, and 16 or more years) respectively regarding the importance of public relations. This group may be considered "seasoned" administrators at the peak of their administrative career who tend to be more sensitive to a broad base of collegial and community support. This particular group (3) also viewed the importance of seeking additional sources of funding for the department differently from other groups.

There was a significant correlation between years of administrative experience and ranking of the importance of public relations. Similarly, a significant relationship was found between formal administra-

tive training and the rank ordering of faculty development.

Significant differences between Heads and Chairpersons were found related to aiding faculty with securing grants, producing manuscripts, presenting papers, and helping faculty members to earn graduate faculty status. The fact that Heads may serve more years as a DEO, may contribute to this difference.

We still have limited insights and consensus about the roles and responsibilities of DEOs of Technology Education. DEOs represent both sets of interests — teaching and administration, Yet, if the DEO is to lead and influence others, the motivation must come from the commitment to the discipline itself. We have to ask the basic questions — what are we trying to do? What ought to be done? Are we trying to do different things? For in that case, the DEO may also be doing different things disregarding institutional and situational differences.

Viewing the opportunity to correct problems, to contribute creatively to the future growth of a department, the opportunity to assist others in reaching their academic and institutional goals, all figure prominently in discharging the roles of a DEO. We should also not ignore the fact, that we have done very little research on how to aid a DEO to return to the fulltime faculty position after serving as a DEO.

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RESEARCH ABSTRACTS

SUBBARAO T. AND ADHIKARI T. B., A Case Study on Retention and Transfer of Teaching Competencies from Training to Practice (Interim Report) TTTI Madras, TTTI Calcutta and CPSC, Manila, 1987 (Support Team: BARKI B. G., BHAT N. R. AND SUBRAHMANYAM, T. V. R.)

Objectives

The major objective of the Case Study is to investigate as to how the identified teaching competencies are developed in technical teachers and how these are used by them in their natural setting. The study intends to answer the following research questions:

(*i*) What are the transactions which go on during the course (specifically conducted to develop the identified competencies) and what is the congruence between the intended and realised process?

(*ii*) What is the congruence between the intended and realised outcomes (of the course)?

(*iii*) What is the congruence between the plan (developed during the course) for utilisation of competencies gained by the teachers and the actual utilisation in their own setting?

(*iv*) What is the level of retentivity and transfer of competencies gained in the course?

(*v*) What can be the explanations for the variations in the degree of congruence in the above cases?

Methodology

The study involved three stages:

- Two week training course on 'Improving Teaching Skills' (Stage 1)
- First follow-up of the participants in using the competencies acquired in Stage 1 (Stage 2)
- Second follow-up based on data obtained from Stage 2 (Stage 3).

During the two week course, the three competencies namely questioning, using assignments and class room testing were developed through micro-teaching and workshop sessions. These competencies were selected as they are the basic ones, which can be used by every teacher without provision of any additional resources in the institutions. The growth of competencies was measured using a Competency Rating Scale developed for the purpose. Participant profiles were also studied using appropriate scales. Course transactions and outcomes were analysed with the help of faculty interviews and a course feed back questionnaire.

The focus of Stage-2 was to study the congruence between the plan of action drawn by the participants during the course and its execution over a period of time as obtained through a self-report questionnaire.

During the second follow-up (yet to be taken up) it is proposed to visit a sample of participants to observe evidence of retention and transfer of competencies in actual class room teaching. During this stage, information to explain the findings of the observations will also be collected through discussion and interviews with participants and others.

Interim Findings

The following are the main findings arising out of analysis of data obtained in Stages 1 & 2.

Stage-1

1. The participant profiles in respect of learning styles were remarkably uniform with preference for andragogical approaches.

2. Most participants perceived teaching as the ability to explain a subject and to manage the class, rather than influencing student performance.

3. A learner empowering approach was predominantly used for developing questioning competency, while information disseminating approach was made use of for the other two competencies.

4. In the case of questioning, step ladder developmental strategy alternating between concern for content and concern for learners was attempted, while in the case of the other two, strategy used was to employ practice, group guidance and faculty feedback.

5. The training processes were non-threatening and non-evaluative with the faculty and investigators being accepted as group members in sharing the satisfactions as well as the frustrations of individuals in the group.

6. There was a growth in the level of competencies in all the three areas. The median gain score as compared to the intended gain score revealed that the gain exceeded expectation with regard to 'questioning', while it was below expectation with regard to other competencies.

7. Participants generally felt that the opportunities to continue to practise the competencies in their own institutions were sufficient or very good.

8. The growth in competencies was substantial enough to enable the participants to sustain and transfer them in their own settings.

Stage-2

1. While questioning competency was reported to be used to the extent planned, use of assignments was low and classroom testing was confined mostly to end of unit tests.

2. The participants reported that student participation in the lesson improved as a result of questioning; there was incongruence between targets planned and achieved with regard to the use of assignments; and the limited use of classroom tests was found helpful to monitor the progress of students. □

KAMALA, A. AND BHAT, N. R. "Perceptions of Polytechnic Teachers Regarding The Practice of Dictation of Notes", TTTI Madras, 1987.

Objectives

The objectives of the study were:

1. To obtain the opinions of teachers on different aspects of dictation of notes in teaching.
2. To identify the extent of practice of dictation of notes.
3. To prioritise the reasons which compel them to dictate notes.

Methodology

A questionnaire to elicit the views of teachers serving in polytechnics was prepared covering aspects such as (*i*) the reasons for giving notes: (*ii*) the subjects for which it is used and (*iii*) the extent of its use. The views of sixty teachers working in eight different polytechnics in Andhra Pradesh (India) were collected and analysed. Among them 38 were from engineering disciplines and another 22 were teachers of science subjects, commerce and pharmaceutical sciences.

Findings

The main findings of the study were:

1. Teachers preferred to dictate notes as they felt that it provided a good support to students to learn better. Almost all of them excepting two indicated that notes dictation is a fairly routine practice in technical teaching.
2. 23 of the 60 teachers whose responses were surveyed indicated that they are in the habit of notes dictation, even when they are through the course of explaining during a lesson.
3. The chief reason for dictation of notes seems to be non-availability of adequate reference materials for the students. They also felt that (*i*) notes help students to learn easily (*ii*) lack of facilities for giving handouts compel them to resort to this practice and (*iii*) inability on the part of students to prepare their own notes compels them to give notes, as and when required.
4. It is surprising to note that the teachers generally seem to favour this practice of dictating notes for utilising the class time better and making instruction more effective. □

BARKI, B. G., BHAT N. R. AND MUKHOPADHYAY B. Standardisation of Guidance Selection Inventory, TTTI, Madras, 1987.

Objectives

The objective of the study was to develop and standardise a guidance selection inventory. The inventory is aimed

* to measure the attitude, interest and aptitude of teachers for guidance and counselling of students.

* to select the most appropriate persons for undertaking guidance and counselling work in polytechnics.

Methodology

Construction of the Inventory:

The inventory has items in the areas of attitude, interest and aptitude in relation to guidance and counselling as, these are known to be indicators of one's possible success in guidance and counselling work. The inventory is in four parts with Part A for obtaining personal data. Part B has items on a five point scale relating to attitude. Parts C and D of the inventory probe into the interest and aptitude towards guidance and counselling activities. The items in these sections are situational in nature and the respondents are given four choices to respond to.

Tryout

The draft inventory was administered on 25 technical teachers working in a local polytechnic, for the purpose of tryout and item editing. The facility value and the discriminating index of items in parts C and D were found out. The facility value ranged between 0.14 to 1.00 for items in part C and 0.57 to 1.00 for items in part D. The discriminating index range was 0.00 to 0.57 and 0.00 to 0.85 respectively.

Final Form

The final form of the instrument developed on the basis of tryout data and the experts' opinion consisted of 50 items and four parts as detailed below:

Part A — Seeking personal information

Part B—25 items dealing with attitude

Part C—10 items dealing with interest

Part D—15 items dealing with aptitude

Norms

The final form was administered on 300 teachers randomly drawn from the four southern States of India viz., Andhra Pradesh, Karnataka, Kerala and Tamil Nadu, for purposes of developing norms required for selection of teachers for guidance and counselling work in polytechnics. The analysis of the data thus obtained suggests that a common norm for the four States basedon the mean and standard deviation of the total scores on the inventory can be adopted for selection of teachers for guidance and counselling work, the selection criterion being that the total score lies in the band 108.97 to 110.03. □

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CALL FOR CONTRIBUTIONS

Contributions are invited to the NEXT issue of the Journal on any topic relevant to its objectives. These may be sent to the Managing Editor to reach him by JUNE 1988 for this issue.