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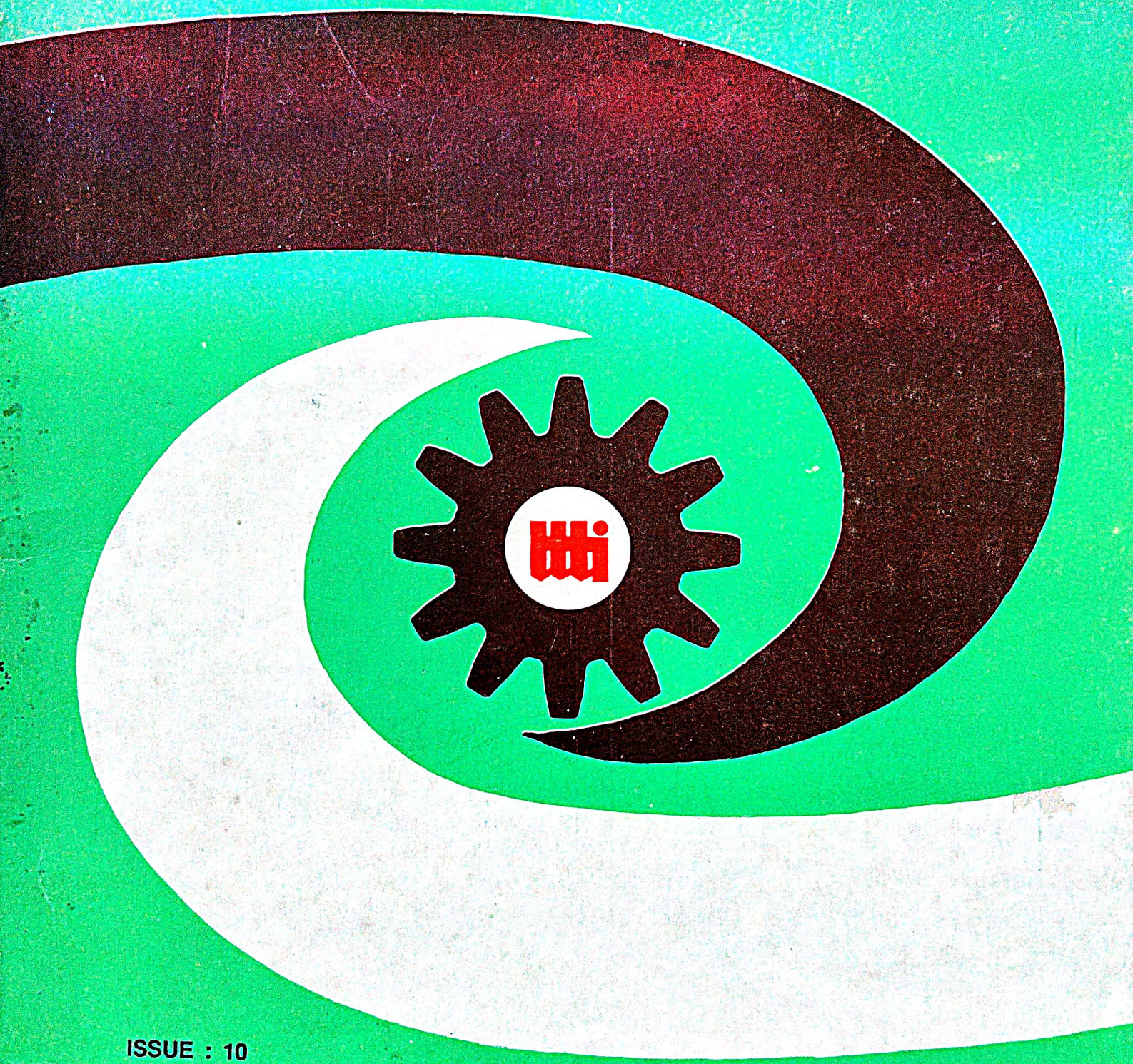

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Editorial

RESTRUCTURING INDUSTRY AND ECONOMY AND CONSEQUENT CHANGES IN THE WORLD OF WORK AND EMPLOYMENT PATTERNS

Two academic activities organized by the Technical Teachers Training Institute, Madras, are very relevant to the role of Technical and Vocational Education in the modern world.

A workshop on "Directions of Technological Development and Technician Education Programmes" was organized at the Institute from 22nd to 24th April 1992. Six areas of development in Technology were taken up for consideration. Bio-technology, Info-technology, Eco-technology, Materials technology, Micro-electronics and Manufacturing Systems Technology are the branches of human knowledge with phenomenal and multi-dimentional impact on the styles and standards of human life, in theory and application, in quantity and quality and in breadth and depth. Such meteoric rise in intellectual inputs into the system of Technical Education should make it dynamic enough for the worthwhile contributions of future citizens enamoured by the materialistic outputs. The workshop recommended appropriate modifications either as substitutions or as new introductions or as suitable changes in the variety of subjects offered through Technical and Vocational Courses. Starting from refresher training to teachers with relevant background knowledge and experience coupled with initiative and enterprise, a series of steps were suggested to implement the recommendations. New instructional materials, changed methods of teaching to be more interactive, differently organized lab-cum-classroom setting, flexible curricula and life-oriented problem-solving type of assessment were the major suggestions.

The second activity of a seminar on "Restructuring Industry and Economy and Consequent changes in the World of Work and Employment" was oraganized on 21st and 22nd January 1993. The theme was divided into six subthemes:

- Human Resource Development : Current Practices and Future Trends in Indian Industry,
- Changed Roles of HRD Personnel,
- Enhancing Effective Manpower Utilization.
- Impact of New Economic Initiatives on Indian Industrial Development,
- Modernization of Industries and Absorption of New Technicians, and
- Role of Quality Management in Industrial Economy.

The gap between the training imparted in Technical Institutions and the requirements of Industries was realized to cause considerable imbalance. An active and sustained interaction between Industries and Institutions is imperative. The export thrust due to the liberalisation of restrictions in India calls for an accreditation to ISO 9000 series to maintain and ensure minimum acceptability of products at global level. The dichotomy between products for export and those for domestic consumption is a dangerous block to progress in this direction. Multinational Private Sector may have efficient management information system, effective financial control and consistent operational perfection but is expensive because of the focus on increased dividends

as the measure of their success and heavy payments on royalty and technology transfer. A viable exit policy could not be formulated in a vast welfare-oriented democracy like India as evidenced by two different types of experiences - one company's fairly attractive separation scheme could meet with only less than 2% success whereas another company managed to close down with the consent of employee leaders. Politicised trade unions many a time tend to lose sight of a human touch. Redeployment, redesigning and retraining seem to be a far cry; further success elsewhere is supposed to bread success everywhere. In a developing country, like India, there is a need to turn out multiskilled persons, reduction in the number of levels in an organization, commitment to the principles and a constant effort to bring about a change in outlook are called future trends in Human Resource Development.

Changes in Industries are affected and effected as commanded by internal competition as well as external rivalry; but many organizations tend to be down sized in the process. The behaviour of HRD personnel is in triangular interaction with their altitudes, values and competencies on the one hand, of course developed by training programmes such as TQM (Total Quality Management), and processes, protocols and policies on the other hand, certainly dictated by quality accreditation such as ISO 9000. Politics reflecting parochialism, fear reflecting mistrust and changes reflecting resentment affect the roles of HRD personnel in industrial restructuring. There is therefore an urgent need to identify the missing strategy for providing the lacking clarity, to engender the necessary cooperation, to bring out consistency, to improve the leadership and to intensify the involvement of HRD personnel in the context of restructuring Industry and Economy. Rather than work HARD AND HARDER against odds, there is a need to work HARD AND SMART against identified and analysed odds to remove them. A stabilised tension-free environment in Industry brings its beneficial returns which can be easily re-invested for further improvement. A paper on "Economic initiatives and their impact on restructuring Industry" presented in the seminar appears in this issue.

Various papers in this issue contribute adequately to the improvement of Technical and Vocational Education ideologically and technologically. From Dyankov's proposal to Nigerian and Taiwanese research work there are quite a few ideas emerging for practice in this subsystem of education, especially in developing countries.

Let us continue to interact through the subsequent issues of this journal more of conceptual issues, research findings and experimented issues.

Finally, a proposal to convert this journal into a subscribed publication is afoot. Readers' and Contributors' views are sought in this regard both in terms of the content and of the price of this journal. A free and fair assessment shall reach the Managing Editor by April 1994.

— *EDITOR*

Current Trends in Providing Vocational Guidance

A. DYANKOV

ABSTRACT

This article deals with the important issue of vocational guidance and provides information on the different approaches applied by various countries in their measures to provide vocational guidance services. The article is based on a recent UNESCO questionnaire, sent to participating countries, aiming to gather information in this area, and summarises the responses of various countries to the questions, which are quoted further below.

Educational and vocational guidance is manpower oriented; it deals with occupational choice; it relies heavily on occupational information; and, while there may be a need for a few professionals, much of the work can and should be done by lay persons or other professionals such as teachers.

Educational and vocational guidance in the future will be presented to people of all ages within the context of rapid social and economic change. The rapid rate of these changes demands a re-examination of the objectives of educational and vocational guidance as well as a reformulation of the ways in which it is delivered.

The overall aim of educational and vocational guidance into the 1990s should be the development of the ability and confidence to make effective occupational and life-style decisions within the context of rapid social change. This implies that the sometimes perceived division between educational/vocational and personal guidance no longer represents a viable dichotomy. Making vocational decisions within a volatile labour market and the life-style implications of these decisions forces an integration of the different aspects of guidance.

Within this overall aim there are several goals. These include the following:

1. People should be assisted by counsellors in being placed in educational programs where there is a high likelihood of success. This is necessary to build confidence in people and to help them focus on their strengths rather than on their shortcomings.
2. People should be helped to understand their interests, abilties, values and aspirations and how these may be used vocationally. It is important that these are understood within the family and societal context. This means involving significant others (parents, friends, spouses) in programs, making them partners in the process. It also means helping people to become acquainted with career opportunities in their community and larger jurisdictions.
3. People should be assisted in examining their needs generally. The aim here is

to help people realize that needs can be met inside and outside the context of paid work.

4. People should be provided with access to current and geographically relevant occupational information. Furthermore, they should be taught how to access this type of information when they are not engaged in educational training.

5. People should be taught decision-making processes that will aid in their use of the data generated by the programs just described in making effective personal and vocational choices.

   This key concept of effective decision making styles can be of assistance to them over a life time.

6. People should be involved in programs to assist them in developing and maintaining human relationships. This would involve a range of activities including communication skills training and understanding of human motivation. The goal here is to strengthen confidence and to equip them with skills that increase the likelihood of strengthening relationships.

The overall aim, restated, is to help acquaint people with the tools for economic and social survival. This implies helping them to be creative thinkers when making decisions and assisting them in retaining a sense of personal well-being in the face of rapid changes in the labour market situation.

Apparently, the need for vocational and educational guidance has been recognized and responded to by governmental, educational, and agency personnel. Most of the time the focus has been on the vocational and educational needs of young people but increasingly attention also is being focused on the needs of adults as well.

UNESCO has distributed a special questionnaire for the Member States with a view to gather information on the additional measures which they have taken to implement the Revised Recommendation concerning Technical and Vocational Education in general, and to describe more particularly the special measures that thave been taken to provide VOCATIONAL GUIDANCE.

Question (1): Please describe briefly the vocational guidance systems and services in your country.

Most of the countries' replies indicated that high priority was given to vocational guidance to provide human resources for economic development. The orientation of individuals towards acquisition of practical skills, together with constructive attitudes towards the world of work, enabling them to pursue specific occupations was generally emphasized in most of the reports. In a number of other replies there was an expressed need to keep pace with the newly emerging technologies, which required vocational orientation towards these new technologies; and subsequently the necessary training and re-training in this area.

Several countries, predominantly the industrialized ones, reported the existence of a dual system of guidance, the one operating under the aegis of educational authorities and the other under labour authorities. Several other countries, however, indicated that they had no system of guidance at all. Guidance systems are usually organized at national, regional and institutional level. The services offered include mostly educational and vocational guidance.

The nature of guidance services are more or less universal, the methods differ, however, from level to level and the age-groups involved. At lower secondary education,

vocational guidance is usually integrated into subjects such as polytechnical or general technical studies, or technical orientation, practical arts, initiation to technology, etc. At the upper secondary level it exists as a separate subject with visits to industry, career-planning, etc. At both levels it is supported by mass media and concentrates not only on students but includes parents as well, in view of the decisive role they play in the decisions of their children.

In some of the countries, almost every secondary school of the education system has access to guidance officers and/or teacher-counsellors. Their function is to offer advice and to assist in career planning, in the selection of secondary studies - appropriate to the vocational goal, providing also educational and occupational information and assessment of potential vocational interests. Emphasis has been placed on the provision of relevant and accurate information to the students, enabling them to make an informed and appropriate choice of studies to suit both their vocational needs and their ability to succeed in the field of their choice. The provisions include pre-enrolment counselling, vocational and career counselling, educational counselling, educational assessment, etc.

In Finland, student counselling in general education is integrated into various subjects at the lower levels of comprehensive school. In the middle and upper secondary schools, student counselling is given in specific lessons included in the curriculum; in personal and small group counselling; by extensive information programmes and job-visiting, as well as by arranging and following up the students' applications for further education. The experimental activities of the secondary education reform include the so-called work-orientation project, which aims at finding out whether work-orientation and career preparation activities can be developed by more efficient student conselling, taking into consideration in its planning and implementation questions of vocational education, career counselling, student and working life counselling.

In Austria, both educational and vocational guidance take the following form: oral information and discussion between a class and the competent officer; distribution of pamphlets; individual counselling at the school or centre; meeting with parents. In Norway, at the upper secondary schools, one teaching period has to be allocated to guidance and advice and in some vocational lines students are placed in special workshops to get practical contacts with the world of work. In Argentina, groups of technical teachers frequently have dialogue with the final year students of primary schools to interest them in technical education.

A comprehensive system of vocational guidance has been established in Bulgaria, Finland, Germany, Poland, and Ukrain. In Nicaragua, vocational guidance is an integral part of the vocational training programme of the Ministry of Education. In Poland, vocational guidance is co-ordinated at national level by the Central Committee of Vocational Guidance. At local level, employment and social welfare bureaux and school superintendents' offices maintain vocational guidance services. In Cuba legislation was introduced in 1981, establishing a national guidance system under the Ministry of Education.

Question (2): How do guidance services at national, local and institutional levels ensure close co-ordination between training, employment and placement services?

Most of the countries' reports indicate that the vocational guidance services are

provided at national, local and school levels, under the overall responsibility of the Ministry of Education. In many countries, however, some other ministries like the Ministry of Labour, or the Ministry of Manpower and of Industry, of Agriculture, etc. are jointly responsible, along with the Ministry of Education, for the vocational guidance, counselling and orientation of both youth and adults. For example, in Austria, Denmark, the Republic of Korea and Romania, the Ministry of Labour provides information on various occupations and hiring requirements. Similarly, such co-operation in Portugal is extended by the Ministry of Employment; and in Thailand, by the Ministry of Industry, Ministry of Interior and the Ministry of Agriculture.

In Finland, a system of student counselling, giving educational and vocational guidance has been created at national, local and institutional levels designed to develop in students the capacities needed for study, career planning, and working life. Education and employment authorities participate in arranging student counselling. At school level specially trained teachers are employed under the authority of the Ministry of Education, and in the employment offices career-advisers are available. A co-operative body of educational and employment authorities, trade unions and employers' organizations (the Council of Career Guidance) has representatives of each interest group.

Vocational guidance services are also provided under the direct responsibility, or with the assistance of other national bodies, institutions and organizations like, for example in:

- Argentina - the National Council for Technical Education (CONET);
- Cyprus - the Central Guidance Office;
- Ecuador - the National Council for Vocational Guidance;
- Greece - the Manpower Employment organization (OAED);
- the Republic of Korea - the Korean Education Development Institute (KEDI) and the Institute for Vocational Research and Training (VOTRI);
- the Netherlands - the Regional Apprenticeship Organizations and the Education, Employment & Liaison Centres (COAs');
- New Zealand - the New Zealand Qualifications Authority;
- Malta - The Employment and Training Corporation;
- Mauritius - the Industrial Vocational Training Board (IVTB);
- Pakistan - the Vocational Guidance cells in the Provincial Labour Departments;
- Spain - the Vocational Training Council and the Regional Commissions for Vocational Guidance;
- Thailand - the Department of Teacher Education, King Mongut Institute of Technology and Rajamangkhala Institute of Technology;
- Zambia - the Students Services Unit at the Department of Technical Education and Vocational Training.

The data provided by some Member States on the enrolment in technical and vocational education (both full time and part time) show very substantial increases in a number of countries. Female enrolments have also shown significant increases over the past few years. The enrolment ratio of technical and vocational education to general education (including vocationalized/comprehensive education) varies from country to country. In five countries (Austria, Botswana, Finland,

Netherlands, Poland) the proportion of enrolments in technical and vocational education is equal or higher compared with general education.

Question (3): Please describe how the vocational guidance provided within technical and vocational education

(a) **provides information to the students on various employment options;**

(b) **facilitates the transition between education and employment;**

(c) **helps employed adults to choose suitable programmes of continuing education.**

The vocational guidance services in many of the reporting Member States ensure a close co-operation between training and employment placement services, by providing *information* about employment opportunities in various occupational fields. Links with employers associations, trade unions and private enterprises contribute to determine the actual qualifications for different jobs.

Many of the replies showed a variety of approaches that included the provision of better access to technical and vocational subjects, a diversification of general education, adaptation to the world of work, understanding and use of new technologies, or a range of categorized approaches and priorities.

Some of the participating Member States indicated measures for co-ordination between technical and vocational education within the educational system and employment. Co-ordination between technical and vocational education and employment exists in most of them. There are usually stronger links between vocational education (part-time) and employment than full-time technical education and employment.

In New Zealand, each secondary school makes provision for educational and vocational guidance and has a guidance counsellor and a career adviser. In Mexico, at the National Polytechnic Institute, educational guidance is regarded as a basic component of student training. At the school level, educational guidance activities take place through two programmes: school guidance and personal development. In Italy, following decentralization, guidance activities are carried out under the Ministries of Education, Labour, Industry and Agriculture.

The transition between education and employment is facilitated in some countries through special publications. For example, in Canada, a rich source of information is offered in the special book "JOB FUTURES" - with detailed employment forecasts in many different occupational fields; while in the Republic of Korea, information on employment opportunities is regularly published in the "Weekly Employment Information", in addition to the Korean telephone answering service on job offerings, which is available 24 hours a day. In Norway, a special file on educational and employment possibilities is published regularly as a tool for the counsellors. It is planned to transfer this information to electronic data processing and to update the material centrally.

In some countries, like Cuba, Cyprus, Netherlands, Swaziland and Zimbabwe, the vocational guidance services invite some specialists from the industrial, business, agricultural and other sectors to deliver lectures at educational establishments or to meet students and parents and provide first-hand information, which helps towards professional orientation.

Besides this, in some of the countries, certain special events are utilized to strengthen the vocational guidance and orientation, such as:

the annual trade fairs - in Zimbabwe,

the ''career days'' - in Swaziland, etc.

The replies also documented the wide range of modalities used in Member States to adapt their educational systems to lifelong education. Indonesia, the Republic of Korea and Kuwait, for example, stated that lifelong education is included in their educational legislation.

In some countries, like the Netherlands, the United Kingdom, Denmark, etc., there are also some private vocational guidance agencies, operating along with governmental bodies, trade unions and employers' associations.

In Finland, the amended Act on Apprenticeship Training makes it possible to implement the system of 'practice contracts'. A practice contract is made between vocational institutions and employers and includes on-the-job training or supervised practice. These contracts are developed with the aim of bringing education and working life closer together and keeping education upto date. In Norway, education is built on the basis of curricular co-ordination with practical training.

Many countries indicate in their responses to the questionnaire that professional orientation and guidance is provided not only to the youth, but also to adults, helping them to re-orient themselves to new occupational fields, or - for the unemployed - to find employment. For example, the Labour Authorities in Finland have special information units for adults' vocational guidance and counselling.

Some countries, like Canada, for example, provide special advisory services to employers. Other countries offer special vocational guidance for disabled and handicapped people, e.g. Syria and Finland. Finland provides vocational counselling also through telephone services.

Question (4): What training is provided to qualify vocational guidance staff?

The qualifications of the vocational guidance personnel vary from country to country. In most cases, some of the teachers at secondary level, both in the general education stream and in the technical and vocational education institutions, act as vocational guidance counsellors. In addition to their basic special and pedagogical training, they have acquired some special knowledge and skills - either with their pre-service teacher training programmes or through special pre-service and in - service short term courses, encompassing educational psychology, career guidance, methodology of testing and evaluation, educational media, labour code, theory and practice of decision making, innovative methods of counselling, socio-economic development, management and administration, etc.

Austria states that every full-time school has a 'guidance teacher', whose teaching load is reduced so as to allow time for educational guidance. Both the guidance teacher and the students may call on the services of the 112 full-time school psychologists in regional, provincial and national centres.

In New Zealand, secondary school inspectors in each region have responsibility for reviewing and assessing the work of guidance counsellers and career advisors. Each group has three special training days a year to update practices. Similarly - in Austria, assessment and review of guidance services is routinely performed by the superiors of guidance officers. Further training courses and professional meetings are a regular source of suggestions for the improvement of educational guidance. The development of vocational guidance has been stimulated by

evaluative research projects. In Finland, provincial educational consultants draw up an annual report of their area for submission to the National Board of General Education. Statistics of the applications and actual intake into secondary education are prepared annually.

Both teacher-counsellors, and professional career guidance personnel upgrade their competence and experience through periodic meetings, conferences and seminars, sometimes - through attachments/internships, or study tours, organized by professional associations, governmental and private bodies and organization, employers' groups, trade unions, etc. A leading authority in this field, promoting international co-operation and exchange of experience over the past 41 years is the International Association for Educational and Vocational Guidance IAEVG, which publishes a periodic bulletin.

A detailed background knowledge of studies relevant to guidance problems and the acquisition of expertise in the development of new techniques and principles of guidance are essential pre-requisites for the delivery of an effective guidance service, as well as a general grasp of the different disciplines of psychology, sociology, economics and education.

Some Aspects of Cooperative Vocational and Teacher Education

A.G. SHANNON

ABSTRACT

Cooperative education programs or 'sandwich courses' are well established pathways into the engineering, business and computing professions. The Bachelor of Education where it requires at least one year's classroom experience before completio would also fall into this category as does the system of teacher internships. In order to develop a more heterogeneous teaching profession, why not encourage more prospective teachers to read for the B.Eng., B.Bus., or B. Inf-Tech. degrees as alternative pathways into the teaching profession, and why not have joint BA BEd and BSc BEd degrees with an industrial or commercial practicum as well as a teaching practicum built into them? What about the provision of teacher-industry fellowships? This poster elaborates some aspects of these ideas.

Introduction

A somewhat neglected aspect of technical and vocational education is the lack of exposure of many school teachers to the world of industry. In this article it is suggested that this might be remedied if (i) teacher fellowships were to be provided for teachers to spend a term in industry or commerce, (ii) some prospective teachers could be enrolled in cooperative education (so-called "sandwich") courses instead of the traditional liberal arts or sciences, and (iii) some double degree BA BEd or BSc BEd programmes be offered by some universities with the provision of an industrial practicum as well as a teaching practicum. Both options have logistic as well as financial difficulties but they are being suggested here on the grounds that 'where there's a will there's a way'!

Paradoxically I wonder, also argue, with FitzGerald (1990) to "put the humanities back into education" and "regenerate the idea that an educated person is a literate one". I shall not pursue this aspect here because it concerns the details in the programmes I am proposing, whereas I am more concerned here with their structure.

Tensions

"Somehow the education curriculum fails to prepare school leavers for the business world" (Mayer, 1990). This not uncommon complaint sometimes presupposes a naive view of the functions of schools and the way students learn. As far as the latter goes, Springle (1974) put it aptly: "knowing is not learning, and telling is not teaching". As for the former I would distinguish education (in schools) from training (in commerce and industry); by education is for the good of the educand, while training is for the good of the trainer. While somewhat simplistic it is often a good rule of thumb when confronted or affronted by competing claims.

The tone of some industrialists' remarks suggests that they believe that education should be a substitute for employers' responsibilities in specific job training. Instead of criticising academics, some business leaders might do better to use their influence to find out why we have to use our scarce resources to run remedial classes in first year of universities. The erosion of these resources is making it even harder to sustain our vigorous cooperative (sandwich) education programs, of which such critics seem unaware.

There is an inevitable tension too within education, particularly higher education, between the purely academic and the operational (or those goals concerned with the solution of problems significant to society). There are moves to reduce the unhealthy aspects of such tensions by the drift towards postgraduate bachelors' degrees in medicine, law and engineering in Australian Universities. There used to be one in education: the former B.Ed.

Co-operative Education

Another way to deal with the tension is cooperative education, which has generally been an outstanding success in terms of student motivation and employer perceptions. Significant posts in companies are filled by successions of students so that a close working relationship develops between the firms and the institutions.

The structures of some of those so-called 'sandwich' courses are illustrated in Figure One. The Engineering degree has a 'thin sandwich' structure while the Science degree has a 'thick sandwich' structure. In the Information Technology degree, there is an interesting variation in that participating companies actually conduct formal classes on their sites as well as provide work for the students.

In these sandwich courses students generally achieve integration of both academic and operational values through an ability to address successfully significant problems in a way which is sound in both practical and theoretical terms'' (Birth, 1986). Unfortunately there is widespread ignorance of these options not only within education but also in industry. For example, even a member of the Australian Prime-Minister's Science Council in 1990 seemed unaware of the purpose and practice of cooperative education.

In my own area of mathematics at UTS, we also have course advisory committees with active participants from commerce and industry. Regular surveys are made of the needs of industry and weekly analyses are made of the position requirements of advertised jobs. In mathematics we are trying to educate our students through the mathematical sciences rather than merely in a range of techniques. The latter may be immediately useful but ultimately obsolete. We want our students to be capable of being trained further and keen to keep being educated. As well as having a right to vocational skills our students are heirs to a cultural heritage. We are, moreover, trying to develop their conceptual framework. Engineers might never use multiple integrals to find a volume of an object - a model immersed in water and Archimedes' principle might be more suitable - but it affects the way they view their work and their capability for higher study.

Options

Amongst the options for bringing education and commerce closer together are (i) provision of schoolteacher industry fellowships, (ii) encouragement of graduates of sandwich courses into teachers, (iii) development of double degrees for teachers with an industrial as well as a teaching practicum.

Meetings with industrialists and visits to

companies are only a partial answer to the problems of the awareness of the needs of commerce in the curriculum. Indeed such brief visits can produce entirely erroneous impressions. The provision of teacher-industry fellowships could give some teachers an opportunity to obtain over a period of a term or so the experience of working in industry (Shannon, 1978).

Likewise the encouragement of prospective teachers to do a first degree in a sandwich program, or to encourage some graduates of such programmes into the teaching profession, is a realistic alternative pathway into the classroom (Shannon, 1979).

The development of joint degrees is another option. As Figure Two suggests, one might read for a mathematics degree in which all the electives are education subjects and also for an education degree in which all the electives are mathematics subjects. The provision of such an industrial practicum would give this joint program a distinctive flavour.

It would be different in tone and ethos from the end-on BA or BSc Dip Ed pathway or the integrated BEd. The graduate would be qualified to start work as a mathematician, or whatever, as well as a teacher. Coordination and integration would come from the appropriate linking of subjects. For example, prior to the industrial practicum, one would study mathematical modelling; during the practicum the student would engage in some mathematical modelling. Subsequently, and prior to the next teaching practicum, there would be a course in the teaching of mathematical modelling.

The double degrees would constitute a joint programme such as the Bachelor of Medicine Bachelor of Surgery in the British tradition, so that a student could not drop out after three years with one of the degrees (Figure Three). Of course, a student might well transfer during the course but it is different from intercalated double degrees where the degrees can be separated out.

Conclusion

No attempt has been made here to cost the suggested options, though this is not difficult. It is more difficult of course to find the money, but it is most difficult in these times of financial recession to focus our educational eyes on what could be done. My concern has been for integration of educational experiences. It is in that spirit that these suggestions are floated.

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Figure 1.
EXAMPLES OF CO-OPERATIVE EDUCATION AT UTS

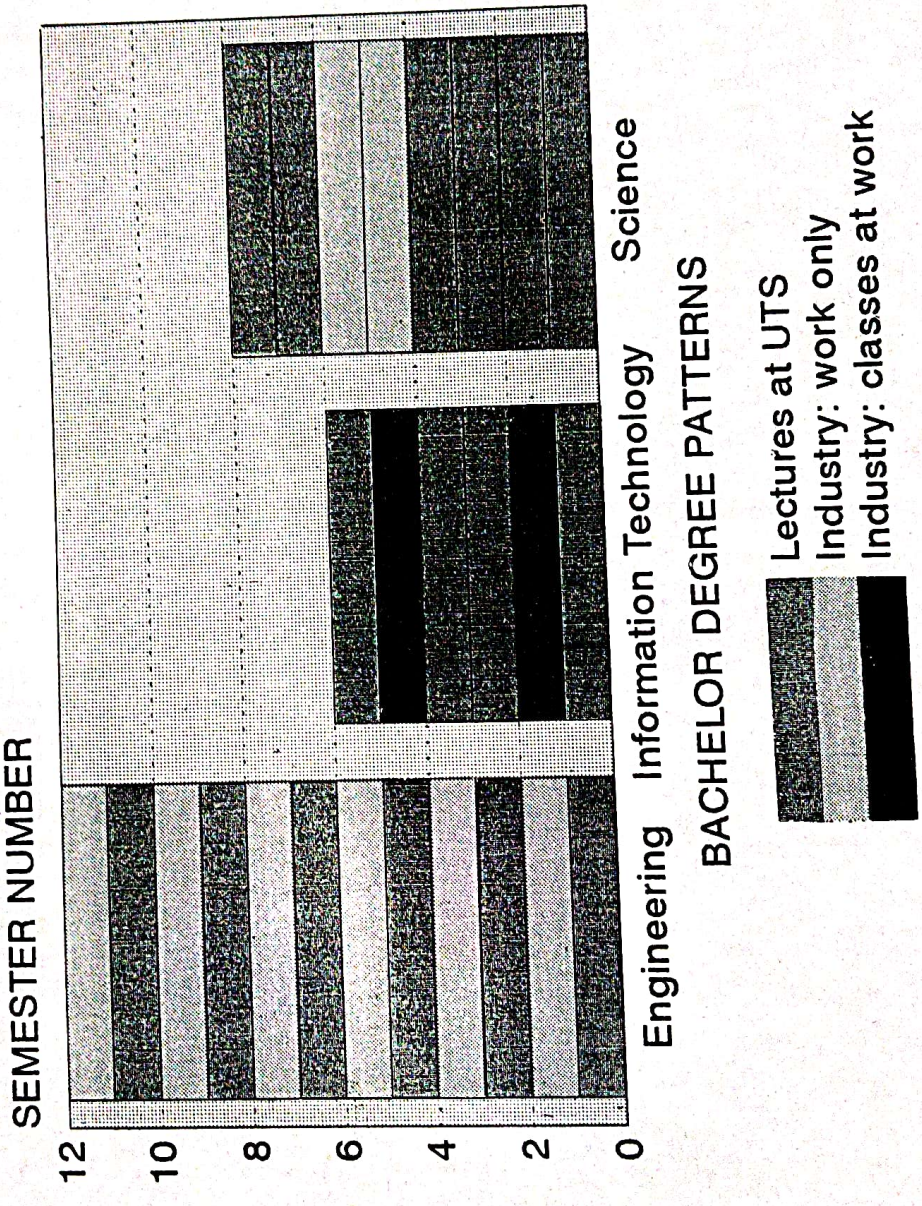


Figure 2.

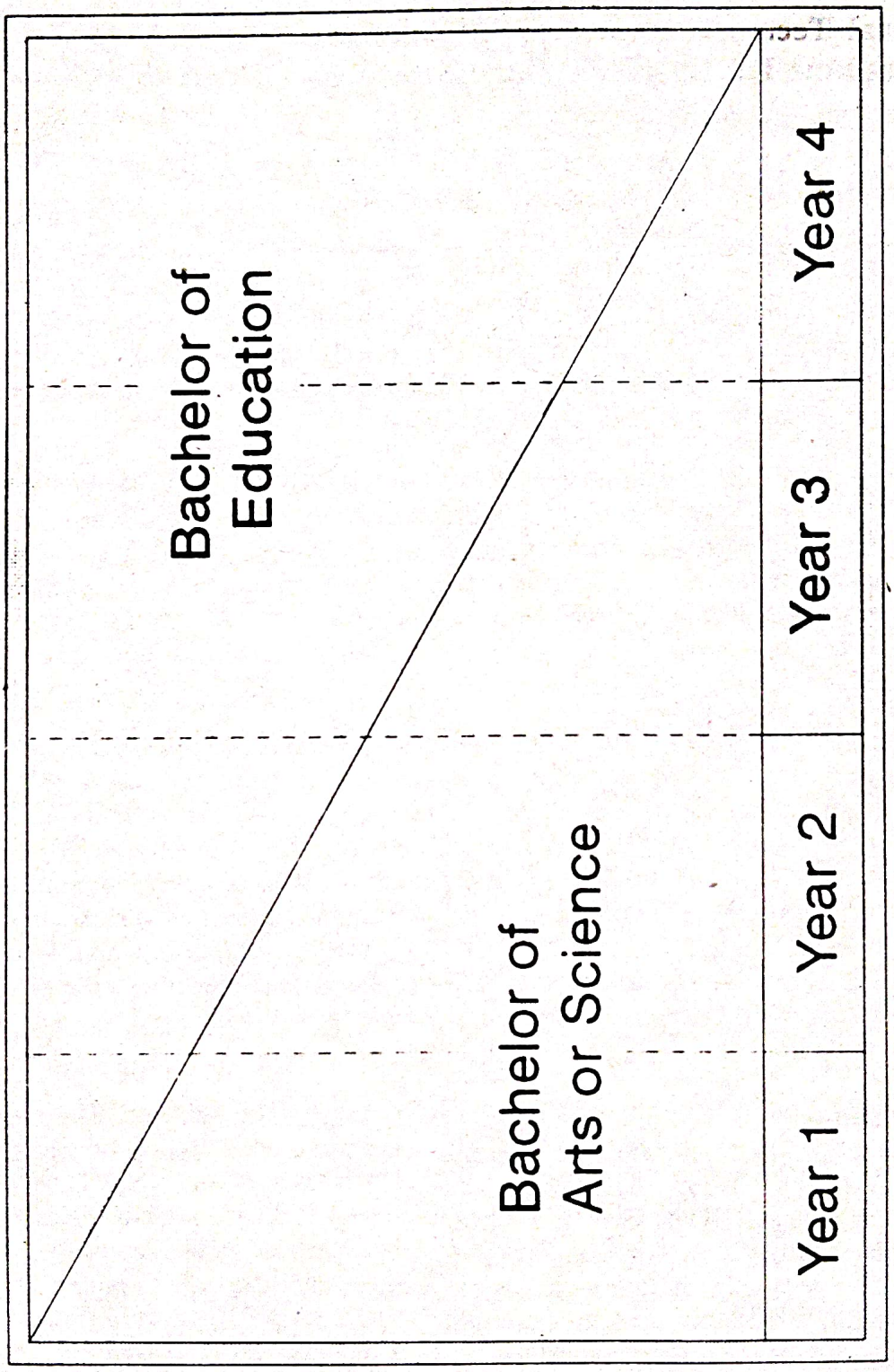
BA BEd or BSc BEd DOUBLE DEGREES

Example of BSc in mathematics

- BACHELOR OF SCIENCE
  - major in industrial mathematics
  - electives from education
  - industrial practicum
- BACHELOR OF EDUCATION
  - *emphasis* on teaching mathematics
  - *electives* from mathematics
  - teaching practicum

Figure 3.

GENERAL STRUCTURE OF THE DEGREES



Vocational Technical Education in Nigeria: A Programme for Lucrative Employment in a Depressed Economy

S. I. OKEKE

ABSTRACT

National Policy on Education (1980) approved the introduction of vocational education into the educational curriculum in Nigeria. Sequel to this introductory technology was introduced into the curriculum of the Junior Secondary School aimed at emphasizing on practical skills acquisition.

Apart from the Junior Secondary School level, vocational education is also imparted in Commercial Schools, Technical Colleges, Schools of Technical Teacher Education, Schools of Catering and Fashion Designing, Polytechnics, Universities and through apprenticeship system. The aim of vocational education is to produce skilled personnel who will be self-reliant and independent of white collar jobs which are non- existent.

This discourse is aimed at exposing the gains of vocational education in Nigeria. This country is presently experiencing terrible economic depression due to the global economic recession, oil glut with consequent fall in oil prices and revenue and her mono-cultural economy. These are affecting all facets of the Nigerian economy and one of the consequences is massive unemployment of a greater percentage of the youth. Today, people who have relevant practical skills are those who are employed and with attractive remuneration. Such areas of employment include stenographic or business centres, and carving, home economics, sculpturing and graphic arts, industries, agriculture, health care delivery system and a host of others. However, appropriate recommendations are made for the improvement of vocational education in Nigeria.

Introduction

Nigeria is one of the third world countries greatly hit by harsh economic conditions aggravated by her over-dependence on petroleum and neglect of agriculture. With the current fluctuations in petroleum prices, there is dearth of revenue to render essential services to the teaming population of the country. The fall-outs of the global economic recession and oil-glut include retrenchment of workers, mass-unemployment, hyper-inflation, low per capita income, various societal vices like bribery and corruption, armed robbery, drug addition, drug trafficking, obtaining by tricks (O.B.T.) popularly christened "419" etc. The basic cause is that people have no jobs

and those with one are not well remunerated. The major problem is that the courses offered by many are no longer suited for lucrative jobs in an economy under stressful economic policies like Structural Adjustment Programme (SAP). The country's problem is that the colonial educational system according to Eyibe (1987) was geared towards producing consumers, not producers and undue emphasis had been placed on social scientists, lawyers, classicists, historians and public administrators, irrelevant to the socio-economic advancement of a developing country like Nigeria. Consequently, graduates in these disciplines are now roaming the streets in search of jobs that are non-existent. This is due to the fact that these graduates cannot use their hands for productive ventures and cannot secure lucrative jobs.

It is to revert this trend that the Federal Government through the 1980 National Policy on Education gave its blessing to the technical/vocational education in Nigeria. The aims and objectives of technical/vocational education according to the National Policy on Education (1980) include:

(a) to provide trained manpower in applied science, technology and commerce, particularly at sub-professional grades;

(b) to provide the technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development;

(c) to produce people who can apply scientific knowledge to the improvement and solution of environmental problems for the use and convenience of man;

(d) to give an introduction in professional studies in engineering and other technologies;

(e) to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant; and

(f) to enable our young men and women to have an intelligent understanding of the increasing complexity of technology.

Therefore, technical/vocational education is the acquisition and application of technology for self-reliance and economic emancipation. The vocational needs of Nigeria require not only that unskilled labour be reduced to a minimum, but also that adequate engineering and science technicians be produced who can provide leadership in their respective occupational fields (Osuala, 1985). Today, Nigerians who lack the relevant skills and are not in business are wallowing in abject poverty and frustration. Those in business are actually succeeding in geometrical progression. Consequently, the education of Nigerians today must emphasize the production of individuals capable of practicalizing their knowledge for self enhancement and economic development. The need for economic development is to reduce the gap between the poor and the rich or at least to ensure an acceptable level of economic well-being of an individual which would enable him to compete favorably in an economy shrouded in hyperinflation and Structural Adjustment Programme (SAP). When a greater percentage of Nigerians are poor, then the country itself is poor. The poverty of a poor country is one segment of a vicious circle of curable and closely related ills. According to Castle (1972) people are poor because they are hungry and sick, sick because they are poor and therefore hungry; poor because they are ignorant; ignorant because they are poor; poor because they lack the means of production.

For total development of Nigerians who would not go about in search of jobs which

are not there, technical/vocational education must be emphasized upon. The ultimate goal of vocational education is to maximize human effectiveness by facilitating the growth and development of fully functioning human beings. Today in Nigeria, white collar jobs are no longer easy to come by. Even when they are available, it is a well known fact that the lowest income earners in Nigeria are the civil and public servants. These groups of Nigerians are economically marginalized. They find it extremely difficult to survive economically; three square meals per day are rarely achieved; ownership of a private car is a miragic dream, not to think of owing a house in a country where a bag of cement costs up to a month's salary of an average worker. In the present economic situation in the country, those who are finding life moderately comfortable are the products of the informal (apprenticeship system) and formal technical/vocational education apart from those in business. Technical/Vocational education which used to be considered as the education for those who could not cope with or meet the demands of the other areas of education or education for second class citizens, is now, due to the economic depression, the saviour of many. This trend is at the moment yielding such dividends in consideration of those who are gainfully employed in lucrative ventures because of their practical skills. Therefore, the prime objective of this discourse is to highlight such areas of human endeavours where those with informal and formal practical skills can be lucratively employed for self-actualization.

Vocational Education and areas of Lucrative Employment in Nigeria

As the economic hardship in Nigeria bites deeper into the bones, many people tend to discover the essence of the acquisition of technical/vocational skills which would enable them to obtain lucrative employment or start their own economic ventures. Such skills can be acquired through formal technical/vocational education in institutions like prevocational and vocational schools at post - primary levels (eg commercial schools etc.), Catering Schools, Technical Colleges, Schools of Technical Teacher Education and Polytechnics at post-secondary level as well as Universities. The informal vocational education is the apprenticeship system whereby one learns a particular type of craft from a professional craftsman within a stipulated period of time after which the master is paid for the training. In a survey conducted in Anambra State of Nigeria using 200 persons in each vocational occupation as the sampling population, it was found that the craftsmen cut across many areas of vocational education (Table 1.). Whether through informal or formal vocational education, such skilled labours are employed in Nigeria in the following ventures.

Business Centres

There is no part of this country one passes without the observation of signposts and bill boards bearing the information like "Type, duplicate and photocopy here", "Bind your books, Bibles and laminate your documents here", etc. The message is that such business centres carry out photocopying, typing, duplicating or lamination of documents. The individuals employable in such business centres are graduates of Commercial Schools, those who offered Secretarial Administration or Business Education in Colleges of Education, Technical Colleges, Polytechnics and Universities. These people are skilled in such crafts as typing, shorthand writing, general clerical office practice or any other secretarial or stenographic work. It is common to see young girls and boys with their typewriters and/or photocopying machines in make-shift

accommodation around our state secretariats, local government headquarters, school premises, industrial estates and other busy areas of our cities. These people make much returns from this business and are not waiting for jobs from various governments. Sometimes, these business centres carry out computer services under the management of youngsters skilled in computer technology.

Building Construction/Installation

With the dearth of employment opportunities in government parastatals, Nigerians skilled in civil engineering, building technology and related fields floated their own construction companies. They scout around for those who want to build houses, take up the contract for surveying the site, drawing the building plan, quantifying the cost of the building and proceed in actual construction of the houses. These new breed contractors are graduates of Technical Colleges, Polytechnics and Universities. They are usually given mobilization fees with which they initiate the work with the clients making funds available at regular intervals. Others take the contracts for the internal and external decoration of the buildings and their surroundings. The electrical installation as well as the plumbing work are equally undertaken by these technicians. In fact most of the magnificient edifices or the popular "white houses" in Nigeria are constructed and decorated at least under the supervision of these artisans.

Hair Dressing/Fashion Designing

There is now the proliferation of hair dressing salons, barbing salons, and fashion designing outfits in all nooks and corners of Nigeria. The owners of these business concerns are mainly graduates of institutes of catering and fashion designing and the apprenticeship system. Nigerians nowadays like to look fine despite the biting economic conditions. Different types of alluring hair-dos are now in vogue for both male and female Nigerians. Dressing is taking another dimension with increasing sophistication day-in and day-out. Nigerians now dress gorgeously and flamboyantly. No wonder then we are having increasing numbers of fashion designing establishments everywhere in Nigeria. Their numbers in the cities notwithstanding, these designers are usually busy all the year round. Many of them have therefore been saved the agony of searching for white collar jobs whose remuneration is nothing to talk home about.

Related to this craft is the manufacture of cosmetic products like toilet soaps, bar soaps, pomades, creams etc. Some who are skilled in this craft rather than looking for jobs, embark on local production of cosmetics without sophisticated technologies. These products may compete favourably in both standard and marketability with those produced by various multi-national companies in this country.

Wood Work/Carving

With the inception of introductory technology in Junior Secondary School system, there is the teaching of carpentry and various aspects of woodwork. This is equally taught in technical colleges and polytechnics as well as in apprenticeship system. The craftsmen here gainfully employ themselves in making of different wood products. These include various designs of upholstery chairs/settees, beds, and other household accessories made from wood. Different patterns of carved doors, staffs, tables etc. are produced by these crafts-men. The work is actually lucrative and many are making their livelihood therefrom.

Leather Work

As earlier noted, Nigerians are today

Table I:
Vocational occupation and the practising graduates of vocational education in Nigeria (A survey carried out in Anambra State of Nigeria).

	GRADUATES OF VOCATIONAL EDUCATION								
Vocational Occupations	GCG	CIG	CSG	TCG	STTEG	PG	UG	SSG	ASG
Business Centres	28	–	105	6	15	33	13	–	–
Hair Dressing	–	64	–	–	6	3	–	–	127
Fashion Designing	–	11	–	–	1	1	–	–	187
Woodwork/Carving	–	–	–	28	–	4	–	–	168
Automobile Maintenance	–	–	–	2	–	8	–	–	190
Home Economics	4	115	–	–	9	16	5	–	51
Sculpturing/Graphic Arts	23	–	–	47	20	43	29	–	38
Agriculture	22	–	–	8	–	15	95	60	–
Health Care	–	–	–	–	–	48	10	127	15
Leather Work	6	18	–	–	–	–	–	–	176

Key:

GCG: General College Gruaduate
CIG: Catering Institute Graduate
CSG: Commercial School Graduate
TCG: Technical College Graduate
STTEG: School of Technical Teacher Education Graduate
PG: Polytechnic Graduate
UG: University Graduate
SSG: Special School Graduate
ASG: Apprenticeship System Graduate

becoming more and more fashionable. We are now in an era of "wear to match". There is need for the cloth one puts on to match with one's shoes and/or bags for females. So, another lucrative area where skilled labour is profitably employed is leather work such as

shoe and bag manufacture and repairs. Various patterns of shoes and bags are now produced in Nigeria to satisfy our unending fashion desires. Majority of the craftsmen here are graduates of the apprenticeship system (Table 1.).

Home Economics

Home economics spans along such courses as food and nutrition, hotel and restaurant management, clothing and textiles, home planning and household equipment. Those skilled in this field are dieticians, hoteliers, restaurant managers, fashion designers, interior and exterior decorators, launderers (washer-men) etc. Home-economists are today managers of the kitchens of most of our government houses and those of prominent members of the society. Any affluent individual is always mindful of his diet or what he puts on. Hence, home-economists are also wardrobe managers of government functionaries and affluent individuals. Therefore, home-economists obtain immediate well paid employment and in alternative they establish lucrative ventures like fashion designing outfits, hotels, restaurants and also act as nutritional consultants. They also establish confectionery outfits for the production of sweet foods; cakes, sweets, biscuits etc. They take the contract for the production of wedding cakes as well as the decoration of wedding venues for which they are bountifully paid. They are mainly products of catering institutes, apprenticeship system and colleges of education.

Sculpturing/Graphic Arts

Graduates of post-primary Schools and those who offered fine and applied arts in colleges of education, polytechnics and Universities now open up sculpturing and arts studios. It is common nowadays to observe the sculptures of human beings, other animals or objects mounted in residential houses, amusement parks, hotels, market square, churches, mosques, town halls and road junctions in our big cities. These are for aesthetic decoration and may be carved from wood, stone, metal or moulded from clay and/or cement. The construction of these impressions are well-paid for and the sculptors make their living out of such work.

Graphic artists make much money from designing and writing of vehicle plate numbers of various types, write inscription on the vehicle bodies, engrave registration numbers on glasses, write inscription on clothes and prepare banners, calenders and almanacs. They equally embark on printing activities for which much is paid.

Automobile Maintenance

Various aspects of automobile repair and maintenance where artisans are employed include general mechanic work, automobile electrical work and motorbody building and panel beating. The majority of artisans engaged here are graduates of apprenticeship system. Some graduates and dropouts of the Junior Secondary Schools go to acquire these skills. In a country where the purchase of new vehicles is almost impossible due to their astronomical prices with the consequent importation of old vehicles the only alternative way of keeping one's vehicle on the road is maintenance. This then creates a booming business for these artisans who make huge sums of money daily. Whatever the stressful economic conditions may be, these artisans still have a comfortable life.

Industry

Skilled individuals are easily employed in various industrial establishments with attractive remuneration. Such personnel are products of

apprenticeship system, factories, industrial plants, technical colleges, polytechnics, universities and special schools set up solely for vocational industrial education. Vocational industrial education is defined by Roberts (1971) as instruction planned for the purpose of developing basic manipulative skills, technical knowledge and related occupational information for the purposes of fitting young persons for initial employment in industrial occupation and of up-grading or retraining workers employed in industry. Few of such special schools exist in Nigeria but mention must be made here of the Petroleum Training Institute, Effurun, Warri, Delta State that produces manpower which specifically serves the petroleum industry. Apart from these skilled labours, University graduates in various areas of engineering and geology are gainfully employed in the petroleum industry and their pay packets are enviable.

In Nigeria, various cadres of skilled labours easily obtain lucrative employment in such industries as manufacturing; government service, transportation and public utilities; finance, insurance and real estate; contract construction; and mining. Relatively large numbers of craftsmen are employed as mechanics and repairmen, carpenters, painters, plumbers, masons, electricians, linemen and stationary engineers in different industrial establishments in Nigeria. The list is unending but the important thing is that these skilled industrial workers are adequately paid and have the job satisfaction.

Agriculture

Various fields of agriculture are today being harnessed and exploited by skilled Nigerians in order to survive. Graduates of secondary schools, technical colleges, Polytechnics, Schools of Agriculture and related areas of biological sciences in the Universities are employed in different agricultural activities. Graduates of agricultural science, plant breeding, genetics and crop production, horticulture etc. are presently engaged in breeding and improvement of highly productive varieties of crops like rice, maize, oil palm, sorghum etc. They also establish market gardens for the production of cherished horticultural plants for internal and external decorations. From these crafts, which are highly remunerative, they tend to survive the economic crunch in the country.

The knowledge in agricultural science has enabled some unemployed youth to embark on mechanized farming often aided my the Federal Government's National Directorate of Employment (NDE) loan scheme.

Agricultural technicians, who are middle manpower, are employed as managers in specialized farming operations such as dairy farms, poultry farms, piggery, commercial orchards, and vegetable farms eg those of lettuce, cabbage, onions etc. They are also engaged in specialized occupations in operations such as that of livestock breeder, broiler plant operator, hatchery manager, supervisor of processing plants, machinery operator, and plant and animal protection technologist, veterinary doctors etc.

A number of technicians are employed in agricultural and agro-based industries such as feed - manufacturing plants, dairy supply houses, milk plants, meat-packing plants, canning plants, flour mill plants, fertilizer - manufacturing plants, frozen food factories, refrigeration and storage plants, pesticide manufacturing plants, and landscape service firms. In fact, the employment opportunities here are limitless and the remuneration quite attractive.

Health care

Vocational education is equally of high demand in our health care delivery system. Apart from the medical doctors and pharmacists who are skilled in their specific disciplines, other cadres of medical personnel are equally needed for efficient medicare including health assistants and auxiliaries. Among these are physical therapy aides, laboratory and x-ray technicians, practical nurses, nurses' aides, and hospital and clinical assistants. The education and training of these personnel are frequently provided in hospitals and health centres, schools of nursing and midwifery, schools of dental technology, etc. Some of these medical technicians such as the laboratory technologists open up their own private medical diagnostic laboratories which are actually booming ventures in this country today due to the peoples' awareness of importance of diagnostic medicine.

Handicaps

This discussion will be totally incomplete without a mention of how vocational education has helped in the rehabilitation of the handicaps in our society. Many individuals in the society possess such a nature that makes it difficult if not impossible for them to compete with nonhandicapped individuals for jobs in the labour force. These handicaps may be of a physical, mental, societal, economic and/or academic nature. Frequently, these people are found in various public places in Nigeria begging for alms.

With the prevailing harsh economic conditions, few people rarely satisfy their wants to deem it expedient to offer alms to these beggars. As a consequence, some of these handicaps with minor disabilities have resorted to learning such crafts as shoe making, repairing and shining, bag manufacture, mat, cane chair, hat and basket making, carpentry, pottery, bicycle and motorcycle repairing. With such jobs, these handicaps are self-reliant and become economically rehabilitated.

Recommendations

From the above treatise, it is evident that technical/vocational education whether informal or formal system is a sine quanon for self employment and easy employment opportunities and it has fared well in Nigeria. It is actually helping the unemployed masses to secure what to be done for economic survival. It rescues many Nigerians from economic strangulation, frustration and poverty. In the light of its tremendous impact on the employment of our jobless youth, and in view of teething problems militating against this lofty educational programme in Nigeria, the following are hereby recommended for the improvement of this educational programme.

(1) There should be the integration of informal and formal technical/vocational education by involving the local craftsmen, artisans and mechanics in the education of students in specific skills at Junior Secondary School level.

(2) There should be a policy whereby apprentices register with the National Directorate of Employment (NDE) for the purpose of subsidizing their training charges.

(3) The Federal Government of Nigeria should utilize the gains of Structural Adjustment Programme (SAP) to adequately equip all levels of education for effective implementation of technical/vocational education programme in the country.

(4) There should be the creation of awareness in the generality of students by way of guidance/counselling, of the significance of technical/vocational

education vis-a-vis acquisition of skills for easy employment in our depressed economy.

Conclusion

It is obvious that the primary objective of technical/vocational education is to produce "job creators" instead of "job seekers". It then becomes axiomatic that at this level of our national development and the economic down turn of our country, scientific and technological demands require that the science and technology curriculum at every level of education be adopted to emphasize practical application for local needs. Nigerians should be given the practical stimulation to redirect their attitudes to technical/vocational education. This is necessary since this type of education produces total individual capable of self-employment and self-reliance. Morman (1979) in consideration of the essentiality of technical/vocational education opined that this type of education is the summation of all knowledge, skills and methods related to production, distribution and consumption of goods and services including their organization for the welfare and happiness of man. Thus, this type of education produces an individual capable of using his hands for personal development and the welfare of humanity in general and therefore, must be given the priority attention it deserves in our educational system.

No nation can be regarded as developed without its citizens being educated and especially educated in relevant fields that are of utmost necessity for economic emancipation. To be educated does not actually imply the number of literate persons rather it implies the acquisition of such knowledge that is useful to the individual as well as the society. Such pattern of education is therefore impinged on the acquisition of practical skills through technical/vocational education. Nigeria needs this type of education now that it is passing through serious economic depression with the attendant unemployment problem. Luckily enough the areas of employment of the products of this type of education are abundant and very lucrative.

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Inclusion of Integrated Science in the Core-Curriculum of technical and Vocational Education in Nigeria

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ABSTRACT

This paper examines the advantages for the inclusion of Integrated Science in the new educational system in Nigeria. It is not only that pupils become acquainted with and apply the scientific method in solving life's practical problems, but also that they acquire the necessary science process skills, which would enable them to live more meaningfully and more effectively in a changing world of science and technology. Suggestions were also made on how the inclusion of integrated science in the core-curriculum of the 6-3-3-4 system of education will help not only in the promotion of education but also in enhancing the social and econmic life of the people.

Introduction

Today, we live in a world of science and mathematics, and the skilful application of their principles termed "technology". Such is the tremendous impact of these phenomena on human life that they more or less constitute the pivot of advancement in most human endeavours.

The extent of the development of agriculture, medicine, communication, physical facilities and infrastructures, as well as the economy of a country could be taken as the "litmus test" of her level of scientific and technological growth. Thus, countries which are readily described as advanced or developed are those that are leading in science and technology.

It is not an overstatement therefore to assert that science is playing an ever greater role in advancing the productive forces, upgrading social relations, creating fundamental new kinds of equipment and technology, raising better labour productivity through the use of sophisticated machinery, developing natural resources mined from the depths of the earth and ocean (an exercise that forms the bedrock of Nigeria's economy), exploring outer space and protecting and improving the environment. These glaring facts about science and technology have, so to say, gingered up all countries into what is called the "technological race".

A Nigerian educationist, Ohuche (1983), stated after observing the role of science in the society that:

> "properly conceived science education enables the individual understand his environment and therefore gain a measure of control of the same".

According to him only through this type of orientation can a society expect to achieve a meaningful economic and technological

development. It is a truism therefore to assert at this point that for any meaningful development in any country such as Nigeria, a meaningful articulated science education programme, cleverly adopted to suit local needs and prevailing conditions is necessary and can be systematically translated into reality through effective teaching of the basic skills of science.

Concept of Science and Objective of Integrated Science:

Science as a word is derived from the Latin word - scientia - meaning knowledge. In literature, science denotes a body of knowledge not just acquired by mere speculation but through empiricism.

Science may also be defined as a systematized body of knowledge which may be verified at any time, by any number of individuals under given conditions. Science is engaged in discovering these conditions and factors that determine or cause the occurrence of a particular event using scientific method of experimentation and observation (Chauhan, 1978). Science is not an abstract knowledge; it deals with things of human experience consisting of matter, material things or things of natural human experience which according to scientific realists " are independent and objective entities".

Modern science dates back to the days of Galileo Galilei (1564-1642) and Sir Isaac Newton (1642-1727). During this time scientists were regarded as philosophers. Among those contributing remotely in some significant way to the scientific orientation of thought and education were Sir Francis Bacon, (1561-1626), Johann Amos Comenius (1592-1670), and John Locke (1632-1704). Bacon was an English philosopher. He vigorously reintroduced the Socratic method - the inductive method of approach to truth and facts.

In his Novum Organuum, (New Approach, New method), Bacon insisted that in the approach to truth, established authority and dogma should be subordinated to empirical data, in other words, to experimentation which forms the basis of the methods of science (Okafor, 1981).

The underlying philosophy and objectives of integrated science in the Nigerian education system especially now that we are operating the 6-3-3-4 system of education needs to be examined in the light of the historical information above. Science teaching in Nigeria may well be regarded as one of evolution rather than revolution. Prior to 1859, science was not included in Elementary and Secondary School Curricula in Nigeria. Omolewa (1977) claims that the establishment of the Church Missionary Secondary School, Lagos in 1859 was a significant step which resulted in the introduction of rudiments of science in the school Curriculum.

This rudiment of science was then known as Nature Study, and it involved the teacher and his pupils "learning about the environment in a form of outdoor observation of plants, animals and non-living objects" (Bajah, 1982).

By 1970, the enthusiasm for Nature Study was beginning to decline. The influence of the new designs in curricula for science was beginning to be felt. The dissatisfaction against Nature Study was vehemently expressed and the subject was almost regarded as a farce.

It became clear then, as it is now, that Nature Study was "no longer consistent with the psychology, philosophy and methodology of the time," (Bajah, 1982). Then, as now, Nature Study - indeed mere observations of nature - was and is no longer adequate for the socio-economic realities of our time thus a

change became imminent. This change was felt in Nigeria with the introduction of General Science in the Secondary Schools; later introduced for the last three years of Secondary Schooling in the early 50's. What used to be known and studied as General Science has once again re-surfaced under the new name Integrated Science for the junior Secondary School with its philosophy and objectives.

To be able to appreciate the philosophy and objectives of Integrated Science in the new system of education, it is considered necessary to review the relevant portions of the National Policy on Education (1981) as they relate to Science education in general and Integrated Science in particular.

According to the National Policy on Education (1981), Secondary education is expected to be:

(i) Preparation for useful living within the society and

(ii) Preparation for higher education. In specific terms, the Secondary School should:-

(a) Provide an increasing number of primary school pupils with the opportunities for education of a higher quality, irrespective of sex or social, religious, and ethnic background;

(b) diversify its curriculum to cater for the difference in talents, opportunities and roles possessed by or open to students after their secondary school course;

(c) equip students to live effectively in the modern age of science and technology;

(d) raise a generation of people who can think for themselves, respect the views and feelings of others, respect the dignity of labour and appreciate those values specified under the broad national aim and live as good citizens.

Based on the above principles, and on the particular references to the duration and course offerings in the Junior Secondary School, it was agreed in a National Curriculum Conference for Junior Secondary Schools (Science), and embodied in the National Curriculum for Junior Secondary Schools - Volume 1, Science (1985), that the essence of an integrated science course is to begin to teach the pupils what science is and how a Scientist works. Therefore, integrating principles are intended to produce a Course which:

(i) is relevant to the child's need and experience.

(ii) stresses the fundamental unity of science.

(iii) lays adequate foundations for subsequent special study.

(iv) adds a cultural dimension to science education.

It is the belief of the curriculum designers that with the "integration" of Science Courses in the Junior Secondary Schools, it is hoped that the child after studying Integrated Science should:

(i) gain the concept of the fundamental unity of Science;

(ii) gain the commonality of approach to problems of a Scientific nature;

(iii) gain an understanding of the role and functions of Science in everyday life, and the world in which he/she lives.

Thus the objectives of integrated Science are aimed at enabling the child who is exposed to it to acquire the following skills:

- Observing carefully and thoroughly;
- reporting completely and accurately what is observed;
- Organizing information acquired;
- generalizing on tbe basis of acquired

information;
- predicting as a result of the generalizations;
- designing experiments (including controls where necessary) to check predictions;
- using models to explain phenomena where appropriate;
- continuing the process of inquiry when new data do not conform to predictions;

It must be emphasized that the nature of Science bring about an obvious and pressing need for a good foundation to be laid in children not just beginning from the Junior Secondary School stage but even before then if Nigeria is to achieve the scientific break through she desires.

The Methods of Science

A most simplified way of describing the methods of Science is probably by saying that "Science is systematic".

According to Chauhaan, (1978), Science has the following characteristics:-

(a) Scientific statements express a discovery of truth;

(b) Scientific statements are systematic;

(c) there is an objective proof or evidence for each scientific statement;

(d) scientific statements go beyond the empirical data. They interpret the data and infer the relationship between the observable things and events.

(e) the relationship in a scientific inquiry is presented as a system of hypothesis.

(f) scientific laws lead to correct predictions of future development.

(g) scientific statements are applicable to future research and to practical life.

(h) all sciences are empirical in nature.

Scientific method is indeed a research method characterized by the definition of a problem, the gathering of data, and the drafting and empirical testing of the hypothesis. The core of scientific method, however, is related to measurement of phenomena and experimentation or repeated observation.

According to Elking (1975), Piagets' work implies that Science education ought to begin in teaching children the fine art of observation. Thereafter children might proceed to collect specimens that they can sort, label and classify. Emphasis on "doing" rather than on "talking in the primary and junior secondary school is implied in the works of Piaget, Bruner and Gagne if the child is to develop the spirit of inquiry required in the pursuit of Science.

It is believed that pupils in the junior secondary schools should be able to acquire the following science process skills as recommended by the Nigerian Educational Research Council:

- Classification
- Communication
- Controlling or manipulating variables
- Counting
- Experimenting
- Formulating models
- Drawing inferences
- Interpreting data
- Formulating bypothesis
- Making operational definitions
- Development of manipulative skills
- Measurement
- Observation
- Prediction and
- Raising questions.

The acquisition and utilization of these

skills interplay to produce scientific literacy and this is what is intended to be achieved by including Integrated Science in the core-curriculum of technical and vocational education in Nigeria.

Advantages of Studying Integrated Science

1. It is easily related to the natural and local environment of children and can therefore often take them outside the classroom into a field situation where teaching is particularly effective.
2. Integrated Science, if well taught can most readily engage the interest of the whole width of ability range of children without loss to the high achievers and so encourage pupils who would not otherwise do so to persist with the study of a science subject.
3. Integrated Science readily alerts pupils as well as their teachers to many current issues of social, economic, and environmental importance e.g. earhquakes, natural resources - pollution, waste disposal problems etc.
4. A good job done on the teaching and study of Integrated Science will remove the mystique of science and avoid the mistaken dichotomy between the teaching of scientific methods and skills and teaching the social relevance of science on the other.

Recommendations

1. Government policy in the field of science should not only aim at providing conditions for scholarship and research but providing also favourable climate for the proper utilization of scientific research findings.
2. Science teaching should be made more meaningful and down to earth and more related to situations in and around our environment. By this is meant that the science being taught and the way it is taught should be seen as relevant to the needs of the individual and the society.
3. Efforts should be made to provide adequate facilities for the teaching and learning of integrated science, train and retrain teachers of integrated science and those already in the field should have their morale boosted so that they can produce an "army" of school leavers who cannot only think science, but also apply science.

Conclusion

It can therefore be assumed, and probably rightly too, that the "raison d' etre" for the inclusion of integrated science in the new education system is that pupils should acquire the spirit of inquiry and indeed the spirit and methods of science. It is not only that they become acquainted with and apply the scientific method in solving life's practical problems, but also that they acquire the necessary science process skills which would enable them live more meaningfully and more effectively in a changing world of science and technology.

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A Study on the Factors Affecting Parents' Attitude to Vocational Education

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ABSTRACT

In Taiwan, the aim of planning vocational education has been chiefly to achieve economical growth, ignoring the factor of social needs. In recent years, with the increase of percapita income as well as the rapid change of social values, it is necessary to take these factors into consideration. Therefore, the purpose of this study was to investigate the vocational education needs as expressed by parents from the aspect of social needs.

In related literature review, it was concluded that, with regard to the social and family structure in Taiwan, certain factors , influenced adolescents' opinions. Furthermore, parent's socio-demographic variables were an important factor influencing adolescent children. Hence, questionnaire was developed according to the theoretical framework. Through surveying, the researcher tried to investigate what were the influential factors for parents on their children.

It was found that there were significant differences in both different family backgrounds and parents' opinions concerning the factor influencing needs.

1. Introduction

It is often mentioned in sociology that parents' occupations, educational levels, and educational systems have a great influence on the education and occupations for their children to choose (Caplow, 1954, Baldridge, 1980, Tausky, 1984). Parent-and-Child relationship and family's social status and cultural environment affect not only an individual's socialization but also his education. Parents' educational attitude and family environment affect an individual's educational level, behavior in the school (Lin, 1981).

The ways how family's socio-economy affects his job choice are: (1) Family leader's occupation, which symbolizes the family's social status and the goal the children want to achieve. (2) Parents usually expect their children have better career performance than they do and children, too, suppose that they should be so. (3) Parents take positive attitude toward education and think highly of children's job choice and achievement in the family with higher socio-economy (Lin, 1976).

Shaycraft (1973) points out that a father's occupation has a significant influence on his children's education. Those who receive high education mostly come from the family with higher socio-economy. Zafiran (1973) suggests an individual's future occupation and

socio-economic status are predictable from his education level, social status and his father's occupation and socio economic status.

Similar findings are gained in Taiwan. Parents' attitude and expectation toward their children's education and their disciplining way, which are enforced by parents' socio-economic backgrounds, influence junior high school students' choice of either studying further on or getting into employment market (Lin, 1981).

While planning vocational education, demanded manpower at different stages of national construction and economical situation of limited resources should be taken into consideration. Vocational education planning has three approaches. One is Social Demand Approach, which studies on an individual's or the society's demand for education. Another is Manpower Requirement Approach, which figures out the manpower produced by vocational education. The other is Cost-effectiveness Analysis, which evaluates the balance between investment and output.

Manpower Requirement Approach has high accuracy of manpower prediction, but it is not commonly accepted in education planning (Educational Ministry, 1975). Its drawbacks prevent it from applying to the planning of educational policy (Shih, 1989). Some scholars, such as Chai's The Match of Educational Policy and Manpower Application (1979) and Lin's The Development and Planning of Private School in R.O.C. (1988), advocate cost-effectiveness Analysis is a better approach to educational planning, though it has the drawback that it is difficult to give an explanation to the results (Lin, 1988).

In the 1960s scholars argued which was the better approach, Manpower Requirement Approach or Cost-effectiveness Analysis. In the 1970s scholars made the effort to moderate these two approaches and include Social Demand (Lin, 1988).

The center for Vocational Education in Ohio suggests in its publication "Manpower, Priority and Finance" (Cited in Educational Ministry, 1975) that it is better to mix up at least two approaches in order to make a more reasonable and more satisfactory vocational education plan. Lin takes the three approaches in his Study on the Quantitative Planning of Higher Education in the Following Ten Years in R.O.C. (1988). This study follows Social Demand Approach.

Social demands are the ones of individuals, the public and the government (Lin, 1988). Yang in the Planning Technology of Vocational Education (1975) defines Social Demand Approach as the study of the society's educational expectation based on demographic and sociology. Peng in The Theory and Application of Manpower Development (1989) says, "Social Demand Approach stresses only manpower supply regardless of market demands. Social Demand Approach promotes educational institutes should predict and satisfy an individual's needs for education." As a conclusion, Social Demand Approach is an educational planning technique which emphasizes the individual's, the public's, and the government's educational expectation.

2. Research Purposes

The purposes of this study were:

1. To find out parents' attitude to vocational education.

2. To find out parents' expectation for various kinds of vocational education.

3. To find out what factors affect parents' willing of sending children to vocational school.

4. To make some strategic suggestions to make parents have positive attitude to vocational education.

3. Methodology

3.1 Literature Review

After analyzing the social factors influencing parents' attitude to vocational education and environmental elements of vocational education, the theoretical basis of this study was determined and a questionnaire was in turn developed. The research scope contains: 1) the definition and contents of social demand, 2) the external factors controlling the public needs for vocational education, 3) the relation between parents' backgrounds and the need for vocational education, and 4) the influence the characteristics of vocational education impose on the needs.

3.2 Panel discussion

Some experts were consulted in the panel discussion to revise the questionnaire named Parents' Attitude to Vocational Education to increase the validity of this study.

3.3 Questionnaire Survey

The questionnaire Parents' Attitude to Vocational Education includes three parts: the subjects' background information, opinions about vocational education, and the factors affecting the subjects' attitude to vocational education.

3.3.1 Background Information

Background information includes residential area, age, educational level, occupation, and the current job position.

3.3.2 Opinions

This part tries to know:

1. Will parents let their children go to vocational school?
2. What kind of vocational school will parents send their children to?
3. What level of vocational education will parents hope their children to receive?
4. What are parents' opinions about expanding the grades of vocational education?
5. What are parents' opinions about reducing the grades of vocational education?
6. What do parents think of setting up more various kinds of vocational schools?

3.3.3 Influential Factors

The third part contains 20 questions, which are developed in relation to social, political, economic, cultural, family and psychological factors.

4. Sampling

The population in this study was all junior high school students' parents in Taiwan. According to the data collected in R.O.C's Annual Educational Statistics (Education Ministry, 1990) and R.O.C.'s Industrial And Commercial Guidebook (1990), the subjects were chosen by stratified sampling from 50 junior high schools over northern, central, southern and eastern areas. 150 copies of questionnaires were sent to each school. The total copies sent out were 7500. And the questionnaires were taken home to be answered by parents. The total effective return questionnaires was 5524, reaching at 73.11% of the questionnaires sent out.

5. Conclusions

QUESTION 1: What are the factors which affect parents' willingness for sending children to vocational school?

Statistical Method

Factor Analysis was applied to sort out all the possible factors from the questions of the scale. By comparing these factors with those mentioned in literature the validity of the scale was tested. And all the data gathered from the questionnaires were analyzed and

explained according to the factors sorted out.

Analysis

After all the possible factors were picked out by means of Factor Analysis, each factor was proved to reject HO by Bartlett test of Sphericity when p=.05. This revealed the Scale of Parents' attitude to Vocational Education developed in this study was valid.

The three factors in this study are termed as:

FACTOR 1: Social demands for vocational education.

FACTOR 2: The match of students' characteristics and vocational education.

FACTOR 3: The constraints of vocational education.

Here are the questions in the questionnaire:

FACTOR 1

1. I encourage children to go to vocational school in order that they can work as early as possible.
2. I encourage children to go to vocational school because they can more easily find a job after graduation
3. I approve children going to vocational school to support family as early as possible.
4. I approve children going to vocational school because the academic load there is not as heavy as regular high school.
5. I approve children going to vocational school because my relatives and friends encourage me to do so.
6. I approve children going to vocational school to match our nation's educational strategy.
7. I approve children going to vocational school to match our nation's educational strategy.
8. I encourage children to go to vocational school to promote the society's peace and prosperity.
9. I believe children may have a better career in the future if they go to vocational school.
10. I approve children going to vocational school to meet social demands.
11. I approve children going to vocational school because they may have a more flexible choice, either studying further or working.

FACTOR 2

1. I encourage children to go to vocational school if they can develop their potentials there.
2. I approve children going to vocational school in order that they can acquire professional skills.
3. I approve children going to vocational school if they are interested in art or crafts.
4. I approve children going to vocational school in order that they can acquire practical knowledge.
5. I encourage children to go to vocational school because vocational education offers a flexible multitude of subjects.

FACTOR 3

1. I disapprove children going to vocational school to promote their social status.
2. I do not encourage children to go to vocational school because there will be fewer opportunities for them to study further.
3. I disapprove children going to vocational school because my family's economy is

good.

4. I oppose children going to vocational school because I expect them to study abroad in the future.

QUESTION 2: Do parents with different backgrounds have different willingness to send children to vocational schools?

Statistical Method

Chi-square test of homogeneity of proportions was used to find out if parents with different backgrounds are all willing to send their children to vocational school.

Analysis

In this study parents' backgrounds include the following information: 1) age -- below 30, 30 - 39, 40-49, 50-59, and about 59, 2) educational level - primary school, junior high, senior high and college or higher, 3) job --- soldiers, government officers, teachers, technicians, farmers, fishermen or ranchers, medical practitioners, business administration and unemployed, 4) job position ---- high ranking management personnel, middle ranking management personnel; office workers, laborers with skill, and laborers without skill. Table 1 presents the relationship between parents' background and their willingness to send children to vocational shool. As Shown in Table I, there is a significant difference between parents' educational level, job and job position in terms of their willingness to send children to vocational school. Parents with lower educational level, or who are farmer, fishermen, skilled or unskilled laborers have higher willingness to send children to vocational school.

QUESTION 3: Do parents with different backgrounds support children to different levels of vocational schools?

Statistical method

Chi-square test of homogeneity of proportions was applied to see if parents with different backgrounds choose different levels of vocational education for their children?

Analysis

The questionnaire Parents' Attitude to Vocational Education, after being tested by Chi-square, gets the following results, shown in Table 2. It is apparent that there is a significant correlation between parents' age and the vocational education level they expect children to enroll. Most parents, about 60.8% of the subjects, expect their children to enroll in technological institutes, 29.6% of the subjects expect junior college, then 9.5% expect vocational high school. Also, Table 2 releases there is a significant correlation between the vocational education level parents expect their children to enroll and parents' educational level, job, and job position.

QUESTION 4: Is there any relationship between parents' backgrounds and their willingness to send children to vocational school?

Statistical Method

One-way ANOVA was applied to find out the relationship between parents' backgrounds and the three factors of the questionnaire. The steps were:

1. Computing the mean and standard deviation of each sub-group.
2. Figuring out the difference among the members of each sub-group.
3. If F value was greater than the critical value when p=.05, Scheffe method was applied to make posteriori comparisons between every two sub-groups.

Analysis

Analysed by means of Factor Analysis, three factors are gained, social demands for vocational education, the match of students'

characteristics and vocational education, the constraints of vocational education. Further more, parents of different ages show no significant difference in all the three factors. Parents with different educational levels show significant difference in factors 1 and 2. Generally speaking, parents with lower educational level approve of their children going to vocational school if their children are talented in art or craft and those parents recognize the social function of vocational education.

Parents with different jobs show significant difference in Factors 1 and 3. Those with lower socio-economic status, such as farmers, labourers, fishermen and ranchers, encourage their children to go to vocational school to meet social needs. However, those who are labourers businessmen, government officers, or farmers think vocational education refrains their children from developing a better career.

In addition, parents with different jobs show significant difference in all the three factors. Many white collar workers disapprove of their children going to vocational schools. Workers with professional skill approve of their children going to vocational schools.

6. DISCUSSIONS

1. Nowadays parents generally encourage children to receive higher education as long as children can pass the entrance exam. So if there are more chances of higher education for vocational high school and junior college graduates, more students will go to vocational schools.
2. The relationship between parents' educational levels and their willingness to send children to vocational schools is negative. Thus, if there is a need for decreasing vocational education students, western Taiwan is prior to Eastern Taiwan, cities are prior to countries, and the areas with higher educational levels are prior to those with lower educational levels.
3. Considering the society's needs due to socio-economic development, more technological junior colleges and institutes should be set up in northern and central Taiwan.
4. If one particular class is set up for vocational high school or junior college graduates in each department of the university, all the educational facilities can be more economically used and parents will no longer be afraid that their children cannot study further if they go to vocational high school.
5. The findings point out parents who are labourers encourage children to go to vocational schools. Thus, a nation's structure of labour need can estimate how many vocational education graduates should be produced.
6. To change the concept that vocational education is equivalent to low social status, three strategies should be adopted: a) offering more chances of higher education to vocational high schools or junior college graduates, b) promoting the quality of vocational education, c) abandoning the concept that diploma is equivalent to ability and enforcing the certification of technique.
7. Whether children are willing to go to vocational school depends on parents' socio-economic status, including job position and educational level. While parents with higher socio-economic status hold negative attitude to vocational education, parents with lower socio-economic status hold positive

attitude to vocational education. Therefore, the campaign of vocational education should focus on winning national trust to attract more students.

8. Before parents decide to send children to vocational school, they often make sure that children are suitable for vocational education. This points out the planning of vocational education should consider not only national economic development but also students' aptitude and interest and provide a variety of vocational education.

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Issues and Priorities in Nigerian Vocational and Technical Teacher Education: A Survey of the Profession

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ABSTRACT

Recent collaborative efforts by government and educators to reform vocational and technical teacher education in Nigeria may be fruitful to the extent that certain important issues are resolved. This study identified key issues in Nigerian Vocational and Technical Teacher Education and determined how they are prioritized by vocational and technical educators. Results of the study showed that participants considered the issues of recruitment and retention of technical teachers, funding, and availability of instructional materials and equipment as the most critical issues to be addressed in any reform effort. The implications of the findings for policy and research are discussed.

Introduction

Nigeria ranks high among developing nations of Africa hit hard by the global economic recession of the late 1980s and deeply indebted to international financial organizations. In recognition of the important role of vocational and technical education in promoting a production-oriented Nigerian economy, the World Bank sponsored in September 1989 a national seminar which focused on the technical and vocational education sub-sector in Nigeria. Discussions which dominated the four-day seminar centered largely on problems and issues which seem to have consistently characterized Nigerian vocational and technical education for over two decades.

The recommendations of a national curriculum conference held in September 1969, for example, alluded to the low status of technical education and emphasized the need for greater involvement of business and industry in training the nation's technical workforce (Fafunwa, 1974). Some analysts (e.g. Aghenta, 1985; and Sofolahan, 1989) have focused attention on issues of low student enrollment in vocational and technical programs, inadequate funding, and serious shortfalls in the numbers of professional qualified vocational and technical teachers.

During the decade of the 1980s, the Nigerian government embarked on a series of projects aimed at correcting the imbalance technical teacher demand and supply. Prominent among these projects were the establishment of new colleges of technical teacher education and the controversial and now defunct Technical Teacher Training Program (TTTP) undertaken in collaboration with the United States Agency for International Development (USAID) for training Nigerian teachers in American Universities.

Some experts at the 1989 world Bank - sponsored seminar (e.g. Towe, 1989; and Sofolahan, 1989) suggested that an important step toward resolving the issue of quality and quantity in the supply of technical teachers is to review and overhaul the entire system of vocational and technical teacher education. An important step in any reform effort should be to identify and address key issues relating to Nigerian vocational and technical teacher education.

Purpose of the study

Given the myriad of the issues and problems associated with Nigerian vocational and technical education, it is inevitable that some issues would be seen as more critical and, therefore, requiring greater immediate attention than others. Some degree of agreement over priorities is necessary if those who make policy and those who implement it are to tackle problems collaboratively. The purpose of this study, therefore, was to determine show vocational educators and technical teachers prioritize identified issues in Nigerian vocational and technical teacher education.

Research Question

The study addressed the following question:

How do Nigerian technical teachers and teacher educators prioritize issues in Nigerian vocational and technical teacher education?

Hypotheses

It was hypothesized that:

1. There is no significant difference in the mean ratings of identified issues between technical teachers and teacher educators (p .05).
2. Male and female respondents in the study do not differ significantly in their mean ratings of identified issues (p .05).

METHODOLOGY

Subjects

The population for this study comprised an estimated 170 technical teachers and vocational-technical teacher educators in six southern states of Nigeria, namely, Akwa-Ibom, Anambra, Edo, Enugu, Imo, and Lagos. The teacher educators included persons teaching in five tertiary institutions (two universities, two polytechnics and one college of education) offering vocational and technical teacher education programs. There were estimated 90 members in this sub-group. This figure was based upon data contained in the 1986-87 edition of the Digest of Statistics on Technical Education in NIgeria (National Board for Technical Education, NBTE, 1987). The technical teacher sub-group consisted of 80 teachers of vocational and technical subjects enrolled in a post-graduate sandwich program in one of the national universities. Since the size of the study population was relatively small (N = 170), no sample was drawn.

Survey Instrument

A 25-item Critical Issues Questionnaire (CIQ) was developed by the researcher after reviewing available literature. The instrument was subjected to face and content validation by three experts in vocational teacher education at a major Nigerian University. A five-point Likert-type response scale was provided and the respondents were required to rate how critical they considered identified issues (5 = most critical issue, 1 = least critical issue). In addition to rating the 25 issues in the instrument, the respondents were further requested to identify three issues they considered most critical and to order them according their importance or seriousness. Data relating to the respondents' age, gender,

education, and teaching subject were collected.

Data Collection and Analysis

The survey instrument was administered partly by mail and partly in person by the researcher. It was discovered during the process of instrument administration that some potential respondents among the teacher educator sub-group were non-vocational education professionals engaged in vocational teacher education programs (e.g., accountants and engineers). These professionals were, therefore, excluded from the study. In total 140 copies of the instrument were administered but only 110 were returned. This represented a return rate of 78.6 percent. Out of the 110 completed questionnaires only 106 were useful; four were completed by non-members of the study group.

Means were computed and ranked for purposes of answering the questions of the study. The t-test for large independent means (Best, 1981) was employed in testing the null hypothesis stated in the study.

RESULTS

Analysis of the data showed that the 106 respondents included 63 (59.4%) technical teachers and 43 (40.6%) vocational and technical teacher educators. There were 69 (65.1%) males and 37 (34.9%) females. The respondents teaching specialities included Agricultural Education (27.4%), Business Education (25.5%), Home Economics Education (13.2%), and Industrial Education (33.9%). Fifty-nine (55.7%) respondents possessed the bachelor's degree, 47 (44.3%) possessed higher degrees. The majority of the respondents (72.6%) were aged between 30 and 40 years.

Table 1 shows the overall means, standard deviations and ranks of the ratings of identified issues in Nigerian vocational and technical education. The ranks shown in Table 1 suggest that the issue of "Recruiting and retaining competent persons as technical teachers" received the highest rating form the respondents (mean = 4.85). The "Need to break the 'marriage' between vocational and general education" had the lowest rating (mean = 2.89).

In answer to the first question of the study, analysis of three issues identified as "most critical" by the respondents showed that financial support from government and industry ranked highest (46.8%) followed by the issue of teacher recruitment and retention. A comparison of the ratings of teacher educators and technical teachers (Table 2) shows that there were no significant differences in the mean ratings of the two groups except for three issues (items 10, 11, and 25). Thus, the first null hypothesis was not rejected for most of the issues identified.

Table 3 shows that significant differences were not found between male and female respondents' mean ratings of nearly all of the issues, except one, namely, item 23. The second null hypothesis was, therefore, not rejected for most of the issues identified, except in only one case.

Discussion

The purpose of this study was to determine how technical teachers and vocational-technical teacher educators prioritize identified issues in Nigerian vocational and technical teacher education. The first research question sought to establish the priorities as rated by the respondents.

The data presented in Table 1 indicate that over 75 percent of the issues received ratings on the high side (mean 4.00) of a five-point scale. This suggest that the majority of the respondents perceived most of the issues as critical.

TABLE 1
Ranks, means and standard deviations of issues as rated by teachers and teacher educators

Item/ Rank	Issue	Mean*	SD
1.	Recruiting and retaining competent and committed persons as technical teachers	4.85	0.43
2.	Financial support for vocational and technical education	4.80	0.49
3.	Providing adequate instructional materials and equipment for vocational teacher education	4.72	0.78
4.	The need to ensure that curriculum and instruction reflect Nigeria's current needs	4.69	0.49
5.	How to keep Nigerian technical teachers technologically current	4.55	0.55
6.	Ensuring that only qualified and occupationally competent teachers are allowed to teach in schools and colleges	4.55	0.71
7.	Funding research in vocational education	4.46	0.78
8.	Updating and upgrading teacher education programs	4.45	0.68
9.	Need to have strong legislation for vocational and technical education	4.41	0.81
10.	Finding ways to make teaching more attractive	4.34	0.77
11.	Changing the image that society has about vocational and technical education	4.34	0.89
12.	How to increase school-industry cooperation	4.24	0.78
13.	Upgrading administrative skills of vocational administrators	4.23	0.76
14.	Shortage of teachers in vocational subject areas.	4.23	1.04
15.	Determining realistic standards for vocational education	4.20	0.79
16.	Assessment of the competence of technical teachers	4.14	0.70
17.	Determining extent to which industry should offer on-the-job training	4.12	0.78
18.	Getting the public to see the relationship between vocational education and the economic climate of the country	4.08	0.84

Item/ Rank	Issue	Mean*	SD
19.	Finding ways to support the professional development of teachers	4.04	1.03
20.	Developing teachers' affective work skills (values, attitudes, and appreciations)	3.98	0.92
21.	Determining the correct balance between general and vocational education that should be offered to vocational-technical student teachers	3.96	0.92
22.	Encouraging the development of teachers who do not have at least a bachelor's degree	3.80	1.09
23.	Inadequate provision of instructional resources to meet the needs of special needs learners in vocational programs	3.52	1.20
24.	Lack of research regarding effective teaching method in vocational education	3.29	1.09
25.	Need to break the "marriage" between vocational and general education	2.89	1.29

*N = 106. On a scale of 1 to 5, 5 represents very high priority issue and 1 very low priority issue.

TABLE 2

Comparison of the ratings of issues between vocational - technical teachers and teacher educators

Item	Issue	(a) Technical Teachers		(b) Teacher Educators		
		Mean	SD	Mean	SD	t-value
1.	Recruiting and retaining competent teacher	4.86	0.47	4.79	0.47	0.78
2.	Financial support	4.86	0.35	4.70	0.64	1.45
3.	Instructional materials and equipment	4.84	0.48	4.74	0.96	0.83
4.	Curriculum and instruction	4.73	0.45	4.65	0.53	0.80
5.	Keeping teachers current	4.51	0.59	4.58	0.50	-0.64

Item	Issue	(a) Technical Teachers		(b) Teacher Educators		
		Mean	SD	Mean	SD	t-value
6.	Ensuring that only qualified teachers teach	4.49	0.84	4.67	0.47	-1.50
7.	Funding research	4.46	0.62	4.44	0.98	0.12
8.	Updating programs	4.52	0.67	4.42	0.59	0.83
9.	Need for legislation	4.37	0.89	4.40	0.93	-0.17
10.	Making teaching attractive	3.90	0.47	4.26	0.73	-3.0**
11.	Change of image	4.51	0.72	4.14	1.04	2.06*
12.	School-industry cooperation	4.17	0.79	4.26	0.82	-0.53
13.	Training administrators	4.33	0.76	4.12	0.66	1.50
14.	Shortage of subject teachers	4.22	1.18	4.16	0.87	0.32
15.	Standards for vocational education	4.17	0.79	4.33	0.75	-1.23
16.	Assessment of teachers	4.11	0.67	4.23	0.68	-0.92
17.	On-the-job training	4.11	0.83	4.09	0.78	0.13
18.	Vocational education and the economy	4.19	0.74	3.98	0.94	1.24
19.	Professional development	4.16	0.88	3.79	1.1	1.76
20.	Affective work skills	3.94	0.97	3.98	0.89	-0.22
21.	General versus vocational education	4.00	0.90	3.79	1.01	1.11
22.	Encouraging teachers	3.87	0.98	3.76	1.2	0.42
23.	Inadequate provision for special needs learners	3.49	1.24	3.63	1.09	-.064
24.	Research on teaching	3.29	1.13	3.32	1.0	0.29
25.	Marriage between general and vocational education	3.11	1.36	2.51	1.12	2.50*

(a) : N = 63; (b) : N = 43

*Significant beyond the .05 level

TABLE 3

Comparison of the ratings of issues on the basis of gender of respondents

Item	Issues	Males [a]		Females [b]		
		Mean	SD	Mean	SD	t-value
1.	Recruiting and retaining competent teachers	4.91	0.28	4.73	0.61	1.89
2.	Financial support	4.81	0.49	4.78	0.48	0.31
3.	Instructional materials and equipment	4.67	0.87	4.81	0.70	-1.00
4.	Curriculum and instruction	4.65	0.51	4.76	0.43	-1.15
5.	Keeping teachers current	4.57	0.55	4.49	0.56	0.73
6.	Ensuring that only qualified teachers teach	4.51	0.76	4.59	0.76	-0.53
7.	Funding research	4.54	0.70	4.32	0.91	1.2
8.	Updating programs	4.49	0.66	4.38	0.72	0.79
9.	Need for legislation	4.43	0.88	4.30	0.88	0.72
10.	Making teaching attractive	4.39	0.73	4.24	0.83	0.94
11.	Change of image	4.32	0.83	4.39	1.01	-0.37
12.	School-industry cooperation	4.25	0.79	4.22	0.75	0.19
13.	Training administrators	4.22	0.78	4.24	0.72	-1.00
14.	Shortage of subject teachers	4.14	1.12	4.37	0.86	-1.21
15.	Standards for vocational education	4.16	0.76	4.27	0.84	-0.68
16.	Assessment of teachers	4.10	0.69	4.22	0.71	-0.80
17.	On-the-job training	4.12	0.74	4.14	0.86	-0.12
18.	Relating vocational education to the economy	4.07	0.85	4.11	0.84	-0.24
19.	Professional development	4.06	1.01	4.00	1.08	0.29
20.	Affective work skills	3.91	0.95	4.11	0.84	-1.18
21.	General versus vocational education	3.87	0.86	4.14	0.98	-1.42

Item	Issues	Males [a]		Females [b]		
		Mean	SD	Mean	SD	t-value
22.	Encouraging teachers	3.86	1.00	3.70	1.24	0.67
23.	Inadequate provision for special needs learners	3.35	1.25	3.83	1.07	2.09*
24.	Research on teaching	3.19	1.10	3.49	1.04	-1.36
25.	Marriage between general and vocational education	2.83	1.35	3.00	1.18	-0.68

(a) : N = 69, (b) : N =37

A rank ordering of the mean ratings of the issues put the issue of recruiting and retaining competent technical teachers on the top of the list of priorities. This finding corroborates with similar views in the literature (e.g., Sofolahan, 1989; Towe, 1989).

Further examination of the data in Table 1 reveals that the issues of "Financial support for vocational and technical education", and "inadequate instructional materials and equipment", ranked among the top three issues identified in the study. This finding is not at all surprising in view of present economic conditions in Nigeria and the deplorable state it has left vocational and technical education programs. Perhaps what is a little surprising about the data is the relatively low priority accorded to the issue of "marriage between vocational and general education". Apparently, Nigerian vocational educators are beginning to see the relationship between vocational and academic education as complementary and one that should be fostered rather than an issue to be resolved. Viewed otherwise, it is difficult to explain the very low mean rating of item 25 (mean = 2.89).

The data contained in Table 2 suggest that vocational - technical teachers and teacher educators share similar viewpoints on the importance of the issues identified in the study. Although statistically significant differences seem to be lacking in the ratings of the issues by the two groups, it seems that technical teachers are more concerned about the issue of "making teaching more attractive" than teacher educators. The teachers' concern was more evident in their rating of item 11 - "changing the image society has about vocational education". Historically, neither teaching nor vocational education has enjoyed high status even in the technologically advanced countries (Edmunds, 1990). It seems that within vocational education, however, image problems persist more among secondary-level teachers than among those in tertiary institutions.

In Table 3, the ratings of identified issues are compared on the basis of the gender of respondents. The results show that male and female teachers and teacher educators did not differ significantly in their ratings of 24 out of the 25 issues. The two sexes differed on the issue of "inadequate provision for special needs learners". The literature (e.g., Sullivan, 1984) suggests that women tend to be more "people-oriented" than men. This might explain, at least in part, the high rating of the

issue by female respondents. It should be noted, however, that the issue was relatively low in the order of priorities as perceived by both male and female respondents.

Implication of the study

The findings of this study have far-reaching implications for planning and implementation of vocational-technical teacher education in Nigeria as well as in other developing countries. First, vocational and technical education can be effectively planned and implemented to the extent that there is a strong public policy and commitment to support it. Such public policy should specifically define the direction of vocational and technical education as dictated by national needs and backed fully by protected, centrally, administered funds. Since both the public and private sectors of the economy have a stake in the products of vocational and technical programs, a mechanism should be put in place for private employers to contribute proportionately in support of such programs. Making private sector contribution almost voluntary as is currently the case with the present set-up of the Industrial Training Fund (ITF) in Nigeria is a serious flaw in securing financial resources for vocational and technical education.

Second, the recent decision of the Nigerian government to develop a local version of the Technical Teacher Training Program, for vocational - technical teacher preparation up to the doctoral level, is both educationally and economically sound. However educators and policy makers alike must articulate a unified vision of the quality of teacher expected from this initiative. Implicit in such articulation should be a realization that quality vocational-technical teacher education programs do not occur in a vacuum. They often result from positive action toward improving instruction in such programs through improvement in system inputs, namely, instructional personnel, facilities, equipment, and materials.

Finally, the rest of the world is moving into the year 2000 with visions of how they will keep their economics competitive in the global market place. Although education appears to have lost much of the faith society once had in its transforming power, many nations still look up to it for solutions to their social and economic problems (Carter, 1992). Many experts now believe that today's high-performance workplace demands workers who can think critically and creatively in order to be able to make decisions and solve problems without supervision (Brock, 1992; Warnat, 1991; Willis, 1991). This brings into question the content of current programs designed to prepare people for the workforce. What was vocational and what was academic in the education of an individual. The era is gone when vocational programs were meant to provide narrow job-specific skills when workers merely carried out instructions handed down by managers and supervisors. Consequently, the artificial barrier which separated vocational and academic education is crumbling in many forward-looking educational systems world-wide. Integration of vocational and academic curricula is increasingly becoming the rule rather than the exception. Vocational-technical education still holds a great deal of promise for a country afloat. Bad economic times, perhaps, may provide a unique opportunity to re-think the content and dynamics of Nigerian vocational - technical education with a view to exploring the kind of positive social and economic changes the nation can accomplish through it.

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The Influence of the Brainstorming Process on Creativity of Vocational Industrial Education Students in Taiwan the R.O.C.

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ABSTRACT

The purpose of this study was (1) to determine the effectiveness of brainstorming to enhance creativity of vocational industrial education students, and (2) to determine the enhancement effects of creative thinking abilities on different subjects in different technical areas. After participating in the brainstorming session, the experimental group students made significantly greater gains than the control group students in fluency, flexibility, originality, and total of verbal creative thinking abilities, and influence, originality, and total score of figural creative thinking abilities. The enhancement of figural-elaboration scores for the experimental group occurred for the machinery department students but not for the electronic department students. There were no significant differences between the machinery and the electronic students in the enhancement of the score of fluency, flexibility, originality, and total score in verbal creative thinking abilities and the scores of fluency, flexibility, originality and total in figural creative thinking abilities, while the effects of experimental teaching on the machinery department was better than that of the electronic department on the figural-elaboration scores.

Enhancing students' creativity has recently become an important goal in education. In fact, it has been suggested that teaching creativity is far more necessary than dispensing knowledge (Wollace, 1986). After the speech delivered by Guilford on creativity in 1950 at the Annual Conference of Psychology in America, research on "Creative Psychology" has gained recognition in the fields of psychology and education (Gilchrist, 1972).

Creativity could be viewed and researched through two psychological perspectives: intellectual structure (SI) and cognitive psychology. No matter from which perspective, creativity could be sparked or enhanced by training with related strategies.

Guilford (1967) divided intelligence into three dimensions: operations, contents and products, which consisted of 150 independent factors. One factor in the operations dimension is divergent production. Guilford viewed divergent thought as a general process based on creative production (Brown, 1989). Some research even offered the creativity-equals-divergent-thinking assumption (Tannenbaum, 1985). The belief that divergent thinking ability could be increased is supported by much research. These studies suggest that students can be trained in divergent thinking.

Cognitive psychologists divide human

information processing into five separate aspects of cognition: attention, perception, encoding, storage, and retrieval. Problem solving is viewed as playing a very important role in information processing. Andre (1986) claimed "problem solving consists of the behavioral and mental activities and performance that are involved in dealing with problems. It may involve thinking (cognitive) components, emotional or motivational components, and behavioral components" (p.171). Problem solving stands at the summit of the hierarchy of all human thinking skills (Christensen & Martin, 1992). Cognitive psychologists stress how to use declarative and procedural knowledge in problem solving, but not creativity. However, what is emphasized in problem solving by the cognitive psychologist is similar to what is emphasized in creative psychology. Therefore, some psychologists combine these two concepts as "creative problem solving".

Much research also supports the theory that problem solving ability can be increased. So, it is necessary to instruct students in skills to enhance their problem solving ability.

Andre (1980) pointed out that any programs designed to increase problem solving ability by increasing divergent thinking have been conducted and have shown positive effects of increasing divergent thinking ability. No matter from which psychological perspective creativity is viewed, it is agreed that creative thinking skills can be enhanced through education. Activities designed to increased fluency, flexibility, and originality can be included in any curriculum (Hicks, 1980).

The Republic of China has established a vocational industrial educational goal "to improve the students' abilities to develop their potentials, to create, and to adapt" (The Education Ministry, 1986). In fact, to increase students' creativity is set in the goals of different levels of education in Taiwan. In Taiwan, after Chia (1970) advocated creative thinking teaching, eighteen papers of experimental research have been written in this field. In the last ten years, the local educational authorities in Taiwan have advocated creative thinking teaching at every level in local education, and it has been found to be particularly effective in elementary education. Because vocational industrial education students are not all required to take the stressful university or college entrance examinations, an emphasis in creative thinking teaching has been promoted. However, many teachers are uncertain about how to include the subject in industrial technology institution. Therefore, the establishment of a creative thinking teaching model is worth further research.

Wu (1989) undertook an experimental study to incorporate creative and inventive concepts into high school vocational curricula and found that an experimental curriculum of creativity and invention could improve the creativity of students. Among nine units of the experimental curriculum, the unit on brainstorming was reckoned by the students to be the favourite and most helpful strategy.

Brainstorming was originated by A.F. Osborn in 1938. Osborn (1963) described brainstorming as ".... a conference technique by which a group attempts to find a solution for a specific problem by amassing all the ideas spontaneously contributed by its members" (p.151). Group brainstorming generally has two main phases: the ideation phase and the adjudgment phase. Osborn believed that brainstorming should be guided by four regulations; 1) criticism is ruled out; 2) "free-wheeling" is welcomed, 3) quantity is wanted; and 4) combination and improvement

are sought. In fact, brainstorming is based on two principles: the delay of judgement and the yield of quality from quantity (Stein, 1974).

Brainstorming facilitates manipulation of external environment and the internal creative climate of individuals, and gives verbal reinforcement. Some research findings indicated brainstorming could increase individual creativity (Andre, Schumers & Whitaker, 1979). Brainstorming is important in the process of creative problem solving (CPS) which is useful in creative thinking. Brainstorming is used as the tool of the divergent phase on CPS's six stags (Treffingr & Firestien, 1989). In 1990, when the SANNO Institute of Business Administration surveyed 394 Japanese corporations in the topic of creative development, brainstorming had the highest percentage (87.1%) among creative strategies to be used as training technique (Nakazono, 1992).

The effectiveness of brainstorming for increasing creativity has been documented in many research articles, but most of these were in the field of writing or composition, or involved brainstorming in multiple strategies of creative thinking. Very few have used brainstorming as the main strategy in creative thinking teaching research in vocational industrial education. Due to these reasons, this researcher used brainstorming as the main strategy in a study of creative thinking teaching in Vocational Industrial Education in Taiwan with the intention of exploring the feasibility of providing a simple creative thinking teaching model of brainstorming.

The enhancement of creativity seems related to the content of what students learn. Lin (1984) studied creative thinking teaching in writing and drawing courses of fourth grade students. The results showed that verbal creative thinking abilities of students in two courses had increased. On figural creative thinking abilities, students in the writing course increased in flexibility and originality, the students in the drawing course increased in elaboration. Li (1987) found similar results in a study, where the students of watercolour, photography, and design courses in vocational schools increased in verbal creative thinking abilities, but not in figural ones; and the students of a Chinese course increased in figural creative thinking abilities, but not in verbal ones. In previous research, this researcher (Wu, 1989) found that the students who majored in electronics were significantly superior in scores of fluency in figural creative thinking abilities to the students who majored in machinery. A probable reason was that the machinery students were in their fourth semester of the "Engineering Graphics" course, whereas the electronics students had completed just one semester's work in that course one and a half years previously. Although the effects of different courses on the enhancement of creative thinking abilities was not the main purpose of these studies, the effect appears to exist. If such differences are real, creative thinking teaching methods should be included in a special professional curricula to improve students' creativity. This phenomenon merits further exploration.

The central purpose of this study was to (1) Determine the effectiveness of brainstorming to enhance creativity of vocational industrial education students, and (2) Determine the enhancement effects of creative thinking on different technical subjects.

METHOD

Research Subjects

Samples were chosen from the Ta-an Senior Vocational Industrial School in Taipei City. Four eleventh grade classes were randomly assigned.

Two electronic classes, randomly selected from three classes, were randomly assigned. One served as the experimental class and the other as the control class. The two machinery classes were randomly assigned to experimental and control groups in similar manner. The actual sample is shown in Table 0.1.

Table 0.1: The actual sample of this research

Group	Electronic Dep.	Machinery Dep.
Experimental Group	40	44
Control Group	45	44

Experimental Design

This two-way quasi-experimental study was composed of a non-equivalent control-group design. Table 0.2 shows the experiment design. There was a pretest before treatment and a post-test after treatment.

Table 0.2: Experimental design

Group	Pretest	Treatment	Post-test
Experimental Group	T1	X1	T2
Control Group	T3	X2	T4

Treatment

The experimental group was taught with brainstorming sessions (X1); and the control group, with the material unrelated to creativity (X2) (introduction of American culture, customs, and national parks). The teaching time in the experimentation was five hours with each group, two hours a week. All treatment groups were taught by this researcher.

Instruments

In this study, the Torrance Test of Creative Thinking was used to determine the experimental effect. This test includes two figural forms and two verbal forms. From the verbal form, this study adopted the fifth activities, unusual uses (Form A: Cardboard Boxes; Form B: Tin Can). From figural form, this study adopted the third activity, lines (Form A), and circles (Form B). All tests were revised independently by three Chinese psychologists. From the Torrance Test of Creative Thinking, nine scores could be measured: verbal-fluency, -flexibility, -originality, -total, and figural-fluency, -flexibility, -originality, -eleboration, -total.

Analysis of Data

A 2x2 analysis of covariance (ANCOVA) was used to test the effects of the experimental teaching wherein group and department variables served as the independent variables. The scores of the post-test were dependent variables and the scores of the pre-test served as covariates. Before the analysis of covariance, a test for homogeneity of regression was conducted to detect if it violated the assumption of homogeneity in the ANCOVA. In this research there were two scores, verbal-flexibility and figural-elaboration, which reached the significant level on the test for homogeneity. The researcher analyzed these two scores with the two-way analysis of variance (ANOVA) for difference between t scores of the pre-test and the post-test. If there was an interaction between the groups and the department in the ANOVA, the simple effect was tested.

RESULTS

The ANCOVA or ANOVA were used to test main effect and interaction effect among nine scores. About interaction effect, only the

figural-elaboration score reached significance among nine scores.

On verbal-fluency scores, group main effect was statistically significant, $F(1,168) = 39.61$, $p < .01$. The adjusted means were 26.98 for the experimental group and 19.28 for the control groups. The experimental group was significantly higher than the control group on verbal-fluency scores.

On verbal-flexibility scores, group main effect was statistically significant, $F(1,68) = 3.90$, $p < .05$. The mean of the difference between t scores of the pre-test and post-test verbal-flexibility scores, was 0.87 for the experimental groups and -1.52 for the control groups. These results indicated the experimental group was significantly higher than the control group on figural-originality scores.

On verbal-originality scores, group main effect was statistically significant, $F(1,168)=25.43$, $p<.01$. The adjusted means were 19.17 for the experimental groups and 13.10 for the control groups. The experimental group was significantly higher than the control group on verbal-originality scores.

On verbal-total scores, group main effect was statistically significant, $F(1,168)=32.84$, $p<.01$. The adjusted means were 57.89 for the experimental groups and 42.69 for the control groups. These results indicated that the experimental group was significantly higher than control group on the verbal-total scores.

On figural-fluency scores, group main effect was statistically significant, $F(1,168)=8.36$, $p<.01$. The adjusted means for the experimental and control groups were 16.90 and 14.41, respectively. These results indicated that the experimental group was significantly higher than the control group on the figural-fluency scores.

On figural-originality scores, group main effect was statistically significant, $F(1,168)=11.09$, $p<.01$. Adjusted means for the experimental and control groups were 35.25 and 28.44, respectively. These results indicated that the experimental group was significantly higher than the control group on figural-originality scores.

On figural-elaboration scores, because the interaction effect between group and department was statistically significant, the method of LSMEANS was used to test the simple effect. The results showed that, for the different t scores, there was significant difference between the experimental groups of the electronic and the machinery departments, $p=.015$; there was a significant difference between scores of the control groups of the electronic and the machinery departments, $p=0.00$; there was no significant difference, however, between the experimental and the control groups of the electronic department, $p=0.098$; and there was a significant difference between the experimental and the control groups of the machinery department, $p=.031$. The means of the difference in T-scores on figural-elaboration scores are 2.76 in the experimental group of the electronic department, 6.10 in the control group of the electroni department, -2.23 in the experimental group of the machinery department, and -6.51 in the control group of the machinery department. These results indicated that the effect of the experimental teaching within the machinery department appears better than the electronic department on the figural-elaboration scores.

On figural-total scores, group main effect was statistically significant, $F(1,168)=7.97$, $p<.01$. The adjusted means were 83.35 for the experimental groups and 72.90 for the control groups. This result indicated that the experimental group was significantly higher than the control group on figural-total scores.

DISCUSSION

The Effectiveness of Brainstorming to Enhance Creativity

Excepting figural-flexibility, the experimental groups progressed in the scores of verbal-fluency, verbal-flexibility, verbal-originality, verbal-total, figural-fluency, figural-originality, and figural-total; and figural-elaboration in the machinery department. The statistical analysis provided evidence that the brainstorming process could enhance the creative thinking abilities. This result is similar to much of the reported research about creative thinking teaching. From the results of the questionnaire of learning reaction for experimental groups, 67.4% of the students reported enjoying the brainstorming program; 83.1% of the students thought the program was useful; 91.6% of the students thought the brainstorming program enhanced their creative ability; 68.6% of the students hoped to take an additional class like the brainstorming program; and 54.2% of the students thought that brainstorming should be required in vocational industrial schools. Generalizing the result, especially on item 3, the brainstorming was well received by most of the experimental group students and considered useful in increasing creativity.

Enhancement Effects of Creative Thinking on Different Technical Subjects

The reslults of this study indicated there were no differences between the machinery and the electronic students in the enhancement of verbal and figural scores of the Torrance Test of Creative Thinking except that the scores of figural-elaboration in which the effects of the experimental teaching for the machinery department students achieved more than the electronic department students. This finding differed from some results reported by other researchers (e.g. Li, 1987; Lin, 1984; Wu, 1989). The two research studies, mentioned earlier and conducted by Li (1984) and Wu (1989), reported that the students majoring in courses related to painting or graphics had more difficulty in the enhancement of figural scores in the Torrance Test of Creative Thinking. The probable reason that the result of this study differed from that of the previous two studies may be due to different intelligence of subjects among the three studies. The competition of the entrance examination is intense in the senior middle school level. The students strongly desire to enter a star or excellent school. This competition results in great differences in students' intelligence among different schools. Ta-an Senior Vocational Industrial School is usually considered as the first choice of qualified entrants in the vocational education level in Taipei district. The school in which students were used as subjects in this researcher's previous research is usually considered as the second or third choice; and the schools in the Li's research as the third or fourth choice. It is possible that the subjects in this research were superior students. If the assumption that enhancement of scores of creative thinking abilities differs among students with different intelligence is true, this will mean that the extent of students' fixedness varies with the students' intelligence. Reducing students' functional fixedness is one of the pivotal points in creative thinking teaching; therefore, how the factor of intelligence influences the effect of creative thinking teaching could be studied further.

A Rationale for Weaker Enhancement on Flexibility

The figural-flexibility was the only score in which the experimental group did not significantly progress. Even though the

verbal-flexibility scores increased significantly in the experimental group. From the original means of verbal creative thinking scores as compared to other verbal-scores, verbal-flexibility had apparently less enhancement in the experimental groups between the pre-test and post-test. Besides conducting the analysis of variance for verbal-flexibility and figural-elaboration, this researcher also conducted the analysis of variance for the other verbal-scores. Among the verbal-scores, none of the interaction effects between groups and departments were statistically significant. For the group main effect, the p value was .0001 on verbal-fluency scores, .0498 on verbal-flexibility scores, .0042 on verbal-originality scores, and 0.0001 on verbal-total scores. Regardless of the comparison of original means or for p values, it is obvious that the increase of the experimental group in verbal-flexibility scores was weaker than in other verbal scores.

To interpret the results on flexibility scores, the terms of fluency, flexibility, originality, and elaboration should be described. Fluency was defined as the total number of relevent responses in the task. Flexibility is the ability to shift categories in thinking. The flexibility score was determined by the number of different categories counted into which responses were classified. Originality was defined as the number of statistically infrequent responses. Elaboration is viewed as an attempt to embellish or embroider upon ideas.

In accordance with the above description, it is easy to understand that the reason students were unable to enhance the ability of flexibility much is attributed to the term "mental inertia" which has been created by researchers and defined as one's thinking path will be strongly influenced by previous impression as physical inertia. The thinking path of the students had greater difficulty in shifting among various categories than in generating fluency or original ideas. The hierarchical network model (Collins and Quillian, 1969, 1970) assumed that category information is stored in memory with association. Classification time is influenced by hierarchical organization. An instance in a basic-level category can be verified faster than that in a superordinate category. The feature comparison model (Smith, Shoben, & Rips, 1974) assumes that comparing the features or attributes of the two nouns is used to classify instances for representing the category. The spreading activation model (Collins & Loftus, 1975) assumes that activation spreads out more effectively along the paths of a semantic network than outside the paths. These models of semantic organization were supported by some research (Reed, 1992). Generalized from the above models and the phenomenon of "mental inertia", one's thinking path will be strongly influenced by previous impression, and a current idea will influence a subsequent idea. Students retrieve a new idea associated to the current idea more easily than that which is remote from the current one, especially in a short test time. When students wrote their ideas in the test, they may have tended to write the subsequent ideas related to the previous one as possible until their ideas in the same category were exhausted. Therefore, experimental group students received significant enhancement in fluency scores, but no enhancement or weaker scores in flexibility scores. The number of responses increased in the creative thinking test of experimental groups, but the number of categories of response did not. This might be attributed to the short experimental teaching time of only five hours.

Modulation and control of more fundamental or routine cognitive skills are required in the ability of "problem solving". changing between skills for problem solving

must be flexible (McCarthy & Warrington, 1990). McCarthy and Warrington defined flexibility as "the ability to shift comparatively rapidly between different concepts and to adopt different perspectives on a concept is a prerequisite for carrying out the operations neccessary for much problem solving" (p.350). Flexibility is a very important component in problem solving and creative thinking. Flexibility in idea production describes a condition necessary for reducing functions fixedness (Haensly & Reynolds, 1989). This study indicated that the enhancement of flexibility is more difficult than the other creative abilities. Inevitably, it is necessary to increase students' flexibility in creative thinking teaching in vocational industrial education. Therefore, for promotion of the validity of creative thinking teaching, it is worthwhile to study ways to enable students to build a smooth thinking path among different categories for easy shifting in creative thinking.

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Technical Education and Indian Economic Growth (1950-1990)

DR. R. SRINIVASAN

Technical Education is the hub for the prosperity of Indian economy. At the post-secondary/higher level technial educatin system produces technicians (diploma holders and technologists (degree holders) in its polytechnics and colleges of Enginering/Technology respectively.

The polytechnic diploma courses train personnel for middle level or supervisory roles and involves three years of study after completing class-X. The degree institutions offer graduate and post-graduate programmes in Engineering/Technology. The first degree in engineering after class XII is of 4 years and the Master's degree courses involve 1½ years of study after graduation. These engineers/technologists occupy senior positions. Nowadays even some students after passing class XII join in the pre-final year in diploma courses in polytechincs and pursue diploma courses. For the benefit of diploma holders even part-time courses are offered by some engineering colleges to acquire degrees in their specialized fields. Besides they can also qualify for AMIE which is recognized equivalent to B.E/B.Tech for their career mobility. Thus they can equip themselves to serve better as effective human resource agents.

Higher technical education system contributes qualified manpower for absorption in all the sectors of the economy-primary, secondary and tertiary (services sector). Thereby it feeds human resources for accelerating production in all these sectors which will go to raise the revenue of the economy.

Achieving rapid and sustainable progress is the prime concern of developing countries like India. The constant march towards achieving economic growth necessitates registering appreciable increments in per capita income over the years. Kindleberger (1965) states that 'economic growth is generally thought of as unidimensional and is measured by increases in income'. Besides this the McGraw Hill Dictionary of Modern Economics (1983) states that ''usually economic growth is meassured by the annual rate of increase in a nation's gross national product, as adjusted for price changes. A better measure, however, is the increase in the real gross national product per capita''. Hence the per capita income in real terms which is estimated after adjusting price fluctuations could be taken as the authentic indicator of the economic growth registered by the country and is also the quickest estimate.

In this paper an attempt has been to establish the nature of correlation between enrolment in technical education and Indian per capita income over the years 1950-90 to find out the effectiveness of technical education if any in the growth of the country.

The data about the number of students admitted in polytechnics and engineering coleges over the last 40 years in the country were related with the estimates of real per

TABLE - 1
Growth of Technical Education* and Real Per Capita Income (1950-90) for India**

Year	No. of Institutions		Enrolment of Students			
	Polytechnics	Engineering Colleges	Polytechnics	Engineering Colleges	Total Enrolment	Real per Capita Income (Rs) at 1980-81 prices
1950	55	47	3,750	3,800	7,550	1,127
1960	195	113	26,000	16,000	42,000	1,350
1970	309	139	43,500	18,200	61,700	1,520
1980	332	157	49,000	28,500	77,500	1,627
1990	771	303	1,21,000	66,500	1,87,500	2,199

* The Indian Journal of Technical Education, April-June 1993

** Datt, R and K.P.M. Sundaram, Indian Economy (1992)

capita income to identify the extent of nexus between technical education and Indian economic growth.

This papers considers only quantitative indices in relating the two phenomena. Growth is necessarily a numerical indicator and that is why the growth in the two factors have been analyzed and related using their respective point growth rates between successive decades.

Inferences:

On the basis of the data it is inferred that

1. The maximum increase in enrolment both in polytechnics as well engineering colleges as a whole was witnessed in the first decade 1950-60 in independent India.

2. The growth of enrolment increased again substantially in the last decade (1980-90), of course lesser than that in the years 1950-60. This could be attributed to the emergence of self-financing institutions which sprang up in the 1980s.

3. The decade 1970-80 accounted for the least increase in combined enrolment in polytechnics and enmgineering colleges.

4. When viewed independently polytechnic enrolment registered a much higher growth than enrolment in degree level institutions. Over the 40 year period the average annual rate of growth in student enrolment in polytechnics comes to 78.16% whereas the same was only 41.25% in engineering colleges.

5. The average enrolment per institution comes to 68 and 81 in polytechnics and engineering colloeges respectively in 1950. Their average intake increased to 157 and 219 in 1990 in polytechnics and degree institutions. This indicates that in engineering colleges more number of students are admitted.

TABLE-2
. Net Domestic Product at Factor Cost (Ratio) (1980-81 Prices)

Year	Primary Sector	Secondary Sector	Tertiary Sector
1950-51	58.3	15.1	26.6
1989-90	35.2	25.5	39.3

6. Now if we look at the real per capita income achieved since 1950 the last decade (1980-90) showed the maximum increase. The least increase was recorded during the years 1970-80. The average annual rate of growth for the entire period comes to 2.27%

7. The nexus between enrolment in technical institutions and real per capita income is found to be positive. The computed values of Spearman's rho are:

i) Enrolment in polytechnics and real percapita income .6

ii) Enrolment in engineering colleges and real per capita income .8

iii) Combined enrolment and real per capita income .8

8. All the three positive correlation co-efficients indicates that there is a direct relation between growth of enrolment in higher technical institutions and real per capita income of India for the entire span of 40 years. Thus it is evident that human capital and economic prosperity are complementary to each other.

The direct/positive co-relation reveals the inter dependence between economic and educational factors for the growth of the economy, though they are not statistically significant. This extent of relationship implies that higher technical education contributes to the Indian economic growth which could be taken as an indication of the need to concentrate on the continuous expansion of technical education in all dimensions. Thus the higher technical institutions have justified their role in supplying competent personnel who have contributed for the economic prosperity.

Yet another relevant indication is the growing share of secondary and tertiary sectors in the Net Domestic Products (NDP). The available statistics reveal that industries account for one-fourth of the total income of India.

On the whole the 1950s and 1980s have witnessed appreciable growths in both the phenomena analyzed. The trend of the 1980s if continued naturally will pave the way for reaching new heights in the years ahead.

Inspite of continuous growth in absolute terms in student enrolment and real per capita income both the phenomena accounted for the lowest growth rate in the decade 1970-1980.

The degree of relationship is more pronounced for the total enrolment as well enrolment in engineering colleges. The higher value of correlation obtained for enrolment in engineering colleges probably indicates that engineers might contribute more for the economic prosperity of the nation than technicians who are made to serve as per the directions/ supervision of technocrats and as they possess a stronger repertoire of knowledge than middle level functionaries.

The nomenclature 'Human Resource Development' now used instead of the traditional term 'education' emphasises the role of human resources/education in accounting for their own as well national development.

This piece of evidence gives an assurance that the Indian economy can fall back upon technical education system for its all round growth in its march towards the 21st Century.

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On the Observed Congruence Between the Investment in Interactive Roles of TTTI and The Polytechnic Teachers Perception of their Worth.

B.N. GUPTA

ABSTRACT

The study investigates the faculty efforts of TTTI and correlates them with the data on polytechnic teacher perception obtained from another study and finds that these are infact, highly correlated.

INTRODUCTION

The Technical Teachers' Training Institute (Eastern Region) started functioning during the later part of the 60's. Initially, teaching personnel of the polytechnics and allied institutions, the fresh graduates from the Engineering Colleges and the polytechnics were trained, with the objective of preparing them as teachers for the polytechnics. but subsequently, it restricted itself to training in-service teachers only.

Apart from the academic training programmes, many other services were extended, e.g., institutional planning, resource development, curriculum development, modernisation, community services etc., which also gained sufficient popularity and such services were requisitioned frequently. Also the action research became a part of regular activities of the TTTI.

It is now necessary to assess any venture, in order to know whether this had desired effect. Because at this juncture, when the polytechnics are advised to take initiative on their own, both qualitatively and quantitatively for development, such assessment are indispensable. The area like modernisation of resources, interaction with industry and community, learning resource development etc. are being proposed to be funded, by the World Bank Assistance and thereby the relation between the polytechnics and the TTTI's are getting more meaningful. Obviously a very pertinent question arises regarding the ability of the individual polytechnics to work on their own in the above mentioned areas. How much they had been assisted so far, through interaction with the TTTI, in these areas of activity? What perceptions do they actually have regarding these? Such information are essential for the TTTI, for its own accountability.

Recently, a drive had been launched, by the TTTI, Calcutta, to get some feedback from the polytechnic personnel, in respect of the interactions of the TTTI with the polytechnics and the vice-versa.

EARLIER STUDIES:

Some earlier studies, related to similar problems, are summarized below, chronologically, with their suggestions:

Studying entity with date:	Findings and related suggestions put forward
1969, Havlock	Suggested a model of meaningful interaction for invention and development.
1972, Glatter	Suggested meaningful staff-college roles, to their climate. Both Havlock and Glatter advised a combination of top-down strategy with bottom up (user-need Based) problems of various stages.
Review Committee: for TTTIs in India (Govt. of India) in 1972.	All activities of the TTTI's are systematically included in scheme. Review committee suggested institutional modular programmes with special emphasis on the inservice short-term courses and extension service befitting the needs of polytechnics.
Inter TTTI, research project: Coordinator, TTTI (Bhopal) in 1980.	Found high positive correlation between TTTI-polytechnic interaction levels and the quality of polytechnic performances.
Inter-TTTI, Study: Co-ordinated by TTTI Calcutta in 1982	Teachers of polytechnics wanted more programmes on the preparation and use of instructional aids and the media rather than basic teaching processes and strategies. However, 94% preferred to participate in the in-service training and 71%preferred to join in the longterm training. Demand was poor in the area of educational management
Joint study by TTTI (Madras) and TTTI (Calcutta) in 1988.	Study showed significant transfer of competency in some area like class-room questioning
Study by Adhikari, T.B.; Subrahmanyan, T.R.V and Gupta, B.N. in 1990.	Found that some areas like long-term and short-term courses, curriculum development, Community polytechnic- development etc. were appreciated much by the polytechnic teachers, whereas some areas are not.
Inter-TTTI, Study: Co-ordinated by TTTI Calcutta in 1982.	Suggestions were put forward for investigations to ascertain the extent of utilisation of the services rendered by TTTI. Some intangible effects of education are also there, which cannot be obviously measured or quantified. But certain ethnographic methods may be followed for some indepth understanding of the involved processes, that lead to such perceptions.

RESEARCH QUESTIONS:

The main concern of TTTI is the quality improvement of polytechnic teachers. The Courses/programmes which were launched, had either achieved expected results to a fairly good extent or had some frustrating outcome. But it has to be accepted as realities. Also at times, it had been the experiences, that desirable changes in attitude or awareness, that elude ordinary measures for assessment have deep-rooted effects as well. But in any case, valid feedback from the real situation is a factor for monitoring the performance of any agency. Keeping these in view, a research question at this stage may be formulated to see how far the amount of faculty-hours invested in a process (taken to be a measure of the intensity of TTTI-services) are reflected in the perceptions of the polytechnic teachers, about the worthiness of the services of TTTI to them?

DESIGN OF THE STUDY:

To explore these investments, percentages of the faculty times toward different services were calculated out (mainly from the faculty time-tables and also from other sources like, resource utilisation records, financial involvements etc.). Data were collected from the individual faculty-members regarding their loads during the year 1989-90 (for presentation to another committee). Data were taken from the study (Subrahmanyan, T.R.V. et. al, 1990) regarding the levels of teacher satisfaction (measured in terms of percentages of polytechnic teachers who felt the efforts as worthwhile) and the two sets of data were tested to see whether the correlation is significant.

The data are presented in table-1 stating activity, % of faculty time, Rank (R_T), % of polytechnic teachers (feeling worthwhile) Rank (R_P), and D ($R_T - R_P$).

RESULTS & DISCUSSION:

The effort (staff-time) and the satisfaction perception volume are highly rank correlated (significant at $P < 0.01$), thereby suggesting that the order of priority of the TTTI in investing time to different service roles are apparently appropriate. however, it may well be that the amount of effort or volumes of positive perceptions may not be proportionate to the outcome in terms of concrete results, rather it may indicate the success of the effort in image building/visibility through public relations' strategy only.

Indepth study is needed to assess the contribution of the TTTI inputs in preparing the system for substantive improvement and generating commitments for such changes. Again Curriculum development is more labour intensive, so far as the TTTI is concerned, although only a small section of teachers are involved. The perceptions of teachers, not involved any time in such processes may be arbitrary. It suggests that constituencies can be delineated for such data collection.

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TABLE -1

RANK CORRELATION OF TIME SPENT BY TTTI FACULTY AND POLYTECHNIC TEACHER PERCEPTION OF WORTH OF TTTI PROGRAMMES

Sl No	ACTIVITY	% FACULTY TIME	RANK % RT	TEACHER OF POLY-TECHNIC FEEL WORTH WHILE	RANK R_P	D $R_T - R_P$
1.	Long term Training Programmes	3.3	1.0	84.8	1.0	0
2.	Short-term programmes	15	2.5	83.0	2.0	0.5
3.	Curriculum development	15	2.5	59.8	3.0	0.5
4.	Media Development	8.0	4.0	43.8	5.0	1.0
5.	instructional Materials/Manuals books	6.0	6.5	39.3	6.0	0.5
6.	Research	5.0	8.0	31.2*	7.0	1.0
7.	Extension Service Consultancy/Projects	6.0	6.5	30.8**	8.0	1.5
8.	Community Polytechnic Services	7.0	5.0	47.3	4.0	1.0
						$\sum D^2 = 6.0$

$$(N = 8) \quad \rho = 1 - \frac{6 \sum D^2}{N (N^2 - 1)} = 0.9286$$

$$\sigma ps = \frac{1}{\sqrt{7}} = 0.378$$

$$H_0 : \rho = 0 \quad Z = \frac{0.9286}{0.378} = 2.457 \text{ significant at } \rho < .01$$

* Average of teachers responding positively in areas of research on Teaching/Evaluation and media.

** Average of teachers responding positively under infrastructure development of Polytechnics and extension service/consultancy.

Determining Training Needs of Industries and Appraising Training Methods for HRD Programmes

Dr. D.D. SHARMA

ABSTRACT

This paper highlights various aspects of Human Resource Developmet (HRD) such as determining taining needs, seleting trainees for training programmes and appraising the effectiveness of training methods so as to use the best approach for conducting effective training in large, medium and small industial and commercial organisations of public and private corporate sectors. Requests from management, talks with supervisors, informed observation group discussions and report analysis have been adjudged as better methods for training need determination. Case study, conferences, sensitivity training and role playing have been ranked as the better methods whereas lectures have been considered as the least effective method of training. It has been observed that training needs of operatives, supervisors and managers are different. Also different training methods have been found suitable for training various categoies of personnel. Quality and efectiveness of continuing education programmes organised for industries can be substantially improved if training needs are systematically determined and appropriate methods are used for imparting training.

INTRODUCTION

In view of the increasing complexities and diversities of modern small, medium and large industrial and commercial organisations training, development and education of human resource has gained heightened significance. Appropriate strategy for human resource development helps in managing the problems of employees turnover, wastage and breakage, accidents, teamwork, motivation and communication and low morale and productivity. Essentials of any HRD programme is to impart knowledge, skills, and attitudes to employees in order to change their overall behaviour. To tackle the manpower problems, every growth oriented modern organisation needs an independent training cell/department which must perform the tasks of setting training the objectives, analysing the training needs, selecting the trainees, designing the training programmes, selecting the training methods, planning the use of training aids and evaluating the training effectiveness. Many private and publlic sector organisations in India realised the importance of this most critical resource and established training infrastructure to develop the human resource. Every organisation must understand that a strategic approach for the human resource development can increase the productivity by multifolds. In view of the fast changing technology and managerial techniques, human resource

development must get utmost priority not only in large, and medium organisations but also small scale industries.

OBJECTIVES

The study had the following major objectives:

i) To determine the manpower training needs;

ii) To determine the criteria for selecting trainees;

iii) To appraise and choose the better training and development methods for operatives, supervisors and managers.

RESEARCH METHODOLOGY

For the purpose of this study, 120 organisations from private and public sectors were selected from all over India with the help of random purposive sampling technique. Structured undisguised questionnaire was prepared to elicit the primary data from 120 training directors/managers on training needs, selection criteria and appraisal of training methods. The questionnaires were mailed to all the selected training directors and those who did not respond were personally interviewed with regard to filling the questionnaire.

Data so collected has been tabulated, analysed and interpreted so as to accomplish the study objectives.

4. ANALYSIS AND DISCUSSION

4.1 Determining The Training Needs:

The training needs are determined by estimating the degree of following problems in the organisations: standards of work performance are not being met, high rate of accidents, excessive scrap, frequent need for equipment repair, high rate of turnover, too many low ratings on employee evaluation reports, many people using different methods to do the same job, excessive fatigue, fumbling, and struggling with the job, and bottlenecks, and deadlines not being met.

Evidence of training needs may also be gathered from several sources such as employee counselling, selection or exit interviews, report by supervisors and managers, product and process change suggestion system, studies of inplant comunication, merit-ratings; etc. Personnel policy may propose annual or periodic surveys to be carried out for assessing training needs. Whatever be the source, its usefuness willl be determined by its ability to meassure correctly the disparity between the current and desired level of proficiency of personnel.

In the survey of methods detemining training needs, training Directors of 120 companies were asked to indicate their preferences for various training methods for production, clerical and supervisory, and technical/managerial employees. A summary of the expressed preferences is given in Table 1. Although there are variations in three types of employees, the most common methods preferred are: (a) informaion observation, (b) requests from management, (c) talks with supervisors, (d) group discussions, and (e) analysis of reports.

It is evident from the preferences for methods listed in Table 1 that the determination of training needs at present is predominently based on subjective judgements or observations. One common method for recording observations is the checklist of training needs. It provides for indicating by a 'Yes' or 'No' check whether or not each checklist statement has been observed by the employee whose training needs are being determined.

Table 2 gives the sample checklist for supervisors. Once the need for training has

been established in terms of the gap between the current and desired level of proficiency of each individual, the second step lies in stating the areas which need training. Areas needing training are generally broken down into:

(1) Knowledge – for the person who does not know

(2) Skills – for the person who knows but he cannot do

(3) Attitudes – for the person who does not care

(4) Habits – for the person who knows

(5) Understanding – for the person who is not properly motivated to acceptt what he is told. The result hoped for is the removal of person's tendency to block, delay or fail to cooperate with certain people

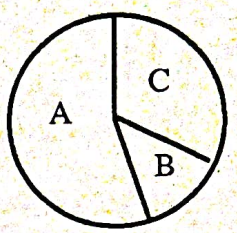
According to another classification, the important areas which may need training are:

(1) Technical Knowledge And Skills - Quality control, cost control, manual skills, safety, and equipment operation.

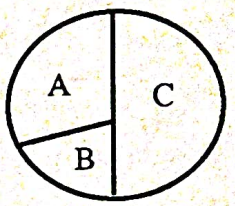
(2) Knowledge of Organisation And External Systems - Company policies, labour skills, safety, and equipment operation.

(3) Conceptual And Inter-personal Skills - Communication planning, organising, decision-making, directing, and discipline.

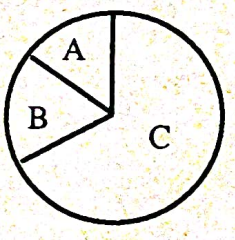
The training needs of employees at different levels in the organisational hierarchy differ in the degree to which emphasis is to be placed on each are shown in Figure 1.



Rank And File employees



First Line Supervisors



Top And Middle Managers

Index: A. Technical Skills And Knowledge

B. Knowledge Of Organisations And External Systems

C. Conceptual And Interpersonal Skills

Figure 1 : Training Needs Of Employees At Different Levels

We may also do the following three-fold analysis (alternatively) as given below to determine the need for and areas of training in an organisation.

(i) Total Organisation Analysis: This involves the detailed analysis of the

TABLE 1
Percent Preferences of 150 Training Directors For Various Methods Of Determining Training Needs

Sr. No.	Method of determining training needs	Types of Employees		
		Production	Clerical	Technical/ Supervisory
i)	Informed observations	12	12	11
ii)	Requests from Management	17	16	15
iii)	Talks with supervisors	16	17	14
iv)	Talks with non-supervisors	4	6	3
v)	Questionnaires to trainees	1	2	4
vi)	Supervisory morale survey	1	1	4
vii)	Employee morale survey	4	4	2
viii)	Group discussions	10	10	13
ix)	Training advisory committee	5	5	6
x)	Tests	3	4	2
xi)	Merit ratings	4	6	4
xii)	Intensive interviews with supervisors	2	4	4
xiii)	Interview with union officials	2	1	4
xiv)	Analysis of reports (costs, turnover, grievance, etc)	2	1	4
xv)	Questionnaires to supervisors	2	2	2
xvi)	Others	5	3	5
	Total	100	100	100

following factors:

a) Structure of the organisation
b) objectives
c) human resources and future plans, and
d) cultural milieu.

The objective of this analysis is to determine whether within the organisation training emphasis can and should be placed.

(ii) Task Analysis: This involves a detailed

TABLE 2 : Samples Checklist For Supervisors

	Items recorded of training specialist	Checked for adequate performance		Possible training need
		Yes	No	
1.	Keeps inventory of tools	X		
2.	Prepares training outline for apprentices		X	X
3.	Takes unsafe machinery for service	X		
4.	Checks all repairs	X		
5.	Maintains hours of work record	X		
6.	Inspects regularlly for quality of products		X	X
7.	Informs on elimination of waste		X	X
8.	Plans workplace layout		X	X
9.	Instructs on cost of materials		X	X
10.	Explains company policy to workers		X	X

analysis of he following factors:

a) Components of a job

b) Skills and training required to perform job at the required standard,

c) Attitudinal predispositions - for instance, the attitude toward safety or interpersonal competence needed to perform the job.

The objective of this analysis is to determine what would be the content of training.

(iii) Man Analysis: Through observation and unobtrusive measures the training requirements of each individual employee should be found out. The analysis should determine what knowledge, skills and attitudes each individual employee must develop to be able to perform his task in an effective way.

4.2 Selection Of Trainees

Although it is true that in selecting persons for training a company generally gives primary consideration to its own benefits and secondary consideration to the benefits accruing to the individual, yet the standards used for selecting training programme participants should be carefully devised and communicated widely throughout the organisation.

Training opportunity will not be passed out as a reward for a good behaviour or for long service or to get relief for sometime from trouble-making employees. Fairness in applying standards should be exercised which helps

boosting employees' morale.

Whenever an individual is sponsored for training, he should be categorically told the reasons for sponsoring him and the expectations of the orgainsation from him after the training. Most companies do not inform the employees why they have been sponsored, such a practice reduces learning, as the employees sponsored are more concerned about the reasons for being sponsored than actually getting involved in the training.

Alongwith determining the kind of employees, we must also determine the number of persons to be given training. The number of trainees can be arrived as under:

No. of persons to be trained	=	No. required at some future date	–	No. to be recruited from outside	–	No. available internally after taking into account the possible wastage due to deaths

4.3 Training And Development Methods:

We should use only those methods which suit to the training needs of a particular training group or training programme. We must select the training methods keeping in view the following trainee groups:

(1) Rank And File Workers (Operatives)
   a) Unskilled
   b) Semiskilled
   c) Skilled

(2) Supervisors
   a) Technical supervisors (Production level),
   b) Non-technical supervisors (Clerical level).

(3) Managers
   a) Executives/Officers
   b) Managers
   c) Top management people

4.3.1 Training For Rank And File Workers

Operative personnel must be trained mainly by using on-the-job training method. Workers must be imparted training on the job, he is handling at his work place. This will enable the worker learn under the same working conditions and with the same processes, materials and equipment that he is and will be using ultimately. The responsibility of training must be given to the immediate supervisor and some outside instructor who is specialist in the field. Effectiveness on-the-job training depends primarily upon qualified trainer. The objective here is to bring the workers to atleast a minimum acceptable standard of performance in the shortest possible time.

On-the-job training does not have desired effect if it is nominal and informal type. To make it more effective on-the-job training is to be made formal and organised type. This method is effective to train operators as it can be imparted in short time (a week or two) and is highly economical.

For implementing on-the-job training to the workers, supervisors are taught the skill of teaching. Training by supervisors is called Training Within Industry (TWI) or the Capsule Method. This method was devised in the USA during the Second World War when a large number of people had to be trained in a short period. It is applied with the following steps:

(A). Preparing The Instructors: (a) Have a timetable - how much skill does the instructor expects the worker to have and by

what date? (b) Breakdown the job-listing important steps of training, (c) Have everything ready - the right equipment, materials and supplies, (d) Have the workplace properly arranged just at the worker will be expected to keep it.

(B) How To Instruct - (a) prepare the worker (1) put him at ease, (2) state the job and find out what he already knows about it, (3) get him interested in learning the job, (4) place in correct position; (b) Present the operations (1) tell, show and illustrate one important step at a time (2) stress each key point (3) instruct clearly, completely and potentially, but no more than he can master; (c) Try-out performance - (1) have him to do the job - correct errors (2) have him explain each key point to you as he does the job again (3) continue until you know he knows.

(c) Follow-up: (1) put him on his own and designate to whom he goes for help, (2) check frequently and encourage questions, (3) taper off extra coaching and close the follow-up.

If the worker has not learned, the instructor has not taught.

Other on-the-job training techniques which must be used are (i) job rotation - sending employee through different jobs, thereby providing him a wider exposure, (ii) Apprenticeship - associating employees with expert employees for quite a long period of time, (iii) Vestibule school - the training is imparted to bigger group by the training department. This method avoids mishandling of machines by untrained people. But the disadvantage is that the training is to be imparted in a artificial situation and (iv) General Education Programmes - courses other than the job skills like in accounting, economics, marketing, labour laws etc. may be imparted. This will benefit the company in intangible ways through the change in employees attitudes.

On-the-job training is in complete conformity with following three laws of learning, hence is the most effective in training the workers.

(1) The Law of Readiness - that is, the employee is having the will and skill to learn and is ready for it.

(2) Law Of Exercise - that is, the employee has to be given the opportunity to exercise his learning on the equipment or machine.

(3) The Law Of Effect - that is, the employee after applying the training gets satisfaction out of his work and his attitude changes favourably.

For training operatives, the degree of knowledge, skill, and attitude required to be imparted varies as shown in Table 3.

Regular programmes must be organised for training of workers depending upon their needs for training.

4.3.2 Training The Supervisors

Besides training the workers at the lowermost level of the organisation, supervisors (technical and clerical) will be imparted training. Their need for training will be determined as detailed below:

i) What kind of work must the supervisor handle?

ii) What must he do to it?

iii) How can he be encouraged to react positively to what he is doing?

After collecting information on the above questions, the training manager must draw the training requirements. The methods of training for the supervisors will be selected as follows:

(1) Establishing the training objectives. These objectives may include the

TABLE 3: Job Requirements And Performance Measures

Sr. No.	Job requirements	Performance required
(1)	Routine jobs	repitiive in nature and adhere to producttion (unskilled).
(2)	Moderately individual and various alternatives available (semiskilled)	Knowllede - specialised expanded
(3)	Highly individualised complex in nature and wider choice judgement and technical expertise is needed (skilled)	Knowledge - cognittive skill - analytical Attitude - career opportunity

following:

a) Imparting conceptual knowledge
b) Changing trainees' attitudes
c) Increasing trainees' problem solving skills
d) Increasing trainees' interpersonal skills,
e) Increasing trainees' acceptance of the training method
f) Increasing trainees' retention of knowledge

(2) Determining the level of trainees in the organisational hierarchy
(3) Method's ability to hold and arouse the interest of trainees during the training period
(4) Availability of other training staff and experts
(5) Availability of finance
(6) Availability of time

Keeping in view the above, following methods will be used for training the supervisors:

(1) Supervisory skill training
(2) Coaching
(3) Conferences
(4) Special courses and class lectures
(5) Job rotation
(6) Brainstorming (involving supervisors in heated and emotional discussions regarding job improvement)
(7) Case studies
(8) Special projects and task forces
(9) Simulation - role playing and gaming
(10) Sensitivity training

Depending upon the training need for supervisors experts must be invited from technical institutions like ITIs, CTIs, IITs, IIMs, TTTIs etc. and local training organisations.

4.3.3 Training and Development of Managers

The possibility of executive obsolescence leads to an increased emphasis on management training and development. Executives obsolescence occurs both from the physical or mental deterioration accompanying the ageing process and from the rapidly changing and increasing complexity and diversity of the technical and managerial knowledge needed to run a business effectively and efficiently.

TABLE 4: Ranking by Training Directors on Effectiveness of Alternative Training Objectives

Sr. No.	Training Method	Knowledge retention	Knowledge acquisition	Changing attitude	Problem solving	Interpersonal skills	Participant acceptance	Overall Rank
1.	Case study	2	2	2	1	4	2	2.5
2.	Conference (discussion)	5	3	3	4	3	1	3.1
3.	Lecture	8	9	8	9	8	8	8.3
4.	Business Games	6	6	5	2	5	3	4.5
5.	Movie films	7	4	6	7	6	5	5.8
6.	Programmed instructions	1	1	7	7	6	7	4.8
7.	Role playing	4	7	2	3	2	4	3.7
8.	Sensitivity training (T-group)	3	8	1	2	1	6	3.5
9.	Television lecture	9	5	9	8	9	9	8.2

Management development is a term given to complex activities, the objective of which is to ensure that as and when the demand for managers arises at various levels of an organisation, there are suitably qualified persons ready to fill the vacancies. It involves a systematic and integrated plan of forecasting, selection, training and development.

Research, experimentation, testing and experience must have yielded a great variety of training techniques and pedagogical methods which can be used in executives/managers' development programme. The managers are required to understand the self and other people, so their training needs are imparting updated knowledge on time management, strain and stress management, MIS, strategy formulation, automation and rationalisation, decision making etc.

They are also required to be given human relations training so that they can build up teamwork among the employees, increase their morale through motivation and participation and thus increase the productivity and profitability. Following methods are used depending upon the need of training and development of executives.

1. Case Study method
2. Incident method

3. Role playing method
4. In-basket method
5. Sensitivity training (or laboratory training)
6. Management games
7. Simulation method
8. Conferences
9. Autonomy training

Table 4 gives the effectiveness of various training methods in view of certain objectives as evaluated by training directors of 120 firms. In this study, directors feel that case study is the best method whereas lecture is the worst method of training for the executives and managers.

To enable every person to understand, develop, and utilise his potential, organisations should provide a development climate as well as opportunities. In the work life of most organisations today, due to our concern for results, task orientation, fire-fighting operations, profits etc. the most critical human resources is being neglected. With a view to focus attention to organisations and development agents on this neglected aspect of a potential resource, the present paper attempts to determine training needs and selecting the appropriate method of training and development. The paper is more suggestive rather than analytical; suggests that an appraisal of methods and techniques of training be carried out so as to impart really useful training to the personnel in organisations. Appropriate strategies for manpower development in organisations by making tactical deployment of available resources are needed to be formulated for obtaining the results for improvement of quality and productivity. Attitudinal change and higher degree of commitment and involvement among employees and managers can come only through the design of better HRD programmes.

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RESEARCH ABSTRACTS

DR. B. MUKHOPADHYAY, Asst. Professor of Education & Mr. B. Somasundaram, Training & Placement Officer, TTTI, Madras. A Study of the Need Assessment of Training for Working Technicians, 1993.

Technicians are the backbone of industries and corporate orgnizations and thus their quality has to be kept always at a higher level to match with the rapid advancement in technology. They need to be abreast of the latest developments through training, as their prior regular polytechnic education becomes obsolete after sometime. The need for training of the working technicians has been felt very much by the Government and other private and quasi Government sectors. In order to design any training programme the training needs are to be appropriately and precisely assessed for various types of technicians in different types of industries. Hence the study "Need assessment of training for working technicians" has emerged on the basis of felt need and this study was identified as one of the research projects under world Bank Technicians Resource Development Project.

OBJECTIVES

The objective of the study was to assess the training needs of the working technicians and to achieve this major objectives, the following functional objectives were taken into consideration.

1. Identify the strategies for assessing the training needs of the working technicians.
2. Design and develop the tools to conduct need assessment of the working technicians.
3. Collect data from various types of industries and corporate organizations for different types of training needs.
4. Analyse and interpret the data for identifying the training needs of the working technicians.

METHODOLOGY

Samples:

The purposive sampling technique was used for the study. In all, 16 industries; including one industrial institute was covered. 23 managers and 29 technicians were interviewed for identifying training needs of working technicians. Among the managers, 2 were in the rank of general manager. Managers covered under the study were directly associated with working technicians and they were fully aware of their training needs. Technicians covered under the study, were all diploma holders and had minimum experience of two and half years as technician.

Tools:

Structured interview schedules were used for the purpose of data collection. The schedules were partly validated with the help of expert group comprised of Educationist, industrial psychologists, and Training Manager. The interview schedule for the managers consisted of the areas: About Industry/Organisation, Personal profile of manager, Training needs of technicians working with him, Changes envisaged in the organization, Free comments of training needs. The interview schedule for the technicians

consisted of the areas: About industry organisation, Personal profile, Training needs, Awareness about organisational progress, Free comments on his training needs.

Procedure:

Structured interview was conducted with each subject. In some cases, each item of the interview schedule was explained to the subject and they themselves filled up the structured interview schedule proforma. In other cases the responses of the subjects were noted by the investigators. Each interview was analysed to identify the training needs of the working technicians. With the managers working in a particular industry, their interviews were analysed with respect to different course along with duration of each course. With the technicians working in a particular industry, their responses were analysed along with their academic background and the duration of each course. With most of the industries a general consensus of training courses was prepared to present a comprehensive view of the managers and technicians.

RESULT

On the basis of the analysis of data 25 list of training needs of the working technicians were prepared taking into consideration their industrial and academic backgrounds. The size of the industry/organisation or the type of product it manufactures/services offer were also considered. The training needs of working technicians, covered the following industries:

1. Auto Electrical industries
2. Heavy Engineering, Rotating Machines, Metallurgy and Foundry industries,
3. Automotive Instruments and Small Machine Tools industries,
4. Textile industries
5. Steel Casting industry
6. Breaks industries,
7. Petro Product industy,
8. Electronic Communication industry,
9. Medical Equipment Manufacturing and Service industry,
10. Cement industry,
11. Chemical industries,
12. Mineral Processing industry

Apart from the training needs of working technicians, several common training needs for all the working technician were emerged from the analysis of the interview data. A few of them were as follows:

Technicians are expected to learn the Electrical - Mechanical - Electronics in combination (Multi skill training)

Technicians are expected to have better communication ability

Technicians should be able to write technical reports

Technicians should be trained in motivational strategies

The long term training programmes are to be oriented towards theory, updation system approach and exposure in leading industries

The short term programme should be essentially to equip or refresh the technicians in work skills in their respective areas.

Technicians should be trained in industrial safety.

BARKI, B.G., A Study of Perception of Polytechnic Faculty for Distance Education, Madras : TTTI, 1992.

In addition to the formal diploma courses offered in the polytechnics in the Southern region the Government of Andhra Pradesh started offering in 1992 Diploma Courses in five selected branches of Engineering by distance mode. Of course the same curriculum implemented in polytechnics is prescribed. Accordingly this study highlighted the perceptions of polytechnic teachers towards this effort when they were assigned the task of preparing instructional materials in identified subjects.

Objectives:

The major objectives of this study were

- To identify the perceptions of conventional teachers of polytechnics in offering diploma courses through distance mode.
- To list the problems if any foreseen in offering the courses.
- Together their views about their willingness to involve themselves in organizing these courses; and
- To find out the preparedness of polytechnic for involvement in this programme.

Methodology:

An open ended questionnaire containing 22 statements was prepared and the identified faculty of polytechnics were asked to give their responses. The data were collected from a total of 30 teachers who were actually involved in writing instructional materials for the diploma courses.

Findings:

The salient findings were :

- 17 out of the 30 teachers favoured the idea of offering diploma courses through correspondence-cum-contact mode.
- 19 of them expressed that skill development is possible through distance education; whereas the others did not accept this view.
- Excepting one, all other respondents expressed their willingness to associate themselves with this programme.
- Nearly 50% of them felt that the duration of the contact sessions are inadequate to provide skill development.
- 60% of the respondents expressed that the content coverage was adequate in the materials which were prepared for distribution to those seeking admission; but the remaining 40% of them were not satisfied with the coverage of the lessons in the materials written.
- More than 90% of the respondents expressed that the conventional polytechnics are not prepared to extend their facilities for the benefit of these students.
- Some suggestions that were offered for the effective implementation of the scheme are:
  - making polytechnics centres for practical work
  - admitting students on the basis of their performances in a suitably designed entrance test
  - organising contact programmes systematically; and insisting on compulsory attendance
  - restricting the number of students for admission to the course.
  - tutor attachment for every student, etc.

SRINIVASAN, R., NATARAJAN, V.K. and SOMASUNDARAM, B.: Impact of New Economic Initiatives on Indian Industrial Development, Madras : TTTI, 1993

Industrial production in the country recorded good achievements in the first fifteen years of planning. Industrialization was given a fillip in the Second Five Year Plan (1956-61) following the model of P.C. Mahalahobis. Though the industrial sector registered a higher annual rate of growth than other sectors, yet in the last twenty five years a few disturbing trends were witnessed which led to widespread industrial sickness, growth of private monopolies and lopsided regional development.

In order to accelerate the pace of industrial development the Government of India announced a New Industrial Policy in July 1991. The salient features of this policy are :

- Abolishing industrial licencing for all projects excepting those related to hazardous chemicals.
- Raising the limit of investment for tiny sector up to Rs.5 lakhs
- Priorities to small scale industries in the allotment of indigenous raw materials.
- Encouraging NRI investment upto 100% equity for selected industries.
- Compulsory Quality Control for products which pose problems to health and life.
- Extending loan facilities by banks under composite single window scheme.
- Reduction in the number of business establishments coming under the purview of MRTP Act.

All these initiatives pronounced call for increased vigour on the part of technical institutions in their functioning. Some useful suggestions which could help in enhancing the prospects of industrialization are:

- Pursuing labour intensive techniques to minimize unemployment among technicians.
- Promoting entrepreneurship, consultancy services and facilities for human resource development.
- Making internship compulsory for all technician courses and extending the facilities of Board of Apprenticeship Training to all qualified technicians.
- Evolving new national uniform curricula for technical education in all fields including new and emerging technologies.
- Bridging the gap between theory and practice by strengthening industry-institute linkages.

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General

The authors are requested to note that the Journal aims at a wide international readership of varied societal and cultural backgrounds. They are therefore encouraged to point out in their contributions the relevance of their results and insights to technical and vocational education systems, other than their own. In the case of research reports, the emphasis should be on applicable research of national and International interest.

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