ISSN 0971-8508

JOURNAL OF TECHNICAL AND VOCATIONAL EDUCATION

ISSUE 16

1999

TECHNICAL TEACHERS' TRAINING INSTITUTE

CHENNAI 600113 INDIA

EDITORIAL AND EDITORIAL ADVISORY BOARDS

CONTENTS

	EDITORIAL	Page No.
1.	Women Engineers *Jaya Kothai Pillai*	1
2.	Education and Training - Roles in Environmental Protection *Michael J. Breckin.*	6
3.	Applications of Geographical Information System in environmental Impact assessment Studies. *M. Narayana Rao, ESM Suresh and Usha Natesan.*	12
4.	Influence of Cognitive Style of Entrepreneurs on Chosen Process of Strategy Making: A Preliminary Survey *R.R.K. Sharma, N.K. Sharma and P. Purwar.*	17
5.	Generation of Scientific Question Paper with the Aid of Computer. *Dinesh M. Bhonde and Urmila N. Shrawankar.*	23
6.	Staff Development Programme through Inter Institutional Cooperation. *V.R. Vivekanandan, C. Vimala and B. Mukhopadhyay.*	28
7.	Technology in Agriculture Teacher Preparation and its Implications for Production of Quality Teachers. *Ekong, A Okon*	36
8.	The implication of Vocational and Technical Education in National Growth and Development in the 21st Century. *Amechi, N.F.*	41
9.	Design of Virtual Technical Teachers Training Institute for TTTI, Chennai. *S. Renukadevi.*	49
10.	Reforming Indian Polytechnic Education *R. Srinivasan*	53
	Research Abstract: Tracer Study on Employment Status of Polytechnic Pass outs in the Southern Region	56
	About our Contributors	58

EDITORIAL

The issue 16, 1999 of the Journal of Technical and Vocational Education (JTVE) has come out with varieties of research papers and articles. This time again our contributors are from various institutions in India and abroad.

In this issue Professor Pillai has contributed her article on Women Engineers. She observed that in the course of last 50 years there has been a dramatic change in the attitude of the people allowing girls to take up professions like engineering. There has been increasing level of confidence among women engineers and most of the women are in engineering profession because they derive satisfaction and get a sense of achievement out of their work.

Professor Breckin in his article on "Education and Training - Roles in Environmental Protection", discussed on points like international debates and agreements, relationship between man and environment, environmental degradation due to technological developments and also gave strategic directions for education and training. He has felt that education and training have got a lot of roles to play to bring about environmental protection and sustainable development which are the immediate need of the day. A different aspect of environment has been highlighted by Professor Rao and his associates. They discussed in details on the applications of geographical Information System. Environmental Impact Assessment sits into the long-term planning process because it provides the vehicle for identifying the potential effects of activities on the environment.

Prof. Sharma and his associates in their research paper on Influence of Cognitive Style of Entrepreneurs have hypothesized that in a small firm the cognitive style of the entrepreneurs are likely to have a strong relation to strategy making decision processes chosen by the firm. The paper attempted to establish this line of argument.

In this issue we are able to get contributions from a polytechnic also. Shri. Dinesh and Ms. Urmila have contributed the paper on Generation of Scientific Question Paper. They have developed a software to obtain scientific question paper to overcome certain limitations of manual paper setting.

TTTI Chennai has been organising institution based courses apart form other activities. Professor Vivekanandan and others have narrated their experience for such activities. It was observed that the idea of implementation of staff development programme through inter-institutional cooperation is unique and through this process the whole institution can derive the benefit. Professor Ekong has contributed the article on Technology in agriculture Teacher Preparation. His discussion centred around four areas namely, Concept of technology, Agriculture teacher preparation, Application of technology in agriculture teacher preparation and Implication of application technology in agriculture teacher preparation.

Experts and thinkers in various fields of knowledge have already started to give their views on future of their disciplines in the next millennium. Technical and engineering education is no exception. In this issue of the journal, Professor Amechi has thrown light on the Implication of Vocational and Technical Education in National Growth and Development in 21st Century. Ms. S. Renukadevi in her article has given her idea on design of Virtual Technical Teachers' Training Institute for TTTI Chennai and Dr. Srinivasan has expressed his thoughts on Reforming Indian Polytechnic Education.

TTTI Chennai has duly completed the Tracer Study on Employment status of Polytechnic Pass outs in the Southern Region. We are glad to publish the abstract of the study in this volume. we have been trying to make this JTVE economically self reliant and as an humble effort towards this end we have added a few advertisements in this issue.

We deeply acknowledge the contributions of the authors from India and abroad for the present issue of the Journal. The Editorial Board appeals to the academics and readers to come forward and contribute by way of publishing papers, articles and best practices in this Journal for the benefit of the Technical -Vocational Education and Training Community. We welcome suggestions for further improvement of the Journal.

Editor

WOMEN ENGINEERS

JAYA KOTHAI PILLAI

1.0 INDIAN SETTING

Engineering Education in India started in late 18th century. An Engineering school was established in Madras in 1794 and it was upgraded into a college in 1857. The Thompson College of Engineering was started in 1847 at Roorkee, The Civil Engineering College in 1856 at Calcutta to train engineering personnel for Public Works Department (PWD) and Indian Institute of Science at Bangalore in 1909. At the time of our independence, there were 38 Engineering Colleges with 2940 students and by 1957, the number of Engineering Colleges more than doubled, with 87 Engineering Colleges and 11510 students, as priority was given to technical education after independence.

The maximum increase in enrolment in Engineering Colleges was witnessed in the first decade 1950-60 in independent India. The growth of Engineering colleges and enrolment of students is given below.

TABLE 1

Enrolment in Engineering Colleges

Year	Engineering Colleges	Enrolment
1951	53	4788
1961	111	15497
1971	134	18207
1981	171	34835
1991	351	70481
1997	416	109500
1999	663	156500

The growth of enrolment in the last decade 1980-90 can be attributed to the emergence of self financing institutions which sprang up in the eighties. Indian Institutes of Technology (IIT) were established at Kharagpur in 1950, at Bombay in 1958, at Madras and Kanpur in 1959, and at Delhi in 1961. Now there is a sixth IIT at Guwahati. Besides there are 17 Regional Engineering Colleges all over India for accommodating more specializations. Women started entering Engineering Colleges only after 1948. Increasing employment opportunities and growing prestige of the profession attracted women into Engineering. By 1950-51 for 12094 men in the engineering faculty there were 19 women and by 1960-61, number of men in engineering was 43389 and women was 403. In 1970-71, out of a total number of 90944 students, only 910 were women.

In percentage of total enrolment, enrolment of women in engineering and technology was hardly 3.8% in 1980-81 and in 1988-89, it had increased to 6.2%.

According to 1991 census, the enrolment of women in Engineering Colleges is only 7.9%.

In India it is found that engineering education is generally long and expensive. Parents in India naturally prefer to spend their scarce resources to support their sons in engineering colleges. Many parents think that money spent on engineering education of the daughter brings no return to the family as she has to be married off. As a result, women students form a tiny percentage of the total strength in engineering colleges.

Other prejudices are that women do not have the stamina to prosecute engineering studies, that they do not have the adequate acumen or talents for mathematics which is the basis for engineering studies.

2.0 SOCIO ECONOMIC BACKGROUND

Indian studies report that in the early stages, women from upper middle class families and with consistent high academic record joined engineering colleges. They belonged to high income groups and had educated parents. Usually the father was the role model. During the fifties and sixties, mostly Christian girls and Hindu girls from the forward caste took advantage of engineering studies. During the seventies and eighties, Hindu girls from backward communities, as well as Muslim girls started entering engineering institutions. But even in the eighties, 83% of the girls entering engineering college were from urban areas and only 17% came from rural areas (Muthuchidambaram (1990)). Majority of the fathers were graduates and post graduates and 3% of them were engineers themselves. During the eighties, about 28% of the mothers of the engineering college girl students were working women; 22% of the mothers were graduates, 75% were matriculates and hardly 3% were uneducated mothers.

3.0 CAREER CHOICE

Parental encouragement and marks obtained in the qualifying examination decided their entry into engineering courses.

Career choices and career decisions are influenced by the decisions about marriage, parenthood, female, male responsibilities in home making, social norms and expected sex roles. Women are not free to explore their interest and make choice with a conscious perspective. In most of the Indian families, even to-day, girls are not taken seriously as careerists and it is considered to be of secondary importance. Marriage is still the principal determinant of women's social position. This results in restrictions upon the freedom of occupational choice and career development of girls.

Currently the factors which influence girls to take to engineering and technology are the social status and prestige which goes with the profession and economic independence it would bring to them. This finding of Muthuchidamabram (1990) is supported by the findings of Horst (1981) who listed the factors of career choice in order of importance. The chance to earn a good deal of money, attaining social status and prestige, to look forward to a stable secure future and to use one's special abilities were cited as important reasons for choosing engineering studies.

4.0 CAREER DEVELOPMENT

Women's career development depends on a number of factors. Due to women's preoccupation with marriage, family and child

care responsibilities, there is role strain which leads to role conflict and career is affected. Usually career development is assessed in terms of promotion to higher cadres, improvement in knowledge and specialisation in the profession.

In the case of women engineers it is found that career options are restricted by the employment agency itself. There is reluctance on the part of private industries to employ women in their undertakings. Hence most of the women engineering graduates choose to join the government or quasi-government organisations or trust organisations. Women prefer government organisations as there is security of service, uniform service conditions such as pay, position, increment, promotion etc framed by rules and regulations; the only snag is that it is a transferable service. Many Indian women engineers, after marriage used to drop out of service in the seventies; some studies have also reported that they refuse promotions if they are transferred as they do not like to relocate. Unmarried women have more geographical mobility to avail better opportunities but they do not like to live alone on their own, as their personal safety and security is in danger.

Due to sex typing of the profession, 58% of the women used to choose Civil Engineering and they preferred desk work such as designing and drafting as it was considered that women were not tough enough to manage men workers in construction work. Less than 5% of the women engineers are found working out doors supervising construction work. Lober reports that there was more sex stereotyping among engineers than in any other professionals. Status wise, designing is considered less prestigious than teaching which is lower than execution of projects. Thus even highly qualified women end up in low prestige jobs.

The trend to-day is more women are choosing Electronics and Computer Engineering as they are mostly indoor jobs and also because job opportunities are better.

In the engineering college itself, women experience sex discrimination; 78.6% of the students experience sex discrimination from the male students, 37% from male laboratory partners, 30% from male laboratory instructors and 44% from male faculty according to a study by Horst (1981). 65% of the women interviewed in the study perceived sex discrimination in the field of engineering. A widely shared perception is that sex discrimination in engineering is more than in other fields. Sex discrimination was both overt and covert. Overt behaviour included open statements or behaviour which downgrade one's abilities, aspirations and interests because of one's sex. Covert behaviour included unspoken or subtle negative assumptions about one's abilities, aspiration or interests based one one's sex. A substantial significant proportion of women reported sexual harassment from both male faculty and students. Sexual harassment included unwanted comments, sexual suggestions and sexual advances which puts one in an uncomfortable position.

Indian women engineers have not received any overt sexual harassment. But some have reported subtle sexual discrimination. Chaturvedi (1985) states that the women engineers had sexual discrimination more from the bosses of their own sex than from male bosses. Women bosses were more strict and authoritative than

the men bosses who were understanding and considerate. Women engineers in India faced difficulties working outdoors, supervising construction work especially in villages. They faced conveyance difficulties; they could not go in two-wheelers wearing a sari and villagers did not approve of their wearing pants during supervision; they could not travel late hours; travelling with men colleagues was frowned upon by family members. Women engineers also found it difficult to extract work from male subordinates (Lober 1984) and manage the contractors. Very few women took part in activities connected with the Professional Associations. (Venkatratnam (1971) and Lober (1984). Thus their visibility was very low and this was one of the reasons for their not climbing the social and professional ladder.

5.1 CONSTRAINS AT HOME

With a demanding job, full of keen competition, women engineers face over load and role conflict. Professional role expectations were not congruent with feminine role expectations.

Marriage is very important in the lives of Indian women. It is true that women professionals are in great demand in the marriage market to-day due to their potential for earning and prestige of the profession. Most of the women engineers in India tend to get married to men from the same profession or equal professional status.

Arranged marriages and dowry practices are common though there is less of dowry giving among women engineers. Women, Engineers or Physicians consider family as their prime responsibility and they try to manage their homes with the help of hired servants or family members. They do feel guilty of neglecting their homes and children. The family-career conflicts among all working women is a world wide phenomenon. Women engineers, because of these dual career problems, choose jobs which are not too demanding, with regular working hours, less travelling etc. and consequently end up in lower prestige work, earning less salary.

5.2 ATTRIBUTES OF WOMEN ENGINEERS

The adjectives for women engineers which got the highest ranks are reliable, independent, adaptable and aggressive in a study by Horst (1982). The trend seems to be that women engineers in USA, with their high intellectual ability, high energy, high motivation and extreme independence are competing successfully with their male counterparts. Among all professionals, women engineers give more support for 'feminism' They are more optimistic in their belief in equal pay for equal work. They have more egalitarian relationship with men, more liberal in their perception of sex role orientation. There is an increasing level of confidence among women engineers and the growing emphasis seems to be on career rather than family.

Indian women engineers have been found to be positive in their attitude towards equality of sexes, prohibition of dowry, effective enforcement of the laws concerning prevention of violence against women such as rape, cruelty to widows; child abuse, prostitution etc.

6.0 CONCLUSION

In the course of the last 50 years, there has been a dramatic change in the attitude of the people allowing girls to take up

professions like engineering. In India, in 1951 there were hardly 19 girl students in the engineering faculty and to-day there are more than 12000 women enrolled in engineering institutions. It is the same in the other countries as well. More and more middle income families are taking advantage of professional education and this is a means of upward social mobility. More women are interested in combining employment with marital and family commitments as two pay cheque family becomes the norm. A large number of women are entering the so called non-traditional careers and engineering seems as a prototype for all traditionally male professions. Many situational barriers and inter personal barriers have been identified and all studies document the pervasive nature of discrimination against women in several settings. But studies have also noted the increasing level of confidence among women engineers and most of the women are there because of the satisfaction they derive and the sense of achievement they get out of the work. There is considerable room for professional opportunities and growth if one has the ability. One of the engineering managers made a remark that is a fitting conclusion. He says 'I hire brains not gender'. According to Erick Erickson, women have to learn "how to be women and workers, wives and colleagues, mother and creative beings and have a sense of continuity". Engineering and science is well removed from workers' sex differences.

REFERENCES:

ISTE Hand Book 1997-98 and 1999-2000. New Delhi: Indian Society for Technical Education.

Man Power Profile, Indian Year Book 1993-94, New Delhi: Institute of Applied Man Power Research, Report 1/94.

EDUCATION AND TRAINING - ROLES IN ENVIRONMENTAL PROTECTION

MICHAEL J. BRECKIN

1.0 INTRODUCTION

The roles of education and training in environmental protection is significant for our future and that of our children. The question itself, of course, appears at first sight as absurdly simple and very similar to those which mankind has frequently encountered at all levels in his activities. The standard answer comes in the nature of a formula familiar to all planners:

'What are the outcomes we wish to achieve and how far can educational strategies, or any other strategies for that matter, be identified which will realise them?' And the situation should be made easier by the fact that the problems of the environment - population pressure, exhaustion of resources, pollution, and following from these increasing disruption of the world's ecosystems - have been recognised for a long time. So, we have most of their causes at both the macro and the micro levels. We argue still about the full extent of the long-term outcomes and disagree as to levels of seriousness, but the causal factors are not much in dispute. It must therefore be surely the case with such a serious issue for us all, that all relevant strategies for prevention and reversal have been considered, analysed, re-analysed, debated and tested. Surely there can be little left to say. The consequences, if we cannot forestall them, the experts agree, are far too serious to have remained unresolved. For even if they do not appear serious today, they will be tomorrow, and the day after tomorrow they will be critical. This much we know and have in fact known for decades. So surely we, mankind, have made our dispositions and agreed internationally, for this is clearly an international issue, upon our strategies.

2.0 INTERNATIONAL DEBATES AND AGREEMENTS

Back in 1987 at the World Commission on Environment and Development chaired by the Prime Minister of Norway, Gro Harlem Brundtland, a call was made for '... sustainable development ... that meets the needs of the present without compromising the ability of future generations to meet their own needs.' Nothing positive resulted. It was followed in 1992 by the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro and popularly know as the 'Earth Summit'. It brought together more than 100 world leaders and passed conventions on climate change, and biodiversity and agreed an environmental action plan. But again as the Conference Secretary-General, Maurice Strong observed 'I would have liked to have seen solid commitments but for the most part

leaders have made broad policy statements.' The result again was no real action. More recently again the Kyoto Conference agreed a climate protocol (limiting greenhouse gas emissions to 5.2% below the levels of 1990, a standard to be achieved by 2008-10), but only very recently over a year later has President Clinton signed on behalf of the US.

Returning more specifically to the theme of education, it appears within this world context of inertia, that either there is no significant role for it or that educationalists have been singularly ineffective in identifying that role and implementing it. So perhaps, the question remains an important one and one that still awaits a considered answer.

A number of scientists - we hope they are the pessimistic ones - believe that even if we could stop today the degradation of the planet, so much damage has already been done that we could not be sure of handing on to our children a sustainable world. That would be a dreadful indictment of our generation - not we suppose that ultimately there would be so many people around to criticise us. But our attitude to strategies for the protection of the environment does rather tend to show mankind at its most irrational. It appeared some time ago that military action against the regime in Iraq was immanent and the international community was prepared to act more or less in unison in this. Fortunately, it seems things have improved. But, had action been taken, it would have been in the name of protecting present and future generations from the threat of weapons of so-called mass destruction. At almost the same time in Central America we had an example of real mass destruction following the hurricane Mitch. The worst storm in the region for over two centuries, perhaps ever. A warning, many scientists believe of what will become a common feature for increasing areas of the globe - and caused by us. Predicted, predictable and potentially more devastating, but not able to stir the will of the international community like a dictator in Baghdad.

3.0 RELATIONSHIP BETWEEN MAN AND ENVIRONMENT

But to return to the original question, the potential role or roles for education and training, the first stage is to analyse the nature of the problem, i.e., to examine the deterioration in the relationship between man and his environment. To introduce a slightly lighter note into what must remain a serious debate, the following is a Fulani poem from West Africa.

Commoner exists where there is no king,

But a kingdom cannot exist where there are no commoners;

Grass exists where there is nothing that eats grass,

But what eats grass cannot exist where no grass is;

Water exists where there is nothing that drinks water,

But what drinks water cannot exist where no water is.

It adds one important element to the debate, apart from being an interesting poem, it shows an awareness of nature as a provider of resources and conveys a sense of balance in the environment. And this comes from an undeveloped society - but perhaps at this stage we should be careful not to read too much into a few lines of poetry.

So what are the problems of the environment and how should they be tackled? Obviously at a detailed level they are too numerous and complex to be specified here, nor is that the purpose in this discussion. But, it is perhaps possible and useful to group or cluster them to some extent so as to inform discussions on education. And from that to identify strategic objectives which might be of interest to us.

4.0 ENVIRONMENTAL DEGRADATION DUE TO TECHNOLOGICAL DEVELOPMENTS

Many of our difficulties have their origin with people. The world population has grown dramatically since the early years of this century and it continues to grow despite efforts at control and periodic epidemics, famines and disasters. This not only increases the demands on nature made by the traditional industrial and agricultural practices, but also greatly encourages the development of new ones.

Technology helps us to overcome these problems in a number of ways:

- It can support traditional production methods; particularly in agriculture where improved chemical fertilisers for crops, and growth hermones for animals can increase yields. Similarly, pesticides help to control crop pests and diseases and perhaps more important than all, technology can improve water supplies for irrigation.

- It can also provide the essential foundations necessary for industrial transformations leading to enormously increased outputs and productivity through new machinery, equipment and processes. Sometimes this results in the introduction of wholly new industrial and manufacturing sectors.

But there are risks and penalties attached to both these aspects of technology.

The record of supporting existing traditional methods has not been good. Here in India we have the examples of the 'green revolution' of the 1960s and 1970s and the misguided water provision technologies which incapacitated the traditional wells and left 23,000 Indian villages without water. There are many other examples of advanced technology in seeking to solve one problem creating more serious problems in another.

Even where technology has not been directly responsible for environmental damage, it has frequently accelerated undesirable trends. In these cases it is usually poor local populations in the poorest regions of undeveloped countries who have taken the blame. A good example of this lies in the de-forestation of large areas of sub-Saharan Africa. It has usually been accepted that this is due to the traditional farming methods of local communities, and central governments in the countries concerned, responding to pressure from the industrialised nations, have imposed severe penalties on these rural farming communities. However, a recent study by the Institute of Development Studies has shown that traditional farming methods are highly protective of the forests and largely sustained their total area and density. Thus the accepted image of environmentally destructive traditional methods appears to be false. Just as the Fulani poem implies, these groups have an understanding of conservation, perhaps an unconscious one, perhaps to modern eyes an unconventional one, but an understanding

nonetheless. And until modern technologies were made available which upset traditional balances all was well. In a similar example from Jordan small scale farming in many regions of the Country takes place in difficult hilly locations. The technology used, particularly the ploughs have changed little since the time of the Romans. An aid programme to modernise the techniques used by these small farmers was introduced. New, more efficient ploughs were an important part of the programme. But these ploughs cur furrows a crucial 8 or 12 inches deeper than the old ones. The result was a near disaster. The fertile topsoil began to slide down the hillsides as ploughing took place and large tracts of previously valuable land became unproductive.

Of course there have been triumphs, but worldwide certainly at the micro level we have to record a large number of failures. Some have been reversible, some have not. Almost all, successes and failures alike have had their origins in the promised advantages offered by the technology of the advanced countries. It is perhaps interesting to reflect on this when considering that President Clinton gave as his reason for delaying signing the Kyoto protocol, the fact that the developing countries were doing too little to protect the environment.

Much more serious, however, has been the impact of technology in supporting new and more competitive industry and manufacture. It is here that we encounter the massive use of the chlorinated fluorocarbons, which are breaking down the ozone layer and the greenhouse gases which are heating up the earth. We also encounter another important characteristic in the environmental equation. The recognition, the acknowledgement of a problem, in this case a very serious problem, but for commercial reasons an almost total unwillingness to take action. The real reason that President Clinton had difficulties with the Kyoto protocol was that business interests in the US felt that emission levels standards were too strict and too expensive to meet. Sacrificing future prosperity, future living conditions, for present profit perhaps. What is certainly clear is that the decision-makes are the chief executives, the businessmen, the managers and the accountants. They hear scientific opinion, some of it form their own experts - they hear but do they listen?

Nor should we believe that all those defending the environmentally damaging technologies are from the developed world. The rich of poor countries are frequently their allies with as much or more to gain. The dramatic reductions in the rainforests of the Amazon basin are being perpetrated by the new rich of South America.

Of course much more could and should be said about the complexities of a range of environmental problems, but probably it is now possible to draw some conclusion with respect to education and its contribution.

5.0 KEY STRATEGIC DIRECTIONS FOR EDUCATION AND TRAINING

We have usually focused the educational effort on training and preparing environmental specialists and more recently on including environmental material in the degree programmes of engineers - particularly for civil, construction, mechanical and chemical engineers. The question, however, must be of whether this is the best approach to adopt, or

more particularly whether it is sufficiently on its own.

The examples provided highlight that he engineers are rarely the decision-makers at the macro level. They also show that, at the micro level, engineers require a breadth of view, vision and understanding if they are to avoid technological 'side-effects' to their activities. These are requirements which are quite independent of their need to understand environmental issues, and probably more important.

They suggest that educational approaches should emphasise:

1. That environmental information should be included in the programmes of managers and economists. These will ultimately take the decisions on future policies and the industrial and manufacturing initiatives which influence the environment. As individuals they are also likely to be influential with the political leadership in leading sector industrial countries. At present few have received any education in key environmental issues.

2. Education for engineers, particularly but not exclusively, at degree level should encourage broader perspective of the subject -in fact the reverse of current trends. Only if this is done and engineers become more aware of the broader context of their work are they likely to be adequately equipped to avoid the 'side-effects' of their activities. This is not an issue of subject content, but rather of the approach to the subject embodied in the training provided.

These are key strategic directions, if they are not addressed the history of recent years suggests that little progress is to be expected.

6.0 CONCLUSION

The role of education is probably a vital one. Perhaps it is the weaknesses in educational planning which are in part responsible for the inertia at macro level and the poor performance outcomes at micro level. We have been too concerned with the quality of the training to ask important questions about the way in which it will be applied. We cannot be surprised if the chief executives of major national and multi-national companies apply the education and training which they have received and that this leads them inevitably to resist arguments which will down-grade their system and reduce the returns of their enterprises. These were the streamlined subject content of their training. Similarly with engineers, the increasing specialisms of their subject have made it difficult or impossible for them to adopt an holistic approach to their work. Even within the wider field of engineering itself this is the case and the consequences are all too apparent.

As educationalists we must not seek salvation in the details of course content, nor even in traditional concepts of the professional and career purposes of the different disciplines. These have changed even if we have not. Instead, if we are to play our role then we must start with the broader questions of strategy. We must start not with subjects, perhaps not even with disciplines, but rather with determining the real needs for the education of nations in a hostile and often self-destructive modern world. Education and training have got a lot of roles to play to bring about 'Environmental Protection and Sustainable Development' which are the immediate need now.

REFERENCES

Friends of the Earth Hydro-electric Dams and Rain Forest Destruction in the Amazon Basin. Briefing Paper (MIMEO) 1988

WCED, Our Common Future (Known as 'The Brundtland Report) Oxford University Press 1987

Anil Agarwal Ecological Destruction and the Emerging Patterns of Poverty and People's Protests in Rural India, Social Action: A Quarterly Review of Social Trends, Indian Social Institute

J. Chaney et al. Drought in the Sahara, Science Vol 191, 1976

UNEP, Sands of Time, Environmental Brief No.2, Nairobi N.D.

Michael, Cross. Spare the Tree and Spoil the Forest, New Scientist, November 1988

Institute of Development Studies Annual Report 1996/1997

Nectoux, F and Kuroda. Timber from the South Seas: An Analysis of Japan's Tropical Timber Trade and its Environmental Impact. WWF International, Switzerland 1989

APPLICATIONS OF GEOGRAPHICAL INFORMATION SYSTEM IN ENVIRONMENTAL IMPACT ASSESSMENT STUDIES

M. NARAYANA RAO, E.S.M. SURESH and USHA NATESAN

1.0 INTRODUCTION

Environment is a combination of many concepts, it includes not only the areas of air, water, plants, soil and animals, but also other natural and human modified features which constitute the totality of our surroundings. Some characteristics of the environment are transportation systems, land use characteristics, community structure and economic stability. Environment is made up of both biophysical and socioeconomic elements which should be considered in Environmental Impact Analysis (EIA). Most environmental problems do have an obvious spatial dimension

Geographic Information System (GIS) is a computer-based tool to capture, manipulate, process and display spatial or geo-referenced data. They contain both geometry data (coordinates and topological information) and attribute data, that is, information describing the properties of geometrical objects such as points, lines, and areas.

Environmental Impact Assessment (EIA) is a systematic identification and evaluation of potential impacts (effects) of proposed projects, plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the total environment. One of the main objectives of the EIA study is to encourage the consideration of environment in planning and decision making. Potential impacts are identified and addressed at an early stage and ultimately at actions which are more environmentally compatible (sustainable).

Environmental Impact Statement (EIS) is defined as the documentation of an environmental analysis of a project or action with a potential for environmental impacts, which are either significant or controversial.

The conventional methods of impact assessment depict the outputs in the form of tables, graphs and so on. The process of incorporation of changes in the outputs obtained from conventional methods are laborious and cumbersome and hence lack in flexibility. The Geographic Information system (GIS) can be an effective tool when considered in the above context. The ability to accommodate spatial information makes it very effective so that it enhances the understanding of the user. The flexibility and versatility of GIS make the data retrieval, manipulations and analysis operations much more accurate and time effective. Integration of GIS and models into spatial decision support system can be very advantageously utilized for visualizing the simulation and thereby planning managerial steps.

2.0 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGIES

The various methodologies examined can be divided in to six types based upon the way impacts are identified.

2.1 Adhoc

These methodologies provide minimal guidance for impact assessment beyond suggesting broad areas of possible impacts (example impacts upon flora, fauna, impacts on lakes, forests) rather than defining specific parameters to be investigated.

2.2 Overlays

Overlay methodologies rely upon a set of maps of a project areas environmental characteristics (physical, social, ecological, and aesthetic). These maps are overlaid to produce a composite characterization of the regional environment. Impacts are identified within the project boundaries by noting the affected environmental characteristics.

2.3 Checklists

Checklist methods present a specific list of environmental parameters to be investigated for possible impacts, they do not require establishing direct cause effect links to project activities. They may or may not include guidelines about how parameter data are to be measured and interpreted.

2.4 Matrices

Matrix methods incorporate a list of project activities with a checkiist of potentially affected environmental characteristics. The two lists are related in a matrix, which identifies cause-effect relationships between specific activities and impacts. Matrix methodologies may either specify which actions affect which environmental characteristics is or may simply lists the range of possible actions and characteristics in an open matrix to be completed by the analyst.

2.5 Networks

Network methods work from a list of project activities to establish cause-condition-effect relationships. This method recognizes the series of impacts may be triggered by a project action. This approach generally defines a set of possible networks and allows the user to identify impacts by selecting and tracing out the appropriate project actions.

2.6 Computer Aided Methods

These methods use a combination of matrices, networks, and analytical models. This systematic approach is to (i) identify activities associated with major federal programs (ii) identify potential environmental impacts at different user levels (iii) provide guidance for abatement and mitigation techniques (iv) provide analytical models to establish cause-effects relationships to quantitatively determine potential environmental impacts and (v) provide a methodology and procedure to utilize the comprehensive information in responding to requirements of EIS preparation.

3.0 GEOGRAPHICAL INFORMATION SYSTEM (GIS)

GIS is a special case of information systems where the database consists of observations on spatially distributed features, activities or events which are definable in space as points, lines or areas. A GIS manipulates data about these points, lines, and areas to retrieve data for queries and analysis. In the early stages of development of GIS, and even today many analyses used to carryout/are carried out by overlay principle. Cartographic data on various themes are copied on

transparencies with common bounding lines and then they are laid over one another to find out specific areas satisfying certain conditions. These were possible because the quantum of data were small. Today, with the availability of large volumes of data from Satellites, manual operations are no longer possible. At the same time, presence of high-speed computers with large space for manipulation and storage has enabled us to switch over from manual GIS to computer-based GIS Systems.

The taxonomy diagram (fig. 1) clearly shows the separation between spatial and non-spatial information systems. The GIS appropriately fits under the spatial information systems category. Two general classes of spatial information systems are identified; geographic and non-geographic. Non geographic information systems although they frequently deal with some portion of geographic space, seldom have strong location links to the earth itself. In other words, they are not generally geo-coded. Thus such systems are Computer Aided Drafting and Computer Aided Manufacturing, come under the non-geographic spatial information systems heading.

GIS presents three distinct but overlapping views: (fig 2)

Map View: The map view focuses on cartographic aspects of GIS, where it is seen as map processing and display systems. The output from these operations is another map.

Database View: This view emphasizes the importance of a well-designed and implemented database. A sophisticated database management system (DBMS) is an integral part of a GIS.

Spatial Analysis: This view emphasis the importance of spatial analysis-focuses on analysis and modeling in which GIS is seen more as a spatial information science than a technology.

The evolution of GIS can be described as a three-stages process. In the early stages development systems were oriented towards

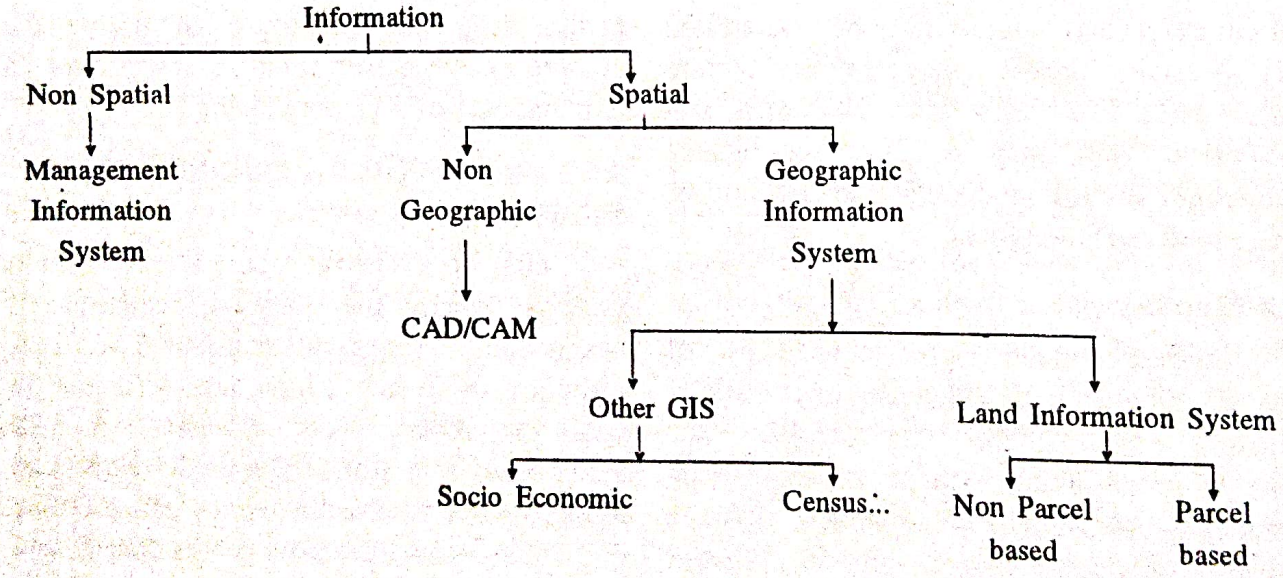

Fig.1: Taxonomy of Information System

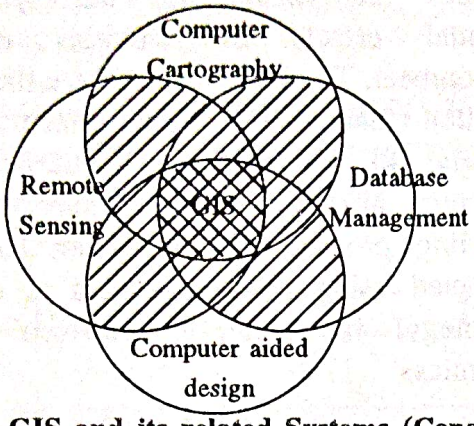

Fig. 2 GIS and its related Systems (Concepts from john kerr and Gabriells zillmer)

data collection and inventory operations (transaction processing systems). Then emphasis shifted towards development of decision support systems. Finally almost all GIS's of today are capable of carrying out spatial analysis and modeling. GIS of today can be broadly classified as raster based systems and vector based systems. However this classification has become invalid because data collected on raster format can be easily be converted into vector format with the available software. In fact, most of the GIS software today cater to both raster and vector data collections and manipulation.

4.0 EIA STUDY OF SANITARY LANDFILLS USING GIS - A CASE STUDY OF CHENNAI CITY

Chennai city is located on the south east coast of India and is the capital of the state of Tamilnadu. The city stretches 10 Km along the coromondel coast and its width extends 19 km inland. Its irregular shapes cover about 174 km^2. The Population of Chennai urban agglomerate is nearly 5.4 millions. The total refuse generated at present in about 2500 tons per day out of this total quantity only about 2.088 tons are collected and disposed of accounting for 84% of solid waste generated. The average density of the city refuse is found to be 50 kg/cum. The study area covers two boundaries i.e., Chennai corporation city limit and Chennai Metropolitan Development Authority (CMDA) limit. The Corporation of Chennai has divided the city in to 10 Zones. Each zone again classified in to 10 to 12 divisions. The Information's like population, lorries, trucks, trailers, bullock carts used for collection and transport of solid waste, haulage distance, time taken from collection point to transfer station/landfill site, container size of storage bins and its location details, average pickup time, location of Intermediate Treatment Facilities (ITFS). Material Recovery Facility (MRF), Incinerators, vermicomposting plants, sanitary workers, supervisors employed, quantity of solid waste per truck for each zone have been digitized in the zonal and division map of Chennai city.

The Chennai Metropolitan Development Authority (CMDA) in the preliminary analysis of the predicted arising of municipal solid waste within the CMDA to the year 2011 suggested the overall requirement for the provision of approximately 30 Mm^3 of void space. The master-plan for Chennai Metropolitan Area 2011 (CMDA) identified a number of preferred areas, on the periphery of the current urban area, for future urban and industrial development. The CMDA has identified 33 landfill sites. Complete EIA study for 33 landfill sites has been carried out by using GIS by Civil Engineering Dept of Technical Teachers Training Institute, Taramani, Chennai. The Ministry of Human Resource Development, Govt. of India has sanctioned Rupees 11 lakhs for this project.

An expert system based GIS model incorporating the guidelines of the Ministry of Environment and Forests (MOEF) for the

evaluation of the environmental impact of potential landfill solid waste disposal sites has been developed in this study. different thematic layers like land use pattern, geology, hydrogeology, geomorphyology, ground water quality, geotechnical data, socio-economic data. Ambient air quality, noise level expected have been digitized. Each and every thematic layer has ben assigned with appropriate weightage factors.

5.0 CONCLUSION

Environmental Impact Assessment fits into the long-term planning process because it provides the vehicle for identifying the potential effects of activities on the environment. To effectively analyze the spatial variation inherent in earth systems, it is essential to integrate the spatial database structures of GIS in to the environmental modeling process. This coupling has been attempted using process models in climate, hydrology, bio-chemical and eco system dynamics.

REFERENCES

Burrough, P.A. Principles of Geographic Information for land resources assessment, clovendon press, oxford, 1986.

Larry W. Canter, Environmental Impact Assessment, Mcgraw-Hill International Editions. 1997.

Michael N. Demers, Fundamentals of Geographic Information Systems, John Wiley Sons, 1997.

M. Narayana Rao, Usha Natesan, E.S.M. Suresh, Siting of Sanitary Landfills using GIS For Chennai City, National Seminar on Applications of GIS for solving Environmental Problems, TTTI, Chennai, 6–8 th August 1997.

M Narayana Rao, E.S.M. Suresh, Usha Natesan 'Assessing Site Suitability Conditions for Solid waste Disposal facilities'. Fourteenth International Conference on Solid waste Technologies, Widener University, U.S.A., November, 1998, (Paper accepted for presentation)

A.K. Sinha, 'More on Geographical Information System'. The Hindu, January, 1998.

P. Venkatachalam, 'Environmental Impact assessment Using Geographical Information System', National Seminar on Applications of GIS for solving Environmental Problems, TTTI, Chennai, 6–8 th August 1997.

Paper presented at the National Seminor on 'Better World Environment' held at TTTI, Chennai during 18-20 Nov.1998.

INFLUENCE OF COGNITIVE STYLE OF ENTREPRENEURS ON CHOSEN PROCESS OF STRATEGY MAKING: A PRELIMINARY SURVEY

R.R.K. SHARMA, N.K. SHARMA and P. PURWAR

1.0 INTRODUCTION

Relationship between personality of decision makers, environment, organizational structure and strategy types is complex. Further, organization structure chosen has been known to be determined by the strategy type chosen by a firm (Chandler, 1962). Miller (1987) and Frederickson (1984) have argued that organization structure once installed influences the emerging strategy and strategy making process. It is not proposed to explain the complete model showing interaction of all these variables here, but only two variables are explored, namely the strategy making process and how its choice is influenced by cognitive personality of decision makers.

Recently there has been a growing subscription to the suggestion that since strategies are conceived in the minds of managers, it is their individual styles of gathering and processing data which influence the strategies and strategy making process chosen by them (Nutt, 1993; Haley and Stumpff, 1988). Ginsberg (1990) has argued that strategic decision choices are made in groups and has developed a framework that relates group's cognitive diversity to its diversification performance, but the theory development is yet to complete.

Strategic decisions for large organizations are made in groups, but for small business normally it is the individual entrepreneur who shapes the strategy to be deployed. Hence in a small firm the cognitive style of the entrepreneur is likely to have a strong relation to strategy making decision processes chosen by the firm. This is the line of argument taken in this paper.

A brief review of literature on cognitive styles of managers and strategy processes used by decision makers is presented in the next section. A framework that relates these concepts is given in the same section. Section three provides on exposition of the hypotheses. Section four provides data obtained by authors which verifies the hypotheses partially. Finally, section five presents the conclusion and indicates future research directions.

2.0 LITERATURE REVIEW

A brief review on literature of cognitive styles of entrepreneurs and decision making processes used is given to develop the basis for hypothesis development.

2.1 LITERATURE ON COGNITIVE STYLES OF ENTREPRENEURS

Managerial cognitions have been described in terms of heuristic and associated biases (Hogarth and Markridakis (1981) short cuts used in processing information, which may at times lead to severe bias and error. A collection of heuristics used by managers and associated effect are given in Schewenk (1988).

It has been documented by Haley and Stumpff (1989) that four personality types as suggested by Jung (1923) use distinctive heuristics to gather and process data. Below are given in brief the interpretations given by Haley and Stumpff (1989) to Jung's (1923) categorization of cognitive personality types.

In literature the most widely used model of cognition is the perception/information processing model as suggested by Jung (1923). According to him people use two types of perception modes, i.e., **sensing** and **intuition** (represented by S and Respectively); whereas they process information in two modes; i.e. **thinking** and **feeling** (represented by T and F respectively). Jung's (1923) Personality theory proposed that people develop dominant preferences for data acquisition: sensation or intuition. Sensation dominant people prefer precise, specific data; they see themselves as realists concerned with immediate problems. In contrast, intuition dominant people seek holistic information that describes possibilities; their decisions use more general data. Thus intuitive people tend to perceive situations by extrapolation and reconstruct the memory based on it. Jung also catalogued two dominant ways of reaching decisions: thinking or feeling. Thinking dominant people stress logic and formal modes of reasoning whereas feeling dominant people form personalistic value judgement; thinking dominant people individuate and emphasize effective and personal process in decision making. Jung has classified two ways in which people receive data and two ways in which they evaluate it to define four personality types: sensing-thinking (ST), intuition-thinking (NT), sensing-feeling (SF) and intuition-feeling (NF). He viewed these personality types as dominant but not absolute modes of expression. Many people exhibit all types of behaviors in their perceiving and judging activities but most people have a preferred style: style that they use more often particularly in ill-structured situations (Simon, 1957) and in decision making under stress. Below are given brief characteristics of these four personality styles.

ST's are hard core realists who go by what things are as they are. They also use formal procedures such as logic for processing data.

NT's use intuitive processes while perceiving the environment. Hence they are likely to take bold steps into the unknown.

For SF's peoples opinion matters substantially. They consult their colleagues frequently before arriving at any decision.

NF's use Gestalt and holistic approach to problem solving and are highly judgmental and hence are likely to take very bold approach to strategy making.

Next the contemporary understanding of strategy making processes used by top level managers of orgnizations is presented. The discussion is borrowed from Miller (1987)

who has presented a nice literature review on this subject. A relationship between these strategies and cognitive styles of managers or decision makers is also given.

2.2 LITERATURE REVIEW ON CORPORATE STRATEGY MAKING PROCESSES

Miller (1987) has presented a summary of different corporate strategy - making processes used and documented by researchers. This is briefly reproduced here. The literature has identified three multi-faceted dimensions of strategy making process: rationality, interaction and assertiveness. The first dimension, rationality, suggests careful analysis of problems and opportunities, scanning of markets, methodical planning, stress on long term objectives, use of analytical tools in strategy formulation and articulating unified strategies (Ansoff, 1965; Steiner, 1969). It has been referred to as 'synoptic' by Frederickson (1984); 'planning' by Mintzberg (1973), 'rational' by Miller and Frieson (1984) and 'analyser' by Miles and Snow (1978).

The second dimension of the strategy formulation process is interaction. The name is derived from the fact that men with limited cognitive abilities make decisions while interacting with each other through the process of argumentation (Lindbloom 1959). Men have limited cognitive abilities and organization structure places bound on the rationality (March and Simon 1958; Simon 1947) and when faced with complex problems, they only satisfice by doing little analysis and formulate strategies according to disjointed, intuitive, implicit and spontaneous process (Cyert and March 1963; Lindbloom 1959; March and Olsen 1976; Quinn 1980). It has been claimed by these authors that such a non-rational approach is necessary due to wide range of complex problems faced by the organizations and individuals, and the attendant cognitive limitations and the social and political contexts in which decisions have to be made. Hence politically fragmented firms operate in an adaptive mode (Mintzberg 1973) where goals and means are discovered through a process of argumentation. This process invariably leads to changes in incremental steps.

The third dimension of strategy making process is assertiveness which is concerned with the riskiness of strategy and reactiveness and pro-activeness of decisions. Entrepreneurial firms act ahead of their environments by taking bold decisions; whereas more complex firms often act conservatively by acting only reactively to the environmental changes (Cyert and March, 1963; Quinn, 1980).

3.0 THEORETICAL FRAMEWORK

The four Jungian personality types may be mapped onto three strategy making processes. Presented below are a few hypotheses in this regard.

ST's stress systematic decision making with hard data. They take less risk than other types do. They want to establish order, control and certainty. They appear to focus on short term problems and use standard operating procedures to solve them. They delve into details and specifics and use logical step by step reasoning. When they are encountered with opposition they rarely reanalyze their position. They use anchoring heuristics and possess a functional fixedness bias due to which they prematurely reject feasible alternatives. Hence they are likely to use

rational process of strategy making. It may thus be proposed:

Hypothesis 1 ST's use "rational" process of strategy making.

SF's stress people's opinion in decision making and stress concentrating on affective and evaluative parts of communication. They focus on short term problems and generally their problems have human implications. They use availability heuristics and posses social desirability bias. Their actions become feasible when people endorse them. They may need constant appraisal/direction for implementation. Hence they are likely to use "interaction" process of strategy making. Thus.

Hypothesis 2 SF's use "interaction" process of strategy making.

NT's tend to ignore specific and detailed information. They erect nonlinear problems by studying patterns in data (Nutt, 1986). They stress analysis but construction takes bolder leaps into the unknown. They emphasize longer range planning and new possibilities. They enjoy tackling complex problems and reducing them to simpler ones. They stress need for innovation, risk taking and discovery. They use perseverance heuristics and possess positivity and representativeness bias. It is proposed that,

Hypothesis 3 NT's use predominantly an "assertive" process of strategy making.

NF's rely on Gestalt and intuitive perceptions and maintain few decision making rules. They stress their judgement and experience, often portraying their personal views as facts. Their interest is in new and institutional forms and human possibilities structure their problems. They spend little effort getting to know specifics and concentrate more on broad themes with longer term goals and problems that require innovative concepts and theories. They sometimes test their hunches, at other they just state their preferences. They use vividness heuristic, stress reasoning by analogy and have an illusionary control bias. They are likely to use assertive process of strategy making. It may be proposed that,

Hypothesis 4 NF's follow a very strong 'assertive' process of strategy making.

4.0 DATA COLLECTION, EMPIRICAL ANALYSIS AND RESULTS

A questionnaire was administered to categorize 20 entrepreneurs into four personality types. The questionnaire to classify managers into four categories of ST/SF/NT/NF was borrowed from Hellriegel et.al (1992). The data obtained appears in Table 1.

We found that out of 16 ST's 10 (62.5%) followed a rational strategy as predicted by hypothesis 1.

Our sample had only 2 NT's and both used assertive strategy as predicted by hypothesis 1.

Our sample had only 2 NT's and both used assertive strategy making process in tune with hypothesis 3. Further, there were only 2 SF's and both of them used interactive strategy making process as predicted by hypothesis 2. obviously more data is necessary for sufficient confidence in the hypotheses which were developed in this paper.

This type of work has tremendous implications for matching strategy making

process with managers' personality. If an organization wants a specific strategy making process to be used then it must choose appropriate managers to manage the affairs as predicted in our study. Alternatively, if managers with different style already exist in the organisation, then suitable training systems may be used to sensitise him about a different strategy making process which he would be using.

This study is of use to banks who give loans to these entrepreneurs. Banks may verify how the strategy is formulated in the organization. If environment is easy then an assertive strategy may work. Sometimes it may be required to follow a rational or interactive strategy making process. In such circumstances it must be ensured that person at the helm of the affairs is naturally comfortable with the strategy making process as required by the environment. They could advise the entrepreneur to be aware of his limitations in respect of specific choice of strategy making process that he is often prone to using. An entrepreneur may affect his short comings by hiring an appropriate type of manager to assist him.

5.0 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Ineffectiveness resulting from differences in strategic choices due to personal preference and environmental imperatives has not been studied. A future study could take these factors into account.

Table-1
Summary of Data Collected on Twenty Entrepreneurs

Firm No.	Personality Type	Strategy Making Process used
1.	S.T	Assertive
2.	S.T	Rational
3.	N.T	Assertive
4.	S.F	Interactive
5.	S.T	Rational
6.	S.T	Assertive
7.	S.T	Rational
8.	S.T	Rational
9.	S.T	Rational
10.	S.T	Rational
11.	N.T	Assertive
12.	S.T	Assertive
13.	S.T	Interactive
14.	S.T	Rational
15.	S.T	Interactive
16.	S.T	Rational
17.	S.F	Assertive
18.	S.T	Rational
19.	S.T	Assertive
20.	S.T	Rational

REFERENCES

Ansoff, I.H. (1965). Corporate Strategy. N.Y., McGraw Hill Book Co.

Chandler, A.D. (1962). Strategy and Structure: Chapters in History of American Industrial Enterprise. Cambridge: MIT Press.

Cyert, R.M. and March, J.G. (1963). A Behavioral Theory of the Firm. Englewood Cliffs, N.J., Printice Hall.

Fredrickson, J.W., (1984). "The strategic decision process and organizational structure". Academy of Management Review, V 11, 280-297.

Ginsberg, Ara. (1990). "Connecting Diversification of Performance: Socio-cognitive approach" : Academy of Management Review, V 15, No.3, 514-535.

Haley, Usha C.V. & Stumpff, Stephen A. (1989). "Cognitive trails in strategic decision making : Linking theories of personalities and cognition". Journal of Management Studies, 25:5 September.

Hellriegel, D., Slocum, J.W. and Woodman, R.W. (1992). Organizational Behaviour, Ch 5, West Publishing Company, New York, pp 144-146.

Hogarth, R.M. and Makridakis, S.M. (1981). "Forecasting and planning: an evaluation". Management Science, 27, 115-38.

Jung, C. (1923). Physchological Types. London : Routledge & Kegan Paul.

Lawarance, P.R. and Lorsh, J. (1967). Organization and environment. Boston. Harvard University Press.

Lindbloom, C. (1959). The policy making process, Englewood Cliffs; N.J. Printice Hall.

March, J.G. and Olsen, J. (1976). Ambiguity and Choice in organizations. Bergen, Norway : Universite Forlaget.

March, J.G. and Simon H. (1958). Organizations. New York : John Wiley and Sons.

Miller, Danny (1987). "Strategy making and structure : Analysis and Implications for performance". Academy of Management Journal, Vol. 30, No.1, 7-32.

Miller, D. and Friesen, P.H. (1984). Organizations: A quantum view. Englewood Cliffs, N.J. : Printice Hall.

Mintzberg, H. (1973).. "Strategy making in three modes". California Management Review, 16 (3), 44-58.

Nutt, (1986). "Decision Style and its Impact on Managers and Management", Technological Forecasting & Social Change, V 30, 39-62.

Nutt, (1993). "Flexible Decision Styles and the Choices of Top Executives", Journal of Management Studies, 30:5, Sept, 695-721.

Quinn, J.B. (1980). Strategic for Change : Logical Incrementalism. Homewood, III, Richard B Irvin.

Schewenk, Charles R. (1988). "The Cognitive Perspective on Strategic Decision Making", Journal of Management Studies, 25:1, January.

Simnon, H.A. (1957). Models of Man, New York, Wiley.

Simon, H.A., (1947). Administrative Behaviour. New York, McMillan Book Publishing Company.

Steiner, F. (1969). Top Management Planning. New York : McMillan Book Publishing Company.

GENERATION OF SCIENTIFIC QUESTION PAPER WITH THE AID OF COMPUTER

DINESH M. BONDE and URMILA N. SHRAWANKAR

1.0 INTRODUCTION

Question paper is a tool for assessment in teaching learning process. Most of the examination bodies invite manuscript question papers from the examiners and one of the paper is selected for examination. The manually set paper is not scientifically accurate as per requirements. The shortcomings viewed are:

- Questions are repeated in the same paper with change of sentence style.
- The marks allotted and the questions asked are not as per the marks prescribed in the curriculum for each topic.
- The analysis of question paper on taxonomical levels is not as per requirement.
- No consideration is given to the Difficulty Standard of the questions.
- No consideration is given to the response time.

To overcome the above limitations the concept of computerised question paper with the aid of computer has been successfully introduced at Government polytechnic, Nagpur.

2.0 THE SOFTWARE:

A Software has been developed to obtain scientific question paper overcoming all the above limitations of manual paper setting.

The Following points are considered while designing the system.

- The question paper gives specified weighage to each topic as per curriculum requirement.
- No question is repeated in part or full.
- All levels (Knowledge, Comprehension and Ampliation) etc., are given due consideration.
- Difficulty Standard of the question is given weighage.
- Time required to solve the question paper is given attention.
- The facility of selection of quantum of repeated questions appeared in previous examinations is provided.

3.0 THE QUESTION BANK

The database of questions as per the question paper scheme has been created consisting of the required fields and the questions are invited from the examiner topic wise in the specific format. Questions are invited with all details such as difficulty

standard, levels, response time etc. The question numbers and the figure numbers are logically related.

4.0 THE CURRICULUM

The curriculum is reset on topic number and subtopic numbers. The analysis is done on micro level to obtain accurate output. The marks allotted to the topic are subdivided into different levels. The content of curriculum need not be modified but the structure requires modification and allotment of marks on micro level.

5.0 THE OUTPUT STUDY

5.1 Question Paper Index

The output is designed and required sets of question papers are generated for examination. The summary of the paper generated is verified from the marks allotted in the curriculum and the question paper index table. It is exactly the same as specified.

Table 1

QUESTION SCHEME

Q.No.	Marks Allotted	Scheme M × Q	To be given with Choice M × Q	Total
Q.1A	5	1 × 5	1 × 7	7
Q.1B	10	2 × 5	2 × 7	14
Q.2	12	4 × 3	4 × 5	20
Q.3	12	4 × 3	4 × 5	20
Q.4	12	6 × 2	6 × 3	18
Q.5	12	6 × 2	6 × 3	18
Q.6	12	6 × 2	6 × 3	18
	75			115

The question paper of Engineering Mechanics for Government Polytechnic is selected on computerised question paper. The question bank of the course is prepared incorporating all above factors. As per the question paper index, first question is objective type with five out of seven questions carrying one mark each, and the sub question 1 (b) with 5 out of 7 carrying 2 marks each are set. Care has been taken to introduce 1, 2, 4, 6 mark questions in order to introduce both subjectivity and objectivity in the question paper.

5.2 Levels

The analysis of selected question paper for Knowledge, Comprehension, Application (KCA) etc. levels is done. The output of KCA levels for the selected paper is done. The questions from knowledge level are of 26 marks; from comprehension level are of 33 marks and the application level are of 56 marks selected in the question paper. Studying the course contents the above selection is found to be proper and scientific.

5.3 Choice

The total marks of the questions selected in the question paper with choice are 115 against 75 giving choice of 65% to the students and is as specified in the question paper index table.

5.4 Response Time

This factor is introduced in the system to verify whether the set question paper generated can be solved within specified duration. For the said course, the question paper is of 180 minutes (3 Hr.) and the generated question paper is of 275 minutes for all question including choice. Viz

Table 2

QUESTION PAPER INDEX

Topic No.	Marks Allotted as per curriculum	Marks Required approx. 1.5 × (2)	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Total Marks allotted sum (1) to (9)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.0	02	03	1 × 1 2 × 1						
2.1	02	03	1 × 1 2 × 1						
2.2	08	12		4 × 3					
3.0	06	09	1 × 1 2 × 1			6 × 1			
4.1	02	03	1 × 1 2 × 1						
4.2	07	12				6 × 2			
5.1	02	02	2 × 1						
5.2	08	12			4 × 2		6 × 1		
6.1	02	03	1 × 1 2 × 1						
6.2	06	09			4 × 2				
7.1	02	04		4 × 1					
7.2	08	12					6 × 2		
8.1	02	03	1 × 1 2 × 1						
8.2	08	12						6 × 2	
9.1	04	05	1 × 1	4 × 1					
9.2	06	10			4 × 1			6 × 1	
10.0									
11.0									

$275 \times 0.65 = 179$ minutes to solve the question paper. It is suitable against the specified time of 180 minutes.

5.5 Analysis of Question Paper

The question paper appeared in the examination was analysed by the expert faculty of Applied Mechanics Department. It is expressed that the question paper is the most scientific, covering all the topics of curriculum with prescribed marks.

6.0 ADVANTAGES AND DIFFICULTIES

To develop a question bank the questions as per the prescribed scheme of marking can be invited from setters for a particular topic of excellence. Industrial personnel are expert in the particular operation in their industry and the setting of related topics can be invited from them.

Inspite of clear instructions there is repetition of questions in the manuscript being received from the setter. Such repetition is avoided in this system.

The manual question paper set may not contain the topic wise weightage given and the thought of KCA levels, Difficulty Standard, Response Time etc. is not yet introduced in manual setting. All these factors are considered scientifically in computerised paper.

The question bank requires updating and more number of questions are required from external as well as internal faculty.

The updating requires study of the entire question in the bank in order to avoid similar question on the same topic.

The computer system set up with facilities of computers, scanners etc. are required.

TABLE 3

ANALYSIS OF SELECTED QUESTION PAPER

Marks as per Curriculum			Marks of Selected Questions		
Topic No.	Marks	Total	Que.No.	Marks	Total
1.1	3	3	Q1	3	3
2.1	3	15	Q1	3	15
2.2	12		Q2	12	
3.1	9	9	Q1	3	9
			Q4	6	
4.1	3	15	Q1	3	15
4.2	12		Q4	12	
5.1	2	16	Q1	2	
5.2	14		Q3	8	16
			Q5	6	
6.1	3	11	Q1	3	11
6.2	8		Q3	8	
7.1	4	16	Q2	4	16
7.2	12		Q5	12	
8.1	3	15	Q1	3	15
8.2	12		Q6	12	
9.1	10	15	Q3	4	15
			Q6	6	
Total	115	115		115	115

TABLE 4

KCA LEVELS

KNOWLEDGE	COMPREHENSION	APPLICATION
30	23	62

CHOICE

TOTAL MARKS WITH CHOICE	MAXIMUM MARKS	PERCENT CHOICE
115	75	65

RESPONSE TIME

TIME WITH CHOICE	TIME TO SOLVE THE QUEST. PAPER
275	179

STAFF DEVELOPMENT PROGRAMME THROUGH INTER-INSTITUTIONAL CO-OPERATION

V.R. VIVEKANANDAN, C. VIMALA and B. MUKHOPADHYAY

1.0 INTRODUCTION

Staff development is a continuing process that is to be nurtured to ensure the quality of institutional inputs to the students. The measure of the efficacy of a programme is the level of self-motivation acquired by a staff member who attends a programme.

The results should become obvious through the increase in the level of the motivation of the students. These results are to be measured not only through their academic performance, but also through their enthusiastic participation in the co-curricular and extra-curricular activities. Another obvious indicator is the competition-preparedness level of the students.

2.0 STAFF DEVELOPMENT IN-FRASTRUCTURE

To meet the staff development requirements of the technical educational institutions, only a handful of institutions is available in the country.

Among the institutions that have the expertise in imparting training for technical teachers, Technical Teachers' Training Institute (TTTI), Taramani, Chennai has distinguished itself as a reputed and well-established institution.

The expectations from an institution that takes up a staff development programme for a technical educational institution are that the institution giving training has:

- trained and dedicated staff
- a knowledge of the operations of a technical educational institution
- awareness of the attitude of the staff participating in the programme
- capability to make a time-bound programme
- capability to motivate the participants to become up-to-date in their knowledge level not only in their own subject area, but also in co-curricular and extra-curricular activities
- imparting practical training
- laboratory facilities for specific skills such as model making

3.0 TECHNICAL TEACHERS' TRAIN-ING INSTITUTE, TARAMANI, CHENNAI

Genesis

Technical Teachers Training Institute, (TTTI) Chennai is an autonomous organisation established by the Ministry of Human

Resource Development (HRD), Government of India, to improve the quality of Technical and Vocational Education Systems in India and in the Southern Region in particular.

Within this general intent, the institute will take initiatives to offer need-based HRD programme through appropriate modes and develop curricula and instructional resources. It will also foster research and offer consultancy and extension services for the total development of polytechnics and other technical and vocational education institutions, business, industry and service sectors and the community at large.

In carrying out the above mandate, the institute will collaborate with national and international agencies interested in and/or deriving benefits from technical and vocational education including business, industry and service sectors.

Mission

TTTI, Chennai, has declared its mission as:

"Technical Teachers' Training Institute, Chennai is a resource institution established by the Government of India for quality improvement of technical education in our country and in the Southern Region in particular."

"We offer quality, flexible, relevant and cost effective programmes in HRD for Technical and Vocational Education Systems in all possible modes."

"We demonstrate leadership by organising dynamic and leading edge programmes to meet the changing needs of Industry, Business and Community."

"We are committed to create an environment, which promotes congenial learning, collaborative decision-making and promoting a sense of belongingness and accountability, which bring out the best in our human resource."

"We are committed to help solve problems in Technical and Vocational Education and in tackling issues, in a proactive manner, by research, development and extension activities."

"We establish and foster close links with national and international agencies involved in Human Resource Education."

Vision

TTTI, Chennai, has stated its vision statement as: "Technical Teachers' Training Institute, Chennai is a model human resource development Institute for planning, designing, developing, organising and evaluating quality training programmes, research studies and learning packages for technical and vocational education, industry and community. The institute strives continuously and vigorously to further enhance its sensitivity to environmental changes and reach greater heights of excellence through active collaboration with national and international agencies on projects and programmes aimed at Total Quality Management of Technical and Vocational Education Systems and Human Resource Education."

Objectives

TTTI, Chennai, has as its objectives the following:

- To take initiatives to improve and ensure the quality of technical education in the

region in particular and the country in general.

- To train technical teachers through long, modular and short courses by appropriates modes including web based programmes.
- To promote research in technical education, technical teacher education and management of technical education system.
- To develop and supply wherever necessary learning resources like Video Programmes, Computer Assisted Instructional Packages and Multimedia CD to technical institutions.
- To collaborate with National and State Councils and other academic bodies of technical education in India and abroad, that have similar objectives, by exchange of teachefs and organizing other need based services.
- To act as a center for disseminating information to all agencies interested in technical education through journals and Information Technology resources.
- To collaborate with industries, business and community in organising continuing and non-formal education programmes and extending consultancy services.

4.0 PERIYAR MANIAMMAI COLLEGE

Genesis

Periyar Maniammai College of Technology for Women (PMCTW, Vallam) is a technical educational institution dedicated to the uplift of women in the rural areas. Located in the vicinity of a small town, it admits only women students for engineering education.

Ever since inception, the institution has enjoyed a good academic record every year. Invariably, its students of each branch of study came out with top honours in the university examinations.

Besides best performance in studies, the institution has also ardently encouraged co-curricular and extra-curricular activities.

Notable among the co-curricular activities are training for students in industries and other institutions.

Students and staff are encouraged to participate and present papers in seminars and conferences.

The foremost among the extra-curricular activities is the National Service Scheme (NSS). The institution has always been successful in promoting games and sports activities.

The students are given exposure to entrepreneurship. For those intending to take up an employment, career development programmes are organised with the help of very reputed companies.

Though the institution does not have an autonomous status, it makes efforts to expand the knowledge of the student beyond the syllabus prescribed by the university. Keeping this in mind, efforts are made continuously to upgrade the facilities such as library, computer center, etc.

5.0 HOLISTIC APPROACH AT PMCTW

Besides focusing its main efforts on excelling in the core discipline, namely, academic performance of the students, PMCTW expands its activities into other areas

such as social service, environment upgrading, sports and games, presentation of papers in seminars and conferences and so on.

Taking the example of Canada India Institutional Cooperation Project (CIICP) model, the institution selected the following areas for its holistic approach:

1. Strategic Planning
2. Staff Development
3. Women in Development (WID)
4. Management Development
5. Environment
6. Industry - Institution Interaction (III)
7. Management Information System (MIS)
8. Total Quality Management (TQM)
9. Research & Development (R&D)

PMCTW had already been actively promoting a few of the above. III, Environment, WID, Strategic Planning and TQM are areas developed very well.

PMCTW is fast developing with its own internal capability in the following areas of holistic approach:

1. Management Information System
2. Research and Development
3. Management Development

The institution has been organising staff development programmes mostly in technical areas. These have been supplemented by lectures from resource persons in areas such as management, quality, human resource development and other general topics.

As regards the technical updating, the institution had its arrangements with in-house and external resource persons. For practical training too, the institution had good arrangements.

6.0 MODUS OF IDENTIFYING STAFF DEVELOPMENT NEEDS

When the initial assessment of the staff development needs of PMCTW had to be identified, TTTI Chennai deputed one of its faculty to PMCTW. He gave his views and conducted a brainstorming session to a group of selected faculty members of PMCTW.

As could be expected of the technical education institution, PMCTW faculty members expressed the need to get training inputs predominantly in the areas of pedagogy, class-room teaching, teaching skills, instructional methods, induction training programme and so on.

The list of topics to be included in the schedule for the first staff development programme for the selected faculty members was finalised.

A few faculty members of the non-engineering disciplines, were familiar in some of the topics. Yet, it was decided that they would receive these inputs as a refresher.

Further, the resource persons were identified for each sub-programme. Mostly, the resource persons were from TTTI Chennai by the nature of the topics selected.

The laboratory facilities of the TTTI, Chennai, were also suitably availed of for this programme. The methodology for staff development programme is to be based on the needs of the individual staff members of PMCTW. It can be further categorised into the requirements of

1. those in the main branches of study offered by the institution.

2. others not in the main branches.

The major highlight of the staff development programme was the practical training on classroom teaching by video filming of the teaching presentation of individual participants.

The case study of the successful programme implemented through mutual cooperation between the two institutions is described in the following pages.

7.0 STAFF DEVELOPMENT PLANNING BY PMCTW

As regards staff development, PMCTW did not have the necessary infrastructure. To address the identified needs, the institution realised that outside support should be enlisted. This need could only be partly fulfilled through its association with a number of institutions.

This advantage satisfied only the needs on technical and managerial development knowledge. As regards teaching inputs, instruction methods, student evaluation, induction training and pedagogy for the technically qualified faculty members, help had to be acquired from other sources.

Struck by the idea of long association PMCTW had with TTTI, Chennai, it sought the help of the latter. The first dialogue on planning the staff development programme was represented by the faculty of TTTI and PMCTW under the guidance of Principal TTTI, Chennai.

8.0 WORKSHOP FOR DESIGNING STAFF DEVELOPMENT

A two days workshop was conducted at PMCTW to identify the training needs of the faculty and staff and to design a set of courses to meet the training needs.

The Director, Quality Assurance and Management (QAM) of PMCTW presented the works that are being carried out in the institution in the areas of Women in Development, Staff Development, Management Development, Institute Industry Linkages, etc. He also expressed the expectations of the Staff Development Cell from TTTI Chennai. This was followed by the lead lecture from TTTI faculty on Concept, Nature and Strategies of Staff Development.

A brain-storming session was conducted with all the faculty and a few staff members to understand their training needs. The training areas that were identified by the faculty and staff were listed down. There were 26 areas of training which were again prioritised by summing up the ranks assigned by all the participants to each programme.

Subsequently the 26 programmes as identified were analysed in detail by the participants and were reduced to 16 courses by combining some of the programmes. The duration of each of the 16 courses was also

decided. The duration varied from one day workshop to one week workshop.

As a final output in the development of the Master Plan, a detailed Action Plan for the Staff Development programmes emerged. This Action Plan was designed for a period of one year. It includes course title, duration, venue, resource persons, budget, etc. Some of the areas of teachers training programme included Time Management, Self Awareness and Creativity, Class room Questioning, Induction programme, Performance Appraisal and Development System (PADS), Student Evaluation, Instructional Resource Development, etc.

A base paper on Staff Development was prepared by the Director, Quality Assurance and Management of PMCTW for Circulation among the faculty. The paper contained the following areas:

- Programming Title
- Criteria for Considering the Topics to be covered
- Duration and Timing of the course
- Selection of Participants
- Identification of Resource Persons
- Assignment of Project Works
- Practical Orientation through Training and Industrial Visit
- Rules for Certification

9.0 MEMORANDUM OF UNDER-STANDING (MOU)

To enrich and accelerate the process of inter institutional cooperation, it was proposed by PMCTW for preparing the outlines of an MOU. It was decided when both the heads of the institutions meet in some formal situation and the outlines of the MOU can be discussed and can be finalised. In accordance with the mutual desire of the two institutions the Memorandum of Understanding was signed on Feb. 28, 1998 for cooperation in the following areas:

- Faculty Training
- R & D Activities
- Guest Faculty
- Seminars/Workshops on Mutual Cooperation
- Sharing Resources

According to MOU, Principal, TTTI, Chennai and one of the sessions faculty member nominated by the Principal, TTTI will act as honorary advisers for the Staff development programmes of PMCTW. Themes of other cooperation activities as may be required in the later days will be developed mutually on case to case basis.

10.0 IMPLEMENTATION

For effective implementation of all the programmes, a close liaison was maintained between TTTI. Chennai and PMCTW, Vallam. From TTTI side one session faculty was assigned this responsibility and he maintained constant interaction with the Staff Development Manager and Director, QAM of PMCTW.

Almost all the programmes were conducted in time except one or two. Certain specialised courses in the areas of Instructional Design and Delivery System, Instructional Media, Management of Motivation, Evaluation Techniques and Guidance and Counseling were conducted by TTTI either at PMCTW or at TTTI Chennai. A segment of the staff development programme was conducted by

other agencies including industrial organisations.

For each course well developed course materials were given and enough scope was given to the participants for interaction. Each course was evaluated by the participants and efforts were undertaken to improve upon the subsequent industrial organisations.

At the Valedictory Function of the last course, certificates were distributed to the participants who have successfully completed certain requirements by attending majority of the course. In all, eighteen faculty members from PMCTW received the certificates jointly signed by the Principal, PMCTW, Vallam and Principal, TTTI, Chennai.

Mission

"To be among the leading, Indian Academic Institutions turning out readily employable students in technology, management and other branches of studies, contributing to the industry, trade, academics, research and development and society as a whole. In addition, to provide systems and services, in the related fields, their infrastructure and potential areas."

Vision

"To become a world class innovative, competitive, up-to-date academic institution providing technological and other inputs appropriate to the branch of study a student has undertaken."

"Encouraging the rural women students of socially weaker sections to take up highest levels of professional education."

11.0 FURTHER PROGRAMMES

Arrangements are being made to organise the next programme for the selected individuals from the faculty who had not attended the first programme.

TTTI is experiencing increasing demand form other institutions. Hence, some members of PMCTW will be given additional training inputs. They would handle some of the sessions of the second programme under the guidance of TTTI faculty members.

Since staff development has also to be extended to non-teaching staff, the faculty members of PMCTW themselves would organise programmes suited to the engineering discipline to which the individual staff belongs. The emphasis will be on hands-on training for the development of the non teaching staff.

12.0 CONCLUSION

The idea and implementation of staff development programme through inter-institutional cooperation is a unique experiment. In the beginning when the work plans was being prepared, certain apprehensions were there regarding effective implementation and monitoring of the programmes. But after conducting the first two programmes, the implementation strategy was much clearer. A few strategic flexibilities were introduced for effectively conducting the rest of the programme. These included in specific cases reconsideration of venue, inviting local experts and occasionally combining two similar courses together with sufficient duration.

It was observed that in certain programmes a few PMCTW faculty who have

enough industrial and training background volunteered to contribute as supportive faculty.

Their services were utilised. It was envisaged that for future programmes the services of these faculty members need to be utilised.

All participants made on record their gratitude to the authorities of PMCTW and TTTI for giving them such an opportunity of undergoing well planned and need based staff development programme. As the programmes were spread all over the year, it was not difficult for them to match their time with the institutional workload. They strongly recommended that similar programmes for their colleagues who could not get this opportunity and for the newly recruited teachers.

The above experience shows that cooperation between the two institutions ended up in successful synergy because of the initial planning done by both the institutions.

More and more technical educational Institutions have started realising the benefits of availing the expertise and infrastructure available with TTTI, Chennai. This has resulted in increasing pressure on TTTI, Chennai. The institutions intending to avail the help of TTTI, Chennai for their staff development programmes should maximise their own in-house inputs so that the speciality areas of TTTI, Chennai, can be shared by more technical educational institutions.

TECHNOLOGY IN AGRICULTURE TEACHER PREPARATION AND ITS IMPLICATIONS FOR PRODUCTION OF QUALITY TEACHERS

EKONG, ANTIABONG OKON

1.0 INTRODUCTION

The ultimate focus of agriculture teacher preparation is the production of proficient and skilful teachers who could initiate, design, develop programmes, implement, manage and evaluate for feedback for relevant adjustment. The strategies therefore, for the training of teachers must be efficient and calls for the utilization of improved approaches to ensure the production of desired quality teachers. This paper examines:

1. The concept of Technology

2. Agriculture teacher preparation

3. Application of technology in agriculture teacher preparation

4. The implications of application of technology in agriculture teacher preparation.

2.0 THE CONCEPT OF TECHNOLOGY IN EDUCATION

Technology has been defined in various ways by different authors based on backgrounds. Okorie and Ezeji[1] saw technology as a systematic study of techniques of making and doing things while Ibe–Bassey[2] viewed it as the application of scientific or organised knowledge to practical tasks. Olaitan[3] preferred technology as the use of products of creativity, inventions and scientific research in the service of man. Technology can be explained precisely as the instrument of problem-solving.

Since education is dynamic and requires development, technology therefore, occupies the pivot position as the strategy of initiating and effecting desired educational developmental processes. It implies the human created knowledge, principles and competencies and application for the development of equipment, tools, power, instrumentation, services and manipulative skills for solving various educational problems. The problems could be in the numerous areas of manpower development, programme development, delivery systems, process and product evaluation; facility development and utiliation and so on.

The relevance of technology can be seen from the following capabilities:

1. The creation and application of scientific knowledge to achieve desired goals.

2. The adoption of updated knowledge and principles to specific needs of education.

3. The capability of causing innovations in educational processes.

It could ensure maintenance and continuity of application of scientific developments to educational situations.

Technology can therefore, be defined as an integrated strategy derived from scientific knowledge, principles and practices for improving educational practices. In the preparation of agriculture teachers, technology could be explained as the scientific and updated approaches employed in effective preparation of the agriculture teacher toward the acquisition of appropriate and relevant skills, abilities and competencies, to be able to perform agriculture teaching functions proficiently. This confirms the view of Edwards[4] who described technology as a disciplined process awareness of using resources of scientific and other knowledge and skills to achieve human resource development. It could also mean a technical process of achieving practical purposes of relevant personnel development. As applied to teaching specifically, technology could be seen as the scientific principles and practices applied to teaching.

The need for the application of technology in agriculture teacher preparation becomes relevant for complete re-orientation of agriculture teachers to be in tune with modern agricultural technology, the delivery systems and practices to be effective and functional.

3.0 AGRICULTURE TEACHER PREPARATION

Teacher preparation is an all-embracing professional activity aimed at producing competent teachers for efficient performance of agriculture teaching functions. In his view, Ezewu[5] described teacher preparation as a programme designed to give professional training to those who will be engaged in teaching and other professional activities in education. Agriculture teacher preparation is therefore, the academic and vocational programme of preparing agriculture teaching personnel in the art of imparting knowledge and skill of practical value to the in- and out-of-school youths. The preparation would focus at providing the following:

- training at pre-service and/or in service levels;
- technical and professional studies consistent with the needs of a competent agriculture teacher;
- leadership training for those responsible for planning, administering and supervising agricultural education programme;
- opportunities for supervised occupational experience programme in agriculture for the trainee teachers to gain supervised participatory experience to be able to organise the same after graduation;
- training and development in technical agriculture general education and professional education to the overall competence of the agriculture teacher;
- training in research as a basis for development and problem-solving.

The activities involved in the preparation of agriculture teachers, are geared toward the achievement of specified objectives as adapted from the objectives of teacher education in the National Policy on Education in Nigeria[6] viz:

- To produce highly motivated, conscientious and efficient agriculture teachers for all levels of education.

- To encourage further the spirit of enquiry and creativity in the agriculture teachers.
- To help agriculture teachers to fit into the social life of the community and society at large to enhance their commitment to national objectives;
- To provide agriculture teachers with the intellectual and professional background adequate for their assignments and to make them adaptable to any changing situation in the life of their country and the wider world.
- To enhance agriculture teachers commitment to agriculture teaching profession.

Agriculture teacher preparation programme training system can be seen from four perspectives:

1. The formal training of pre-service teachers.

2. Professional improvement programme for the serving agriculture teachers through in-service, workshops, conferences and re-training schemes.

3. Research programmes on agriculture, agricultural education and agriculture teacher related issues.

4. General services to the education system and the public.

4.0 APPLICATION OF TECHNOLOGY IN AGRICULTURE TEACHER PREPARATION

The objectives of agriculture teacher education programme can effectively be realized with the application of technology in the preparation of the teachers. This justifies the fact that the crux of modern education in agriculture would facilitate the development of vocational and technical methods of operations in agriculture, is within the spheres of technology.

The application of technology in agriculture teacher preparation can be described as all-embracing and systematic utilization of scientific principles, techniques and facilities in preparing and updating the technical, professional knowledge and pedagogical skills, tasks execution and attitudes of pre-service or in-service agriculture teachers for effectiveness. It can also be defined as the scientific approaches employed in effective preparation of the agriculture teachers toward the acquisition of appropriate and relevant skills, abilities and competencies to be able to perform agriculture teaching functions proficiently.

Technology can be developed and applied in the following areas of agriculture teacher preparation:

- Programme planning, development and evaluation in relation to goals and objectives, course of study, follow-up programmes and evaluation strategies.
- Instructional planning associated with lesson plans, students needs and interests, performance objectives and instructional material selections.
- Instructional implementation considering how to direct students classroom and field laboratory experiences; oral questioning techniques to facilitate learning, learning entry behaviour approaches and so on.

- Instructional evaluation in the aspects of students acquisition of knowledge, skills and attitudes.
- Instructional management as concerned with the management of time and resources, enforcing self-discipline in instructional situation, stimulation of enthusiastic classroom and field practicals, the provision of health-care kits in case of emergencies during the learning process as well as good inter-personal relationships.
- School community relations focusing at harnessing co-operation with members of the institutions community for obtaining feedback from the public about the programme performance as well as the strategies for co-operating with supervising educational agencies.
- Instructional communications as it involves the utilization of visual, audio and audio-visual aids raelia, life specimens conduct of farms and home project inspection visits, the guiding of communication as well as the techniques of preparing technical reports.

5.0 STRENGTHS OF APPLYING TECHNOLOGY IN AGRICULTURE TEACHER PREPARATION

Technology applied to the preparation of agriculture teachers can be associated with the following strengths:

- It will develop in the teachers the ability to teach and educate others.
- It would create in the teachers the awareness of the principles that underlie good human relations.
- It will help instill in the teachers a sense of responsibility to make their contribution to the educational, economic, social and cultural progress of the society.
- The quality and output of agriculture teachers would be enhanced through their exposure to updated experiences.
- The teachers would acquire innovative skills and abilities as well as other professional tools to cope with changing times and new technologies in agriculture.
- The agriculture teacher will be technically and professionally sharpened to be able to manipulate the relationship between man, the environment and agriculture.
- Making the teachers more articulate in agriculture concepts, principles and practices.

6.0 IMPLICATIONS OF APPLICATION OF TECHNOLOGY IN AGRICULTURE TEACHER PREPARATION

The test of the professionally qualified agriculture teacher is in his ability to effect learning processes proficiently both in the classroom and on the field laboratories. This is realizable through the application of technology in the preparation of the teachers. It will ultimately result in the production of the well trained, competent, conscientious and dedicated teachers with the relevant tools to initiate and manage an innovative, captivating, objective and vocational oriented agriculture and related instructions in a learning situation. The good quality teachers through application of technology in the teacher preparation is obvious. Mkpa[7] stressed that it should even be more

obvious in specialized teacher preparation programmes.

The technologically prepared agriculture teachers would constitute the group of teachers from which modern and updated approaches to teaching in tune with relevant and recent agricultural technologies are expected. It therefore, implies that for quality agriculture teachers to be produced, the preparation programme and activities should deviate from the orthodox and traditional pattern to the specialized technology oriented one. This would make the teachers to be conversant with updated delivery systems in agricultural instructions and improvements for an assured occupationally wealthy citizens.

REFERENCES

Okorie, J.U & Ezeji, S.C.O.A. (1988). **Elements of guidance, vocational and career education.** Onitsha: Summer Educational Publishers.

Ibe-Bassey, G.S. (1988). **Fundamentals of educational technology.** Uyo: Dorand Publishers.

Olaitan, S.O. (1966). **Vocational and technical education in Nigeria: Issues and analysis.** Onitsha: Noble Graphic Press.

Edwards, P. (1987). An educational framework for school technology. In Kurt Riquarts (ed.). **Science and technology education and quality of life.** Ipn-Materiallen Vol.3.

Ezewu, E.E. (1992). Teacher education in Nigeria in the year 2,000. In B.G. Nworgue (ed.). **Perspective on Teacher Education in Nigeria.** Nsukka: Association for Promoting Quality Education (APQEN).

Federal Government of Nigeria (1981). **National policy on education.** Lagos: Federal Ministry of Education.

Mkpa, M.A. (1992). Educational technology in teacher education. In B.G. Nworgu (ed.). **Perspectives on teacher education in Nigeria.** Nsukka: Association for the Promotion of Quality Education (APQEN).

THE IMPLICATION OF VOCATIONAL AND TECHNICAL EDUCATION IN NATIONAL GROWTH AND DEVELOPMENT IN THE 21ST CENTURY

AMECHI, N. F.

1.0 INTRODUCTION

Olaitan (1996) defines vocational technical education as that form of education which emphasizes the development of occupational skills needed as preparation for work. It is a form of education which promotes the dignity of labour by entrenching work as the goal of education. Thus vocational technical education or technology education is conceived as instruments for attainment of self-realisation, individual and national efficiency, economic, scientific and technological development (Okon, 1995). It is with the realisation of this unique role that emphasis is placed on vocational technical education when there is a decline in the economy or when unemployment is high. Many authors believe that the present attention being giving to vocational technical education is because of the socio-economic problems facing most countries in the world currently. Amaewhule (1998) agrees with this and adds that this is in conformity with the aims and objectives of the New National Policy of Education, which stress the survival of the individual by acquisition of appropriate skills, abilities and competencies as equipment to enable individuals to live and effectively contribute to the development of the society.

Education, particularly technical and vocational education, is the key of sustainable development and economic prosperity. With the growing technological innovations, consequential restructuring in industry, economy, occupational patterns and job qualification, there must of necessity be a reorganisation in technical and vocational education in terms of new programmes, retraining programmes, curriculum designs, training methodologies, learning materials, teacher preparation, management and administration.

This paper therefore focuses on vocational and technical education in the 21st century, direction of change, problems and solutions and finally it looks at implications of technical and vocational education.

2.0 VOCATIONAL AND TECHNICAL EDUCATION IN 21ST CENTURY

It is widely accepted that the world is at the threshold of technical information explosion and micro-electronic revolution which will create a new way of living and working which in turn, will make new demands on the education system. However, the technologies adopted depends largely on the education and skill levels of the work

force ie, the more educated and the higher the skill acquired by the work force, the faster their adaptation to energizing technologies. By the year 21st century, the population of most countries in the world must have increased. It is hoped that more women will enter the work force which includes occupation previously regarded as exclusive for men. These include such trades as building, auto-mechanics etc. These will create new demands for skilled manpower needs in technical and vocational education. All these would generate changes in school curriculum. There will also be the need for training and re-training programmes for most workers to develop appropriate skills for various occupation in which trainees seek employment. Future curriculum will emphasise maintenance skills in training, leading to the development of multiple and or inter disciplinary skills. If properly conducted, it should lead to the acquisition of broad knowledge and basic skills applicable to a number of occupations within a given field so that the individual is not limited by his education in his freedom of occupational choice, and changes as he may, from time to time, deem fit.

Therefore, learning and teaching in the future will require increased cooperation between education systems and enterprises, industries, agriculture and service sector. New instructional strategies such as computer assisted instruction will endure. The teacher will be characterised by marked flexibility and versatility. He will be more amenable to innovations due to the emergence of new technologies. He will be a facilitator of learning than the present day teacher who is conservative and reluctant to change.

3.0 DIRECTION OF CHANGE: AT TECHNOLOGY LEVEL

The age we are now in the 20th century, is variously described as knowledge society, information age, mechatronic age etc. It is characterized by a striking new type of revolution, a wide range of advanced technologies and a variety of spectacular innovations and rapid changes. The value emphasis is greatly shifting from 'materials' to 'information' and 'time'.

As we enter the 21st century, the new technologies differently known as emerging, advanced, frontier, high technology and the like, are unleashing altogether new forces on the world scene. The advances made in micro-electronics, information technology, materials technology and biotechnology have an all pervasive character. The emergence of computing system, robots, numerically-controlled machines, based on this technology is accelerating the process of automation in factories and offices and are reducing the demand of traditional labour.

4.0 AT THE INDUSTRIAL LEVEL

The cumulation effect of all the new technologies is resulting in an explosive rise of new industries in areas like micro-electronics, computers, lasers, optics, robotics, remote-sensing, alternate energy, space manufacturing, ocean engineering, environmental recycling. Many developing countries have plans to achieve self-reliance in industry, catch-up with developed nations and strike a balance in external payments. New technologies are being imported through bilateral or multi-lateral agreements. They are being processed, absorbed and modified to suit the local conditions. The result is seen in the form of establishment of new industries,

force ie, the more educated and the higher the skill acquired by the work force, the faster their adaptation to energizing technologies. By the year 21st century, the population of most countries in the world must have increased. It is hoped that more women will enter the work force which includes occupation previously regarded as exclusive for men. These include such trades as building, auto-mechanics etc. These will create new demands for skilled manpower needs in technical and vocational education. All these would generate changes in school curriculum. There will also be the need for training and re-training programmes for most workers to develop appropriate skills for various occupation in which trainees seek employment. Future curriculum will emphasise maintenance skills in training, leading to the development of multiple and or inter disciplinary skills. If properly conducted, it should lead to the acquisition of broad knowledge and basic skills applicable to a number of occupations within a given field so that the individual is not limited by his education in his freedom of occupational choice, and changes as he may, from time to time, deem fit.

Therefore, learning and teaching in the future will require increased cooperation between education systems and enterprises, industries, agriculture and service sector. New instructional strategies such as computer assisted instruction will endure. The teacher will be characterised by marked flexibility and versatility. He will be more amenable to innovations due to the emergence of new technologies. He will be a facilitator of learning than the present day teacher who is conservative and reluctant to change.

3.0 DIRECTION OF CHANGE: AT TECHNOLOGY LEVEL

The age we are now in the 20th century, is variously described as knowledge society, information age, mechatronic age etc. It is characterized by a striking new type of revolution, a wide range of advanced technologies and a variety of spectacular innovations and rapid changes. The value emphasis is greatly shifting from 'materials' to 'information' and 'time'.

As we enter the 21st century, the new technologies differently known as emerging, advanced, frontier, high technology and the like, are unleashing altogether new forces on the world scene. The advances made in micro-electronics, information technology, materials technology and biotechnology have an all pervasive character. The emergence of computing system, robots, numerically-controlled machines, based on this technology is accelerating the process of automation in factories and offices and are reducing the demand of traditional labour.

4.0 AT THE INDUSTRIAL LEVEL

The cumulation effect of all the new technologies is resulting in an explosive rise of new industries in areas like micro-electronics, computers, lasers, optics, robotics, remote-sensing, alternate energy, space manufacturing, ocean engineering, environmental recycling. Many developing countries have plans to achieve self-reliance in industry, catch-up with developed nations and strike a balance in external payments. New technologies are being imported through bilateral or multi-lateral agreements. They are being processed, absorbed and modified to suit the local conditions. The result is seen in the form of establishment of new industries,

modernisation of old industries, improved products and services. There are traditional products such as textiles, chemicals, metals, vehicles and other capital goods. Some of the industrialised nations are steadily shifting away from production of goods to knowledge and information-intensive services.

5.0 NATIONAL-EXPERIENCES

The foregoing startling observations do not mean that all nations are undergoing all the changes at the same time and at the same rate. The rate of absorption is governed by several factors such as historical background, social fabric, cultural ethos, geographic locations, demographic density, political system, economic policy, technological level and educational development.

Inspite of these variations, many countries are undergoing a process of restructuring in their industrial, economic, employment and educational systems, though in varying degrees. Nigeria should follow these countries' footstep especially in the area of technical and vocational education; in order to be part of the national growth and development of the 21st century.

6.0 PROBLEMS OF VOCATIONAL AND TECHNICAL EDUCATION

6.1 PUBLIC ATTITUDE

We cannot look at the future with firm intent without some reflection on our past and present circumstances. The challenge of vocational education are complex and diverse. On one hand, the programmes are battling with poor public image and grossly inadequate resources, both human and non-human (The unfinished Agenda, 1984:2). On the other hand vocational education is being called upon to provide solutions to the emerging high rates of unemployment (Nwakolo, 1997:7). The general perception about vocational programmes is that they are for less able or disruptive students, students who are not succeeding in 'academic' programmes. Essentially vocational education programmes are perceived as dumping grounds for drop-outs. For instance, the Guardian Newspapers (1996 Nov.), quoted the then Borno state Commissioner of Education as saying that the Technical Colleges at Bama, Damboa and Lassa would take care of the current drop-outs at the primary school level. What a vision for the 21st century.

6.2 INADEQUATE FUNDING

It has been realised that the disciplines of science are the most affected by miserable funding. Of the lot, engineering is worst hit. The tools, instruments and machines required for workshops are not always available and sometimes have to be imported at great costs. This applies to the spare parts required to maintain the equipment. Inadequate funding leads to inadequate facilities, laboratories and workshop equipment.

6.3 STAFFING

The demand for qualified and experienced professionals and the type that are required to teach technology education is very high and majority of them prefer to go to industries where the pastures are greener. Teaching is now the awaiting pool from where people get to other employment.

It is not possible for anyone to teach the skill he does not possess no matter how good he may be in a teaching methodology. Therefore, institution must have staff development programme. Another way out is

to improve salaries and condition of service of teaching staff so as to be comparable with what is obtainable in industries. This will bring out the best in the teacher and the nation will be best for it.

7.0 IMPLICATIONS FOR NATIONAL GROWTH AND DEVELOPMENT

Development is a change which is both forward looking self-fulfilling; it is the exploitation and utilization of both human and material resources to improve the lot of members of a giving community. Todaro (1979) defines development as "a multi-dimensional process involving the reorganisation and reorientation of entire economic and social system". Development involves radical changes in institutional, social and administrative structures, popular attitudes and sometimes customs and beliefs. Its realization may, infact, involve fundamental modifications of the international economic and social systems.

The economic, political and demographic world that is enveloping education as we enter the 21st century will differ significantly from the 20th century. To achieve greater heights in national development, therefore, we must encourage and develop our own technology.

Technology education must be properly backed up by the basic sciences such as Mathematics, Physics, Chemistry, Biology and other related sciences. At the NCE level, each of the five programmes (Agriculture, Business, Fine and Applied Arts, Home Economics and Technical Education) utilizes one or more of these basic sciences.

To this extent, there are inter-relationships among the sciences, technology and national development. For instance, Japan has been able to build herself up from the defeat and ruins of world war II and has even become the strongest economic power in one generation because she has been able to replace her devastated physical facilities and update her managerial and research development capacities.

What all these suggest is the known fact that technology education is a sine qua non for both national growth and development.

For vocational education to perform its role of retooling Nigeria for national development in the years ahead, its present unsatisfactory status must be enhanced in terms of its objectives, curricular, delivery and evaluation procedures. The following issues are major concerns that need to be addressed:

(a) A major part of the frustration of vocational education teachers is in the area of equipment. The need for the establishment, equiping and maintenance of workshops/studios, laboratories and other facilities in vocational institutions cannot be over-emphasized.

(b) An improved welfare package will not only inspire and motivate serving teachers, it will also attract others to the classrooms.

(c) Retraining of vocational teachers and reorientation of policy makers will have to be pursued vigorously because of emerging technologies.

(d) Closer ties should be developed and sustained between vocational education institutions and industry and business to

facilitate the implementation of programmes and also open opportunities of employment for their products. Employers should be seen to be playing definite roles in establishing and maintaining the value of educational credentials through employment policies and recruitment practices.

(e) There is need for a curricular shift to all levels of the education enterprise from theoretical platforms to more job related approaches. Students need to acquire skills to be utilized in establishing and managing their own small scale business with available local resources.

(f) Computer education should be a major/core subject in all vocational education programmes. All serving teachers today should undergo inservice training in the use of computers.

(g) Adequate funding from government and non-governmental organisations is absolutely needed.

(h) More government commitment to vocational and technical education is required. This commitment should include a specific legislation; budgetary allocation and establishment of Vocational Education Boards and Advisory Committees at both the state and local government levels respectively.

(i) All institutions offering both vocational and technical eduation should run consultancy services to exploit their human and material resources in generating revenue the institutions.

(j) The institution should also market its expertise to all neighbouring companies and government agencies as a means of attracting consultancy and other services in this drive for revenue.

(k) Industries should be encouraged to patronise the neighbouring higher institutions for their research and development projects.

(l) Equality of educational opportunities for all sex and of professional treatment and pay in working life must be constantly pursued by the leaders and decision makers in all fields of education.

(m) Vocational and technical programmes are expensive to establish, therefore, government should substantially improve the monitoring of its implementation strategies not only to ensure accountability of funds but also to achieving effectiveness in teaching and learning.

8.0 IMPLICATIONS OF TECHNICAL AND VOCATIONAL EDUCATION

The role and functions of technical and vocational educators must undergo radical transformation in order to cope with the demands of the anticipated growth and development in the 21st century. The current compulsions of advanced technology will lead to restructuring in industry and economy, reorganisation in workforce, and reformations in technical-vocational education. The technical and vocational educators of the 21st century can no longer be a mere information dispenser. They will be expected to play several roles at the same time. They will be expected to be knowledge specialists, vocational practitioners, course designers, curriculum developers, resources material producers, performance evaluators, students' guides and counsellors, community and social

workers, facilitators of learning, and above all, educational managers.

Concerted efforts should, therefore, be made to enhance the competence of technical teachers to enable them rise to the occasion. Greater stress should be laid on: recruiting technical teachers with proven academic briliance and long years of technical and vocational experience; training them in pedagogy, andragogy, instructional technology, educational management and retraining them periodically for continual development.

The 21st century is bound to create more complex situations in technical and vocational education. The work-force for advanced technology must therefore be knowledge-intensive and multi-skilled. In order to prepare such work-force, the curriculum of technical and vocational education should consist of broad-based education, basic training, education and training in specialised areas, and in industrial upskillings.

The 21st century, with its concomitant advanced technologies, will bring about revolutionary changes in all walks of life generally and in technical and vocational education in particular. Its effects on industry and economy will assume crises proportions. The value emphasis will shift from **materials** to **information** and **time.** Muscle power and machine power will be replaced by **brain power** and **mind skills.** Knowledge-intensive and multi-skilled workers will be increasingly required. Technical and vocational courses must, of necessity, be restructured for preparing work-force for advanced technology. Broad-based education, industrial upskilling, and resource-based learning will become imperative in technical and vocational education in order to meet the enhanced level of technology of the 21st century. Technical teachers will be required to perform a variety of roles. Their training programmes would be relevantly recognised and modernised.

As we approach the 21st century and the world prepares to take over the major industrial tasks, we must move on to the new enterprises. The implication of this for technical and vocational education can be seen in the effect of advanced technology in the changing mix of the work-force, the proportion of unskilled workers, operatives and craftsmen. As new technology jobs call for relatively higher level of cognitive and judgement skills, the share of technicians is increasing and that of those below is correspondingly decreasing. The need for highly qualified engineers, technologists and information specialists is also on the increase as they are required to contribute to a wide variety of possible applications of new technologies.

On the rising demand for technicians, work-force flexibility requirements will almost certainly demand a higher base level of technical and vocational education especially in the industrial sector where there will be the greatest need of technician.

As we enter the 21st century, technical and vocational education programmes must have a critical role to play in ensuring an on-going provision of adequately skilled technicians work-force through initial training, upskilling and retraining.

In other words, for an enhanced national growth and development in the 21st century, Nigerian technical manpower must be trained to be more independent, more resourceful and

no longer be mere appendages to plants and machines.

In the context of the 21st century, cognitive, analytical and abstract thinking skills are needed in the place of practical and manual skills, and more computer-related knowledge and skills are required rather than more engineering skills. In short, the work-force for advanced technology of the 21st century is required to posses deeper technical knowledge, broad versatile skills, wider applicability, penetrating judgement and faster rate of adaptability.

9.0 CONCLUSION

It is the position of this paper that all is not well with vocational technical education. Vocational education is a pre-condition for the technological ,and industrial development of the nation. The programme has been less than successful because of implementation problems such as dearth of vocational teachers and absence of functional workshops and workshop tools and machines.

In most countries of the world, vocational education has been given a pride of place because of the realisation of its importance in the growth and well being of any nation. We must look for ways to enhance vocational technical education in our country.

To this extent, the author recommends that incentives (financial and otherwise) should be given to vocational teachers in order to reduce their exodus from the classroom. It is also recommended that affordable hand tools like hoes, hammers, sewing machines, typewriters, etc., can be affordable by the schools or the students themselves, while the more sophisticated vocational machines be provided in Area Vocational Centres to serve groups of schools on rotational basis. Finally, we contend that a successful technological education programme will enhance the national economic and social well-being of any nation.

REFERENCES

Amaewihule (1998) "Philosophy of Vocational education and its operation in Nigeria: How realistic?" a paper presented at the 10th Annual Technological Writers' Association of Nigeria (TEWAN) conference held between 15th and 19th September, at F.C.E. (T) Asaba.

Federal Republic of Nigeria (1992) Higher Education in the Nineties and Beyond. View and comments of the Federal Government Report of the commission on the Review of Higher Education in Nigeria, Lagos.

ILO, AFSDEP (1988) Training of Technicians for the Mechatronics Age Japan.

NWOKOLO, P.O. (1997) Vocationalization of Schools in Nigeria: The way forward. A paper presented at the National Conference on Nigeria Education, held at the University of Nigeria Nsukka. April 15th - 19th.

Okon, E.J. (1995) Unwritten Preambles in Federal Ministry of Education, Lagos in May, towards the Preparation of a National Workshop of Technology Education.

Olaitan, S.O. (1996) Vocational and Technical Education in Nigeria (Issues and Analysis).

Osuala, E.C. (1989) Redefining the mission of Vocational Technical Education in contemporary Nigeria NVA, UNN.

Osuala, E.C. (1992) Computers in Vocational - Teacher Education: A perspective on key issues and problems, NVA, UNN.

Osuala, E.C. (1995) Science, Mathematics and Vocational - Technical Education in National Development: Challenges for the 21st Century Nigeria. IMT, Enugu.

The Guardian Newspaper (1996) (Nov. 7). Borno Merges Primary and Junior Secondary Schools p. 6 Vol. 2.

The unfinished Agenda (1984) The Role of Vocational Education in the high school. Washington D.C: U.S Department of Education.

Todaro, M.P. (1979). Economics for a Developing World: An Introduction to principles, problems and policies for Development. London, Longman.

DESIGN OF VIRTUAL TECHNICAL TEACHERS TRAINING INSTITUTE FOR TTTI, CHENNAI

S. RENUKADEVI

1.0 INTRODUCTION

Major changes are needed in training of technical teachers that are sensitive to different needs, working conditions, learning styles, language and background of the individual trainee. The emergence of powerful new Information and Communication Technologies (ICTs) helped us to visualize the concept of "Virtual Universities". Virtual University is the electronic framework, within which life long learning/ continuing education courses and professional continuing education are electronically offered through the Internet. Technical Teachers' Training Institute (TTTI), Chennai has been involved in research in developing flexible modes of delivery of instruction to technical teachers. Internet, as a powerful delivery tool aids in the development of Virtual Institutional setup which will be ideally suited for training technical teachers through distance mode. This paper depicts the design model of **Virtual Technical Teachers' Training Institute (VTTTI)** for TTTI, Chennai.

2.0 NEED FOR VTTTI

TTTI, Chennai is building up infrastructure in all its extension centres. It would be beneficial for both TTTI, Chennai and the trainees, if they are trained in their own work environment or close to their work environment. The communication between the teacher trainer and the trainee should remain even after the completion of the training. The heterogeneous group of trainees should be allowed to learn at their own pace. Hence it is proposed to develop a VTTTI which would deliver IT related courses to technical teachers in the southern region providing the benefits of individualised instruction, life long learning and learning in the workplace.

3.0 COMPONENTS OF THE VIRTUAL TTTI

The virtual TTTI, aimed at imparting Information Technology courses to technical teachers has the following components and all these components are web based.

- Tour of the Campus
- Course Prospectus
- Registration
- Courseware
- Training Process
- Help and Support.

3.1 Tour of the Campus

This tour will take the trainee through the Institution, providing him/her with the details of TTTI, Chennai namely the Vision

of the Institute, Mission, the resources available and the list of various training programmes offered at the physical campus and virtual campus. It will also provide a 3D view of the physical campus and virtual campus. A guest book will be provided for visitors.

3.2 Course Prospectus

The course prospectus will contain the list of courses offered by the Virtual University and the calendar of courses for the current year. This component has to be updated every year. The prerequisites for joining all the courses will be provided. The list of courses will be finalised after discussion with the respective Directors of Technical Education in the region.

3.3 Registration

This is the most important component of the virtual Institute from an administrative point of view. Every trainee will have to register himself/herself for a course using an on-line registration form providing Information such as Name, Institution, Job profile, Academic Qualification, his/her background, knowledge etc. This component, after checking for validity will provide the user with a user name and a password (of his/her choice).

3.4 Courseware

The success of learning based on ICT depends on the quality of learning materials offered. The learning resources include

- Course overview
- Course Schedule
- Course Material (Chapters)
- Frequently Asked Questions
- Library Catalogue
- Samples of Assignments/Projects
- Audio/Video of Expert Lectures

The learning resources will help the trainee to learn/train himself at his/her own pace but within the time frame set-up by the Institute. These learning resources will act as support material for the training process.

3.5 Training Process

3.5.1 Lectures

Lectures will be conducted through desktop videoconferencing. There will be a two way communication where, after the tutor finishes the trainees can ask questions. One way of conducting the lectures is to assemble all the trainees at the extension centre and conduct the videoconferencing. Another way is to have tutor to trainee communication through video conferencing if the trainee has adequate infrastructure at his/her own institution.

3.5.2 Tutor Support

The trainees will be provided with an email id of the tutor and course co-ordinator through which they can communicate with the tutor. Online tutor support will be offered at fixed times which will be notified in the Notice Board. The trainees can converse with the tutors at these fixed times.

3.5.3 Collaboration

The trainees will be provided with the email id of the various trainees. This would help them in discussing about the course contents. Combined project work can be taken

up by two or more trainees in each group so that they can converse with each of them using Basic Support for Co-operative Work (BSCW) software and they can design and develop projects in a team. The BSCW system supports collaboration by providing **shared workspaces** over the Internet. The system is designed primarily to support self-organising groups.

3.5.4 Assignments

Assignments will be provided at the end of each module. The trainees have to complete the assignments and send it to the tutor for marking. The trainees can get assistance either from the tutor or from fellow trainees through their email id. Assignment samples are provided as part of courseware so that trainees can refer to them.

3.5.5 Assessment

The test may be taken on-line at a predetermined time at the extension centre at a fixed time. If the training is offered at the workplace, it can be taken on demand. The assessment schedule will be provided at the time of registration. For the present course conducted at the campus, assessment is based on projects and practice sessions. The frequency of the tests will vary depending on the course. The data from the tests conducted would aid in the assessment of the effectiveness of this mode of training **Portfolio based assessment** is the ideal choice for technical teachers. A grade will be provided at the end of the course.

3.5.6 Feedback

The quality of any educational system can be enhanced by the feedback received from the learner. In this case, there will be multiple feedback

- Feedback from Trainee
- Feedback from Trainee's trainee
- Feedback from Institution Heads
- Feedback from Directorates

The feedback from the trainee will be on-line. All the others have to be received off-line.

3.6 Help and Support

The virtual TTTI would offer support to technical teachers in the following areas

- Tutor Contacts
- Student Contacts
- Library Services
- Assessment Information
- Information Support for Infrastructure (if required)
- Instructions on How to Use the Web
- Directions to Other Web Sites
- Bulletin Board

4.0 DEVELOPMENT

A skeletal structure of the virtual Institute has been developed. The necessary menu options, files and web pages have been created for use within a virtual teacher education institute. The web site has been developed taking into account all future considerations. The intricate details within each web site option is under development. The structure of the web site is as shown below.

About TTTI	Information	Course Documentation	Training Process	Support
TTTI at a glance	List of Courses	Course Structure	Lectures	Tools (Down Load)
Vision	Calendar	Schedule (Course, Assessment)	Tutor Support (Email, Chat)	Assessment Information
Mission	Tools Reqd	Course Material	Collaboration	General Instrns
Visit to the Campus	Registration (Form)	FAQ	Assignments	Notice Board
Guest Book		E. Journal	Project	E-mail list
		Lib.Ctlge	Assessment	Directions to Other sites
		Assignment Samples	Feedback	
		Project Samples		
		Audio Lectures		

5.0 CONCLUSION

Information and communication technology has given the scope for technical teacher training to be done in an effective, faster and flexible manner. This project aims at delivery of Information technology courses to technical teachers through the use of ICTs. A sample web site with all the features have been developed which would be adopted for the implementation of VTTI.

REFERENCES

Bates, A.W. (1995). Technology, Open Learning and Distance Education, London : Routledge

Freeman, R. (1997). Managing Open Systems, London : Kogan Page

Passy, D and Samways, B. (1997). Information Technology - Supporting Change through Teacher Education, London: Chapman & Hall

REFORMING INDIAN POLYTECHNIC EDUCATION

R. SRINIVASAN

In the three tier technical education system the polytechnic curriculum is based on a 50:50 weightage between theory and practicals. In the Industrial Training Institutes (ITI) which produce skilled craftsmen the weightage is about 20:80 between theory and practicals. On the other hand in higher technical institutions like colleges of engineering/technology offering B.E.,/B.Tech., courses the courses are offered as a 60:40 mix between theory and practice.

In 1947 when India attained independence we had 53 polytechnics; but in 1999 the number rose to 1,104 signifying about more than 19 times increase. Similarly their admission capacity has also grown from 3,670 students in 1947 to nearly 1,90,000 during the five decades. The number of diploma holders coming out of these institutions which stood at 1,447 in 1947 went up to more than 95,000 in 1996.

In the 1990s the Government of India introduced a World Bank Project to strengthen technician education by borrowing a soft loan repayable over the next 20 years. The project aimed at Capacity Expansion, Efficiency Improvement and Quality Improvement besides Staff Development which is the major focus. Further the polytechnics originally conceived as Diploma Institutions have started offering Post-Diploma and Advanced Diploma courses of 1 1/2 and 2 years duration respectively. Other significant achievements are:

- Multi Point Entry and Credit System has been introduced i.e., now polytechnics admit persons with +1, +2 and other higher qualifications for polytechnic courses
- Distance Education facilities to pursue Diploma in Engineering commenced in Andrapradesh in 1992 in five disciplines
- Three exclusive Post-Diploma Institutions have been set up by the Government of Andrapradesh
- Academic Autonomy has been conferred to see that they conduct examinations and declare results to a selected group of institutions in Andhrapradesh and Tamilnadu.
- To accelerate the facilities for women Residential Polytechnics have been started following the National Policy on Education (1986) and its Programme of Action,
- The I year English syllabus incorporates practice for language proficiency
- Entrance examination introduced in Andhrapradesh for admission

- Continuing education cells have been instituted in polytechnics. This mainly focusses on industry-institute interaction and to develop materials for industrial personnel
- Polytechnics organize part time/short term Certificate and Diploma courses in selected areas
- The Government of Andhrapradesh has opened three polytechnics for minorities
- Semesterization introduced; examination has objective items
- A polytechnic for Handicapped youth is functioning in Mysore
- The Government of Andhrapradesh has instituted Model Residential Polytechnics at identified places

In order to make their functioning more effective the following suggestions are offered.

- Entrepreneurship Development be given prominence. The State Directorates of Technical Education could institute an Entrepreneurial Training Institute (ETI) for identified alumni of Polytechnics and Engineering colleges. A 3 year DEIM [Diploma in Entrepreneurship and Industrial Management] is also desirable.
- An aptitude Test be introduced to allot disciplines soon after students admission in I year diploma courses
- The curriculum should have inbuilt provision to offer practical training in summer vacation to students in industries.
- The Government should encourage industries to organise Campus Interviews to select supervisory personnel
- A three year Diploma in Environmental Science (DES) could be launched to turn technicians with multi skills suited to a few engineering disciplines
- Giant industries with excellent facilities should be made to adopt atleast one polytechnic; also large scale industries be encouraged to start polytechnics. The Madras Refineries Limited (MRL) has instituted a polytechnic institution.
- To have continuity in higher technical education technical and general universities including women's universities should launch a Polytechnic Wing too on their campus The laboratory and other facilities could be optimally used for teaching both degree and diploma students. The Aligarh Muslim University, The Maharaja Sayajirao University, Baroda and SNDT Women's university Mumbai have polytechnics
- Automobile Industries could set up a Service Unit in polytechnics; emission Certification could be undertaken by polytechnics
- The Diploma in Commercial Practice (DCP) course should be offered in more number of polytechnics. Even here it has been renamed as Diploma in Commercial and Computer Practice (DCCP). In some cases it is also known as Modern Office Practices (MOP)
- Besides B.E./B.Tech, Master's Degree in commerce, English and Science Subjects persons holding Degrees in Education should be given preference in recruitment as faculty of polytechnics.

- The engineering colleges and Technical Teachers' Training Institutes (TTTI), could jointly run a 5 year integrated B.E.Ed., to attract youth who have a flair for teaching profession
- The All India Council for Technical Education (AICTE) should incorporate a Diploma/Degree in Teacher Education as a mandatory qualification for teachers of all technical institutions
- A Diploma in Technology Management (DTM), focusing on Computer and Educational Technology could be offered as an exclusive software based programme admitting Class X passouts or individuals with +1/+2 pass.

REFERENCES:

L.S. Chandrakant, Polytechnic Education in India, 1971 Bombay: D.B. Taraprevala Sons & Co., Pvt. Ltd.,

ISTE Hand Book 1998-99; New Delhi; Indian Society for Technical Education

University News, Feb.8, 1999, p. 19

CALL FOR CONTRIBUTIONS

Contributors are invited to send their papers of publication in the next issue No. 17/2000 before 31 July 2000.

This journal is priced as follows:

	India	Other Countries
Annual Subscription	Rs.50/-	10/- US $
For Five Years (5 issues)	Rs.200/-	40/- US $
Month of Publication	Every December	

Subscription by Demand Draft favoring the Principal T.T.T.I., Chennai, Payable at Chennai.

If you do not get the subscriber's copy by 31st of January, Please write to the Editor.

RESEARCH ABSTRACT

Tracer Study on Employment Status of Polytechnic Passouts in the Southern Region T.T.T.I., Chennai (October 1999)

1.0 INTRODUCTION

A study on the status of employment of passouts from the polytechnics was undertaken to assess the effect of World Bank Assisted Technician Education Project implemented in the 1990s. The study analyzed data collected from the states of Andhrapradesh, Karnataka, Kerala, Tamil Nadu and Union Territory of Pondicherry served by the institute.

2.0 OBJECTIVES

The study analysed the following objectives:

- To determine the number of students who were enrolled and who ultimately passed out in the year 1993-94/ 1994-95 and in the year 1998-99.
- To determine and make a comparative study of the employment of the percentage of students passed out in the year 1994-95 and in the year 1998.
- To determine and make a comparative study of the pattern of employment (in Government and Private Sector, large, medium and small scale industries), salary range offered to passouts with special reference to women students over the years 1994-95 and 1999.
- To determine the disciplines in which there are low opportunities of employment and the reasons thereof.
- To determine the number of diploma pass outs pursuing higher studies through full-time, part-time and distance mode and the areas in which higher studies are undertaken.
- To attempt to co-relate the various subcomponents like Curriculum Development, Laboratory Development, Interaction with industry on State-wise basis and determine whether any of these developments have had a significant effect on enhancing employment.

3.0 METHODOLOGY

To collect data from the polytechnics, industries and diploma holders passed out from polytechnics three different questionnaires were developed and used. A few industries were visited and a structured interview schedule was also used to elicit the views of industrial personnal.

4.0 SAMPLE

Questionnaires were mailed to 49 randomly selected polytechnics in the southern region. Out of this data were received from 20 polytechnics - viz. Andhra Pradesh(6), Karnataka(3), Kerela(1), Tamilnadu(8) and Union territory of Pondicherry(2). Out of this 4 were girls polytechnics.

4.1 SAMPLE CHARACTERISTICS

Out of eight polytechnics for women included in the study students responses were received from 4 institutions i.e. The sample coverage was 50% of girls' polytechnics surveyed.

A total of 1,317 Diploma holders responded to the questionnaire from all over the southern region. Of these 794 were men (60.29%) and 523(39.71%) were women.

When analyzed statewise the sample drawn covered 182 (13.83) students from Andrappradesh; 168(12.75%) from Karnataka; 88(6.68%) from Kerala; 710(53.91%) from Tamilnadu and 169(12.83%) from Pondicherry.

5.0 FINDINGS

The major findings of the study were:

- A large percentage of polytechnic passouts got jobs within 1 to 2 years after completing the diploma.
- There was a substantial increases in enrolment rate in the state of Karnataka and Union Territory of Pondicherry.
- The pass percentage in the year 1993-94/1994-95 and in the year 1997-98 was more or less same.
- The pass rate in Karnataka and Tamilnadu were found to the relatively high as compared to the other states in the year 1996-97 as well as 1997-98.
- There was a substantial improvement in the pass outs in respect of Andrapradesh and Pondicherry in the year 1997-98.
- The pass rate in disciplines such as Automobile, Metallurgy, Refrigeration and Air conditionsing and Textile Technology was on the increase.
- When looking at the employment maximum percentage of Diploma holders were employed in private sector in all the states except Karnataka in the southern region. In case of Union Territory of Pondicherry the percentage of polytechnic pass outs employed in the private sector was 95%.

The analyses revealed that as regards employment potential of polytechnic pass outs (a) Computer Engineering had limited opportunities and (b) Commercial Practice without adequate Computer applications had limited employment opportunities in the Corporate sector.

- The responses of industries which employ technicians yielded the following opinions.
- The ratio between Degree and Diploma holders employed was found to be 1:2. This indicates that a significant number of diploma holders are employed in industries.
- The technical knowledge of diploma holders has been considerably improved whereas the practical skills need improvement.
- Large number of diploma holders are recruited as supervisors.
- The salary paid to male technicians ranges from Rs.1500/- to 7000/- per month and for female technicians it is from Rs.1500/- to 5000/- per month.
- In the next 5 years (2000-2004) the technicians requirement is expected to increase by 50% of the existing strength.
- The minimum qualification for admission to polytechnics may be +2.
- Commitment to work needs to be developed.
- Human Resource Development and Business Environment are to be included in the Curriculum.

ABOUT OUR CONTRIBUTORS

AMECHI, N.F., is with the Department of Vocational Technical Education, University of Nigeria, NSUKKA, Nigeria

BHONDE, DINESH M., is Controller of Examinations, Government Polytechnic, Nagpur 440 001

BRECKIN, MICHAEL J., is Head, International Development Centre, University of Huddersfield, Holly Bank Road, Huddersfield HD3 3BP, UK.

EKONG, ANTIABONG OKON, is in the Unit of Agricultural Education, University of UYO, P.M.B.1017, UYO, AKWA Ibom State, Nigeria.

JAYA KOTHAI PILLAI, was formerly Vice Chancellor, Mother Teresa Women's University, Kodaikanal - 624 102 India.

NARAYANA RAO, M. is Principal, Technical Teacher's Training Institute (SR), Chennai 600 133, India.

RENUKADEVI, S. holds MCA and M.Phil. degrees. She is Lecturer in Computer Centre, Technical Teachers' Training Institute (SR), Chennai 600 113, India.

SHARMA, R.R.K., is in Indian Institute of Technology (IIT), Kanpur 208 016, India.

SRINIVASAN R. is Assistant Professor, Centre for Rural Development , Technical Teachers' Training Institute (SR), Chennai 600 113, India.

VIVEKANANDAN, V.R., is Director, Quality Management and Assurance, Periyar Maniammai College of Engineering for Women, Vallam 613 403, India

JOURNAL OF TECHNICAL AND VOCATION EDUCATION

ISSN 0971—8508

STATEMENT OF OWNERSHIP AND OTHER PARTICULARS
FORM IV RULE 8

1.	Place of Publication	Technical Teachers' Training Institute Taramani, Chennai 600 113, India.
2.	Periodicity of Publication	Annual
3.	Printer's Name, Nationality and Address	Mr. V Prasad, B.E., (Hons) Indian AKSHARA, Commerce Centre,, 303/7 Mount Road, Chennai 600 018.
4.	Publisher's Name, Nationality and Address	Dr. M. Narayana Rao Indian Principal T.T.T.I. Chennai 600 113.
5.	Editor's Name, Nationality and Address	Dr. M. Narayana Rao Indian Principal T.T.T.I., Chennai 600 113.
6.	Name and Address of Individuals who own the newspaper and partners or shareholders holding more than one percent of the total capital	Technical Teachers' Training Institute, Chennai 600 113.

I, Dr. M. Narayana Rao, hereby declare that the particulars given above are true to the best of my knowledge and belief.

1 Dec. 1999

Dr. M. Narayana Rao
Signature of Publisher

NOTES FOR CONTRIBUTORS

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 system, other than their own. In the case of research reports, the emphasis should be on applicable research of national and international interest.

Submission of manuscripts

Manuscripts for publication should be sent to Dr. M. Narayana Rao, Managing Editor, by name. Only original articles will be accepted and the manuscript should be in English. They should be typed on A-4 sized paper, double-spaced, on one side only with wide margins and submitted in triplicate. Normally, the manuscripts should not exceed 3,000 words (20 typed pages). Photographs, drawings, cartoons and other illustrations are welcome. All illustrations and tables for publication should be submitted in separate tracings suitable for printing. Intending contributors should attach a certificate that the paper has not been sent for publication to any other journal.

References

The articles/papers should be appropriately authenticated by giving the relevant bibliographical references in the standard format.

Summary

Each manuscript should be preceded by a summary of 200 words in length, which should be an abstract of the whole paper/article, not of the conclusion alone.

About the author(s)

Authors are requested to send their bio-data along with the manuscript of the paper/article.

Off-prints

The author(s) of published article/paper will be sent the copy of the Journal in which it is published without charges.

Dr. Arule

Publisher and Managing Editor: Dr. M. Narayana Rao, Principal, Technical Teachers' Training Institute, Chennai - 600 113. **Owner:** Principal, Technical Teachers' Training Institute, Chennai - 600 113. **Printed by:** Akshara DTP Work Station, 303/7, Mount Road, Chennai - 600 018. Ph: 4364303