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CONSULTATION MEETING ON THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO TECHNICAL AND VOCATIONAL EDUCATION

at

Colombo Plan Staff College for Technician Education
SINGAPORE

10 - 14 March 1986

FINAL REPORT

CONSULTATION MEETING ON THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO TECHNICAL AND VOCATIONAL EDUCATION

Organized by the
COLOMBO PLAN STAFF COLLEGE FOR TECHNICIAN EDUCATION

In cooperation with
UNESCO-UNEP INTERNATIONAL ENVIRONMENTAL EDUCATION PROGRAMME (IEEP)

March 1986
SINGAPORE

FINAL REPORT

TABLE OF CONTENTS

I. INTRODUCTION

1.1 Background and Preparation

Within the framework of Unesco's approved programme and budget for 1984-1985 and as an activity of Unesco-UNEP International Environmental Education (IEEP) of The Division of Science, Technical and Environmental Education, the Colombo Plan Staff College for Technician Education, Singapore organised under Unesco contract and in cooperation with IEEP a Consultation Meeting on the Incorporation of Environmental Education into the Curriculum and Teacher Training for Industrial and Agricultural Schools.

Unesco prepared the objectives, agenda, information note, draft invitation letter and outline of working document for the Consultation Meeting. Further, Unesco identified the Member States to be invited to send one participant each to the meeting. Similarly, Unesco prepared three case studies on the environmental education dimension of industrial and agricultural schools in Singapore, Czechoslovakia and the State of Michigan in the U.S.A. and a study on environmental education in technical and vocational education as well as provided a set of reference EE documents for each participant, and the needed funds for the preparation and organisation of the meeting. Dr. Abdul Ghafoor, Programme Specialist in Environmental Education, Unesco, Paris represented Unesco, assisted in administration of, provided technical support and made a presentation on Unesco-UNEP International Environmental Education Programme to the above mentioned meeting.

The Colombo Plan Staff College for Technician Education (CPSC), Singapore prepared the working document and one case study referred to above, issued invitation letters to identified Unesco National Commissions and institutions, issued air tickets to identified participants, received participants on arrival, housed the meeting in its premises, provided professional staff members to present the different parts of the working document, provided needed local material and secretarial support, and prepared the draft final report on the basis of an outline formulated by Unesco.

1.2 Objectives

1. To study the need and place of environmental education in technical and vocational education.

2. To develop guidelines and strategies for the incorporation of environmental education into technical and vocational education mainly into school curricula and teacher training for industrial and agriculture schools.

3. To recommend activities and documents to be developed by Unesco-UNEP International Environmental Education Programme for fostering the incorporation of EE into TVE at national, subregional, regional and international levels.

4. To exchange information and experience in the development of environmental education in technical and vocational education.

1.3 Participants

Seven participants and one observer from Australia, Egypt, Indonesia, Union of Soviet Socialist Republics, Sri Lanka, Malaysia and Switzerland as well as the Director and 2 Faculty members of CPSC and the Unesco Programme Specialist in Environmental Education attended the meeting. (For list of participants and observer see Appendix 5).

1.4 Date and Venue

The meeting was organised from 10th to 14th March 1986 in the premises of Colombo Plan Staff College for Technician Education, Singapore.

1.5 Bureau of The Meeting

Chairman	:	Prof. Ali Labib Ibrahim (Egypt)
Vice-Chairman	:	Prof. Nina Mikhailovna Chernova (USSR)
Rapporteur	:	Dr. Peter Hardy (Australia)
Members	:	Dr. Robert McCaig (CPSC)
		Dr. Abdul Ghafoor (Unesco)

1.6 Unesco Secretariat

Dr. Abdul Ghafoor, Programme Specialist in Environmental Education, Unesco, Paris.

1.7 Colombo Plan Staff College for Technician Education

Dr. Robert McCaig, Director
Prof C Ramakrishna Sastri, Faculty Consultant
Dr. Teravuti Boonyasopon, Faculty Consultant

1.8 Presentation of Documents

The following documents were presented at the meeting:

(i) The Unesco-UNEP International Environmental Education Programme (IEEP) was presented by Dr. Abdul Ghafoor (Unesco).

(ii) Six country reports were presented by Dr. Peter Hardy (Australia), Prof. Labib Ibrahim (Egypt), Mrs. Tri Iswoyo (Indonesia), Prof N. M. Chernova (USSR), Mr. V. K. Nanayakkara (Sri Lanka), and Mr. Tsen Keng Phin (Malaysia).

(iii) A document entitled Environmental Education in Technical and Vocational Education was presented by Mr. Sven Grabe (Switzerland).

(iv) The working document entitled Guidelines for the Incorporation of Environmental Education into Curriculum and Teacher Training for Industrial and Agricultural Schools was presented by Dr. Robert MacCaig (Director, CPSC), Prof. C.R.K. Sastri (Faculty, CPSC) and Dr. Teravuti Boonyasopon (Faculty, CPSC).

(v) Three case studies on the incorporation of environmental education into technical and vocational education in Czechoslovakia, the State of Michigan, USA and Singapore were presented by Mr. M. F. Mikhno (USSR), Mr. Tsen Keng Phin (Malaysia) and Mr. V. K. Nanayakkara (Sri Lanka) respectively.

2. PROCEEDINGS OF THE MEETING

2.1 Opening Session

The Director of the Colombo Plan Staff College for Technician Education opened the meeting. In doing so, he extended a very warm welcome to the delegates and expressed gratitude to Unesco (IEEP) for the opportunity of working with it on the importing, absorbing and challenging issue of environmental education. He expressed the hope that the meeting would bring forth a report which would advance the acceptance of Environmental Education and further the development of appropriate curricula and teacher development programmes. Dr McCaig spoke about the uniqueness of the Colombo Plan Staff College and of the role it could play in promoting environmental education. As a Staff College, it had provided over the past eleven years service to the technician education systems of eighteen countries in the region in the form of workshops addressing all aspects of technician education, from senior management to the development of teaching modules. It also provided extensive consulting service and library reference facilities. The faculty, in their work in the regional countries, were acutely aware of environmental problems and of the need to address these through appropriate educational programmes. Technicians constituted that section of the workforce most immediately in contact with environmental matters. The Director therefore expressed a desire to work with other agencies such as Unesco (IEEP) which share its concern with environment education. There was need to create further awareness and also to develop specific programmes leading to better management and teaching practices. The initiative of Unesco in holding the Consultation Meeting at the College was seen as very propitious.

He called upon Dr Abdul Ghafoor, Programme Specialist in Environmental Education, Unesco, to speak.

Dr Ghafoor extended a welcome to the delegates on behalf of Unesco. He referred to the work of Unesco-UNEP International Environmental Education Programme (IEEP) and to the role this Consultation Meeting has in the overall programme being followed by IEEP. The programme of activities prepared for the Consultation Meeting was outlined and administrative arrangements explained. He expressed appreciation to the delegates for their willingness to participate in the meeting and for the contribution of their knowledge and experience (in full text, see Appendix 5).

2.2 Plenary and Group Sessions

The members decided during the early stages of proceedings that it was appropriate to adopt a round-table format. This proved most satisfactory in creating an informal but creative working environment. The meeting proceeded by means of plenary presentations, consideration of guidelines prepared by the Colombo Plan Staff College, examination of case studies and preparation of this draft report.

2.3 Closing Session

At its final session, the meeting formally approved this report and committed it for dispatch to Unesco (IEEP).

Several members stood to express their thanks to Unesco (IEEP) for its vigorous pursuit of this issue of environmental education. They also appreciated the opportunity of participating in the meeting and were particularly thankful to Dr Ghafoor for his ready availability as adviser and facilitator. They also expressed appreciation of the work done by the director of the Colombo Plan Staff College, the College faculty and the support staff for providing an environment which was enjoyable, yet conducive to working.

Dr Ghafoor on behalf of Unesco extended his thanks to the governments of the countries from which the delegates had come, for making their services available to the meeting. He expressed his appreciation of the work done by the Chairman, Prof Ali Labib Ibrahim and the Vice-Chairman, Mdm Nina M Chernova, and particularly the rapporteur, Dr Peter Hardy, on whose shoulders had rested much responsibility for the presentation of the final report. Thanks was given to the director and faculty of the College and Dr Ghafoor made particular reference to the unstinted availability of the College support staff, thus ensuring that every aspect of the Committee's work was carried out smoothly.

The Director in closing the meeting thanked all for their very active participation. He indicated that the College would be taking up the issue of environmental education in its 1986-87 academic programmes and he looked forward to further cooperative opportunities.

3. PRESENTATION ON UNESCO - UNEP International Environmental Education Programme (IEEP)

Dr. Abdul Ghafoor, Programme Specialist in Environmental Education Unesco, Paris, made the following presentation at the meeting.

3.1 Background

Three dates are important to be mentioned in the development of environmental education in the last 15 years.

1. 1972 is the year during which the United Nations Conference on Human Environment was organized in Stockholm, Sweden. Recommendation 96 of this Conference stated that the "the Secretary-General, the organizations of the United Nations system, especially the United Nations Educational, Scientific and Cultural Organization, and the other international agencies concerned, should, after consultation and agreement, take the necessary steps to establish an international programme in environmental education, inter-disciplinary in approach, in school and out-of-school, encompassing all levels of education and directed towards the general public, in particular the ordinary citizen living in rural and urban areas, youth and adults alike, with a view to educating him as to the simple steps he might take, within his means, to manage and control his environment". Thus, the need and international mandate for the development of environmental education.

2. 1975 is the year during which Unesco and UNEP (United Nations Environmental Programme) launched the Unesco-UNEP International Environmental Education Programme (IEEP). Its current goals are to promote implementation of the Recommendations of the Tbilisi Intergovernmental Conference on Environmental Education (1977) through encouraging and assisting governments, national, regional and international institutions to incorporate environmental education into formal and non-formal educational systems and programmes in order to make people aware of the nature of the relationship between man and the environment on which he depends; impart knowledge and skills to understand and solve environment and development-related problems; and enable people to acquire attitudes and motivation leading to sound decisions and actions for the protection and improvement of the environment and its quality.

3. 1977 is the year during which Unesco, in co-operation with UNEP, organized the Intergovernmental Conference on Environmental Education in Tbilisi, USSR. This conference was an activity of IEEP. The most outstanding contribution of the Tbilisi Conference was the formulation and endorsement of environmental education goals, objectives and guiding principles which have since served as a common denominator in the development of most environmental education activities at international, regional, subregional and national levels. The conference also produced strategies for the development of environmental education.

3.2 Activities

IEEP's activities may be summarized under Exchange of Information and Experience, Research and Experimentation, Training of Key Personnel, Preparation of Materials and International Cooperation.

1. Exchange of Information

The main activities of IEEP in this area can be summarized as: publication of Connect in 5 languages and distribution to 13,000 professionals and institutions; compilation and issuance of a Glossary of EE Terms; updated bibliography on environmental education as well as directories on institutions, projects and activities in EE. Numerous meetings, including this Consultation Meeting on the Incorporation of Environmental Education (EE) into technical and vocational education (TVE) have fostered this aspect of IEEP's activities.

2. Research and Experimentation

IEEP's research and experimentation activities have involved an international survey of EE needs and priorities; surveys on curriculum development and teacher training in EE, survey and studies on the incorporation of EE into university general education; studies on the development of guidelines for the incorporation of EE into non-formal education and into technical and vocational education. Similarly, IEEP has supported 31 pilot, experimental and research projects in formal and non-formal environmental education. Furthermore, IEEP has supported the local adaptation of selected EE documents at national level.

3. Materials Preparation

IEEP has prepared and distributed around 77 documents. This number is increasing. Examples are sourcebooks, modules, guidelines for the developing curriculum, teacher training in EE as well as non-formal EE. About 20 examples of these documents were shown at the meeting.

4. Training of Key Personnel

IEEP's training activities in EE at international, regional, sub-regional and national levels have focused on key personnel such as curriculum developers, teacher educators, educational planners, educational administrators and supervisors, as well as on personnel in rural development and adult education projects for the purpose of their orientation for a better understanding of the philosophy, goals and objectives of EE, as well as becoming familiar with strategies needed for EE development for primary and secondary schools, for pre-service and in-service teacher training and for its incorporation into non-formal education.

It is in this context that one international training course, 5 regional and 5 sub-regional training seminars, as well as 37 national training workshops in the Arab States, Asia, Africa, Latin America and the Caribbean and Europe have been organized by IEEP.

5. International Co-operation

Most of the activities implemented by IEEP have an international co-operation dimension. Specifically, international co-operation has been enhanced through fielding advisory missions concerning EE training activities, curriculum development and pilot projects. Similarly, nine EE regional and international meetings and conferences organized by governmental and non-governmental organizations have been supported by IEEP.

4. PRESENTATION OF COUNTRY REPORTS

Six country reports were offered to the meeting reviewing the dimensions of environmental education in technical and vocational education, under the following headings.

1. Introduction

2. Background information on the physical, social, economic and cultural aspects of the country.

3. Major environmental problems of the country, their main causes and measures taken for their solution and prevention.

4. Current technical and vocational education programme and its environmental education dimension.

5. Future plans for the development of technical and vocational education with environmental education dimensions.

6. Suggested priorities for the incorporation of environmental education into technical and vocational education.

7. Suggested strategies or ways and means for the incorporation of environmental education into technical and vocational education.

8. Conclusion

Summaries prepared by each participant of their country report are included in Appendix 5. A brief review of these follows:

It is evident from the reports that in several countries awareness of the need for a structured approach had led to very positive developments in the technical and vocational education sectors. Thus, in Australia the Technical and Further Education System in the State of New South Wales commissioned a major research project in 1984 "Environmental Education in TAFE", copies of which were presented at the meeting. In that state alone, some 185 courses were offered which impinged on environmental education. Other technical and further education state systems, colleges of advanced education and universities were including programmes deliberately incorporating environmental education.

In the USSR, a major reform was under way in the teaching of environmental and vocational education. Of particular interest to the meeting was a range of non-formal methods utilised in that country to encompass the whole of the community in environmental matters.

Egypt had gone through three stages in the process of developing environmental education and acknowledgement was freely given to the impetus provided by earlier Unesco-UNEP initiatives. A special department within the Ministry of Education with responsibility for environment and population education had been established and the commissioning of the Academy of Science to undertake research in the area was indicative of lively developments in environmental education.

In Indonesia too, authorities had taken the initiative in 1984 by passing legislation which stressed the necessary link between the preservation of the environment and social advancement which provided for the educational institutions to take an active role. Curricula were being developed for the school systems and this would provide a sound base for extension into other sectors.

Sri Lanka already has an extensive college system offering environmental education related subjects. With the establishment of the National Conservation Strategies, it seemed inevitable that a more specific identification of environmental education responsibilities would emerge.

All the countries concerned appreciated that the problems of their own environments need more attention. Some of the problems were common to a number of countries, e.g. deforestation, pollution, urbinsation and its social implications, control of water and soil quality. Others were more important in particular countries, e.g. population size. Government commitments to improvement of the natural and cultural environment, expressed through constitutions, policy statements and legislation had initiated the process of better environmental management. Environmental Education of the community was actively encouraged as a way of developing greater awareness of the environment and its problems and supplementing legislation. Educational programmes in schools and colleges, sometimes innovative in that they are breaking down the tradition of subject boundaries and approaching the environment holistically, were being progressively introduced as resources permitted.

Technical and Vocational programmes were essentially developing a person's skills and knowledge for working in a particular occupation. Although this was the primary aim, programmes were being developed and improved to extend the proportion of environmental input as there was a perceived need to develop an environmentally educated labour force. At the operator to para-professional level, workers have the potential to protect and improve both the internal (working) environment and the external (community) environment. Environmental Education can enhance this potential through specific courses for an occupation complementing general awareness subjects and specific environmental subjects in other courses. Resources to support these activities were important and being made available.

The education of the teacher himself was a factor in successful implementation of environmental education; so efforts to develop teacher awareness of the environment must complement curriculum development.

5. WORKING CONCEPTS

As the membership of the meeting was drawn from several countries representing different perspectives on environmental education, time was devoted to arriving at a common understanding of factors concerning environmental education which would recur during the course of the meeting.

5.1 The Environment

The environment was regarded as including all aspects of people and their surroundings whether affecting them as individuals or as groups. Thus it comprised all the natural and socio-cultural factors around man which directly or indirectly affected his living, including working conditions. Environmental factors were interwoven with each other and in their effects on people and other living beings. The natural environment includes the living and non-living, the geographical landmarks, topography and climatic conditions, the man-made features such as roads, bridges, buildings, transport and other features like sanitation, health and nutrition. Diagramatically it might be seen as follows:

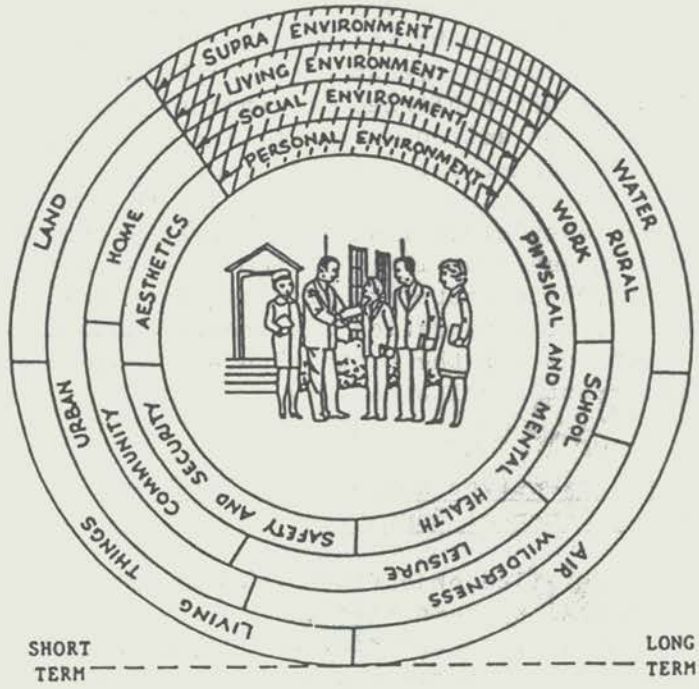

Figure 1: Man and His Environment

5.2 Environmental Education

The following definition included in the final report of the Tbilisi International Conference (1977) was accepted as incorporating all the elements required for the purpose of the meeting.

> "Environmental education is an integral part of the education process. It should be centred on practical problems and be of an interdisciplinary character. It should aim at building up a sense of values, contribute to public well-being and concern itself with the survival of the human species. Its force should reside mainly in the initiative of the learners and their involvement in action and it should be guided by both immediate and future subjects of concern."

5.3 The Need for Environmental Education

Though justification for environmental education was not regarded as necessary, members were concerned that this was not always self-evident to people and governments. More and more, the very factors which promoted a better standard of living at the same time led to serious threats to the new status thus gained. This was particularly obvious in industries with their chemical wastes and in agriculture with problems created by insecticides and salination of soil. While the adverse impacts on people were obvious, short-term gains too often blinded governments and industrial leaders to the need for action. Frequently, calamities leading to great social disasters were the only occasions which led to a demand for action. Unfortunately, too much environmental damage takes place insidiously over years or decades, all too often unheeded until it is too late or until a stage is reached where costs are prohibitive. Thus, the need for environmental education awareness, understanding, commitments and actions for the protection and improvements of the environment and its quality.

5.4 Goals, Objectives and Guiding Principles of Environmental Education

Detailed objectives for each specific sector of educational systems need to be developed by each country within the framework of general goals. In determining such objectives, members considered that the following aspects emphasised by the Tbilisi Conference needed to be kept in mind.

(i) In addition to the biological and physical features, environmental education should also consider the ethical, cultural, social and economic features of the human environment.

(ii) Environmental education should be a re-orientation and dove-tailing of different disciplines and educational experiences.

(iii) Environmental education should show clearly the economic, political and ecological interdependence of the modern world.

(iv) Environmental education should bring about a closer link between educational processes and real life.

(v) Environmental education should meet the needs of all ages and socio-professional groups in the population and should be a continuing process.

Additional principles included in the Tbilisi Report were the need to:

(i) consider the environment in its totality - natural and built, technological and social.

(ii) examine environmental issues from local, national, regional and international points of view.

(iii) focus on current and potential environmental situations.

(iv) promote the value of local, national and international cooperation in the solution of environmental problems.

(v) explicity consider environmental aspects in plans for development and growth.

(vi) enable learners to have a role in planning their learning experiences.

(vii) relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age.

(viii) help learners discover the symptoms and real causes of environmental problems.

(ix) emphasise the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills.

(x) utilise diverse learning environments and a broad array of educational approaches to teaching/learning.

In subsequent chapters these issues are examined more closely from the point of view of incorporation in school and college curricula.

5.5 Definitions of Technical and Vocaitonal Education

For the purposes of the meeting, technician education was defined as including:

> Educational programmes which prepare students for a variety of occupational specializations in industry and agriculture. They function in industry as engineers, technologists, technicians, supervisors, foremen etc. and in agriculture as development officers, researchers, field workers etc. The activities they perform cover a wide range i.e. planning, design, research, operation, inspection, supervision, production, processing,

In distinction to this, vocational education was seen as encompassing:

> Programmes encompassing education and training for more specific and high level skill proficiency in industry and agriculture leading to jobs on the shop floor/farm. The vocational track in a comprehensive high school and extension courses for upgrading of workers are also included in this category.

An overriding consideration in both technical and vocational education was that they should not be confined entirely to mastery of skills and technical knowledge. The nature of society today requires individuals to possess, in addition, a comprehensive understanding of their social, civic, and ethical responsibilities. Workers must be able to do the job for which they are trained, but they must also appreciate their obligations to the community and fellow workers.

6. ROLE OF TECHNICAL AND VOCATIONAL EDUCATION IN ENVIRONMENTAL CHANGE

6.1 Responsibilities of Technical and Vocational Education.

Education can be an instrument of social change and well-being, reflecting the totality of the emerging needs of the community (in its immediate environment at least) in a proactive manner. With the growth of technical and vocational education affecting the lives and careers of any country's population, it is inevitable that its responsibilities to society are bound to grow. This sector must impart the technical knowledge and skills needed for gainful employment and take into account the concerns and interests of the societies in which it exists. Environmental protection being a major concern not only at the local level, but at national, regional and international levels too, technical and vocational institutions must address themselves to this important issue.

Sensitivity to current priorities and problems has already been demonstrated by institutions in Technical and Vocational Education in some countries. In India, for instance, polytechnics have recognised their role in rural development and thirty-five of the 500 polytechnics have been designated as "Community Polytechnics". They are already providing active technological support to rural communities in their immediate surroundings through innovative projects, activities and specially designed courses and programmes. Providing support and technical assistance for activities associated with environmental protection is but a natural extension to this overall philosophy.

6.2 Involvement in Environmental Education.

One of the main causes of environmental degradation is rapid industrialisation and development of agriculture with insufficient protection of the environment and renewable energy resources, land and water. Technical and vocational education supplies the skilled manpower needed by this sector and it should therefore play a very active role in imparting Environmental Education. Technical and Vocational Education institutions have workshops, classrooms, libraries, audio-visual hardware and software etc. which can be utilised for offering instruction in environmental areas.

They have human resources in the form of technically qualified staff who, with some re-orientation, could offer Environmental Education. As members of society they will be aware of environmental problems and issues and so should be motivated to take up this task. The large student community is also a vast resource that can be fruitfully utilised to develop contact with the general public and spread the message of environmental awareness and of the need to cultivate basic community skills needed for protecting the environment.

The connections between these institutions, industries and other organisations in their communities is an asset which can be used to emphasise industry's responsibility to identify environmental problems contributing to the goals and objectives of Environmental Education.

6.3 Role of Technical and Vocational Education in Environmental Change.

Technical and vocational education has thus a pivotal role to play in bringing about environmental change as envisaged by the Tbilisi Conference. Few, if any, sectors of education are more suited or competent to take up the technological aspects of environment. Additionally, these institutions can effectively integrate environmental concepts into the subjects which they are already teaching.

Their role in environmental change could be of two types:

6.3.1 A Reactive Role:

Most Technical and Vocational Education authorities and institutions respond positively to public and governmental requirements and adjust their activities, policies and programmes to suit changing requirements. They can play this role to incorporate Environmental Education into their educational curricula. Institutional officers concerned with system management react to policies and directives handed to them by government departments which have decided to implement the recommendations of the Tbilisi Conference. They may perceive their role in a limited educational context and could be satisfied with offering instructional programmes in technological areas with emphasis on environmental aspects. They may, however, not consider direct involvement of students in community activities.

6.3.2 A Pro-active Role:

In contrast to the above, the Technical and Vocational Education authority may consider its role as a more complex and involved one regarding it as a duty to utilise its expertise to foresee environmental problems through direct community involvement and developing courses and programmes offering solutions to these problems. The management in this case may seek involvement in national and regional level projects, debates and discussions concerning technological and other aspects of environmental issues and take part in policy-formulation. At the same time they would be taking a lead in implementing such policies and proposals at the system and institutional levels.

Figure 2: Pro-active and Reactive Roles of Technical and Vocational Education in Environmental Education

Level	Pro-active Role	Reactive Role
A. National Level	Technical and Vocational system foresees environmental problems and: 1) makes recommendations to the government for a warranted change in policy to protect the environment. 2) Evaluates consequences of new developmental plans and projects as they effect the environment and recommends alternatives to government. 3) Exhibits strong positive desire to participate in national policy making for environmental protection.	Technical and Vocational Education system: 1) follows the policy outlined by the government and adjusts its programmes and courses to suit such directives. 2) May not wish to involve itself in activities outside the purview of educational programmes.
B. System Level	The system assumes a significant role in the implementation of Environmental Education components and: 1) recommends new sets of objectives, targets and action plans for implementation. 2) Surveys the needs of society and the community and pinpoints critical areas and programmes to be focussed upon. 3) Evolves new programmes and courses.	The Technical and Vocational Education system assumes a limited role in bringing about environmental change. 1) It rests contended with conduct of instruction in a few Environmental Education related areas as identified by authorities. 2) Its interest in reacting to societal and community needs beyond educational activities is solely in response to external pressures.
C. Institutional Level	1) Institutions are involved wholeheartedly in community activities and in grappling with environmental problems. 2) Institutions develop good rapport with Environmental Education related industries and organisations. 3) Institutions conduct studies and research into environmental problems faced by the community. 4) Institutions evaluate their own programmes and make innovations wherever necessary. 5) Institutions might conduct contests and competitions in essay writing, short stories, slogans, drama etc. in environment related areas to create local awareness.	1) Institutions adhere to set patterns of courses and courses and programmes in Environmental Education areas. 2) Institutional activities are limited to teaching, related practical and project work. 3) Environmental Education areas are seen as additional to normal requirements. 4) Institutions do not perceive the need to educate anyone outside the institutional community. 5) The institution limits itself to institutional boundaries.

These activities are possible at three distinct levels - natural, system and institutional, as is indicated in schematic form in Figure 2.

In reality, however, these two extreme cases may represent the two ends of an operational role spectrum of the Technical and Vocational system and institutions.

Global Role of Technical and Vocational Education in Environmental Change.

In identifying their role in environmental change, educators should become aware that there are many areas in which they may participate to achieve the ultimate objectives and goals of Environmental Education. So technical and vocational institutions endowed with human and material resources of a particularly applicable nature can take an active role in sensitising society to ecological needs through direct involvement. The nature of the role of Technical and Vocational Education in this global sense would emanate from the structure of the environment as represented in Figure 1 in Chapter 5.

Developing this assumption, it is clear that Technical and Vocational Education could play a part in each of the types of environment identified in Figure 1.

At the supra-environmental level the issues might seem to be more in the arena of mega-politics, remote from the technician educators, and particularly from technicians. Yet, for example, the possible greenhouse effect on the planet from the accumulation of carbon wastes or dust in the stratosphere, or the impact on climate by man's ill-use of his forests or mismanagement of lands, are often the accumulation of environmental abuse in a host of small local environments. No one sector of industry or one type of industry can be identified as carrying full responsibility. The problem is an accretion of abuses by many industries where our technicians and our technician educators can have an impact requiring international agreements for effective environmental impact policies. An informed technician force working partly within industry, but equally importantly, being informed citizens able to voice opinions on such issues, can have an impact on policies at this supra-environmental level since the men and women making these policies are influenced by public opinion or public pressure.

The issues of relevance and accountability become clearer as one moves into the living and social environments identified in the model, firstly because the impact at the workplace on the worker and on his community are more immediately visible and can be seen to be more specifically within his control. Industrial smog, water pollution, ingestion into the lungs of harmful substances, soil erosion and the dehumanising of life in urban development are visible to all who wish to see or care. Secondly because solutions

to them seem possible and often within the grasp of individuals, small organisations and communities, it needs but sensitivity, a will to take action and professional and technical competence of the kind which technical institutions possess.

An attitude that has to be rejected if environmental education is to succeed is that of dependency - the problems of environment are somebody else's; if "they" would take action all would be well. Environmental education is as much a question of values as it is of techniques. Thus, at the innermost level of the model presented - at the level of the personal - lies the key to successful environmental education. Environmental protection is largely achieved if each individual has been inculcated with a sense of values, a concern for correct resource husbanding and management, a concern about his own health and welfare, and an appreciation of what constitutes a good local and community environment. These values form the foundation of good Environmental Education; the educational adage of proceeding from the known to the unknown is most pertinent here. Problems of man-induced sickness, of pollution of air, water and soil, of waste of resources in the larger society are but magnified versions of what happens in our homes, schools and colleges. It is essential that Environmental Education has a broader perspective than that of industrial management, important thought that is. It must be life-long education creating an awareness of the problems to be found in all form of the areas identified in Figure 1 and developing a workforce able to operate at these levels.

The actual Environmental Education role assigned to and taken up by institutions in Technical and Vocational Education can, however, vary widely from country to country and institution to institution. At one end of the spectrum, institutions may be imparting instruction in isolated environmental subjects in the form of traditional courses, and at the other, institutions may have a philosophy of Environmental Education infused into all programmes, projects and activities and be involved wholeheartedly in interaction with the community.

This wide variation can be the result of a number of factors, some of which are:

i) National policy on Environmental Education in the country.

ii) Objectives and roles assigned to the education sector in general, and to Technical and Vocational Education in particular, in relation to Environmental Education.

iii) Extent of existing linkages between education and the environment ministries.

iv) The exact location of an institution and the nature of its surrounding community.

v) The extent of linkages possessed by the institution with industries, other organisations and the community.

vi) The leadership of the institution.

vii) The corporate reputation of the institution.

viii) The staff and students and the extent of their commitment to Environmental Education.

ix) The nature of the curriculum and its responsiveness to Environmental Education needs.

As these and other factors may significantly affect the actual role played by Technical and Vocational Education institutions in Environmental Education, it is necessary that the authorities in the respective countries take steps to ensure that each of the above factors be addressed. Further, it is necessary to ensure that institutions receive proper policy and administrative backing together with the necessary financial support by ministries of education and the respective directorates of technical and vocational education. Only then can the hopes of the Tbilisi Conference come true.

7. THE NEED AND PLACE OF ENVIRONMENTAL EDUCATION IN TECHNICAL AND VOCATIONAL EDUCATION

As Technical and Vocational Education is essential for supplying the manpower needs of our economic activity, it is vital that Technical and Vocational Education re-orient its education and training system towards protecting the deteriorating environment. Technical and Vocational Education needs to strive to produce craftsmen and technicians who not only fulfil their professional roles effectively, but do so with a focus on wise use of resources, recycling of wastes and preserving the quality of the environment. This chapter outlines some of the strategies through which this reorientation can be performed.

7.1 Objectives

The objectives of technical and vocational education are currently oriented primarily towards meeting the needs of economic activity in a changing technological backdrop. In this process, the responsibility of technical graduates towards the environment and ecology has been largely ignored. The Tbilisi Conference has now brought the focus back to the environment and specified the broad goals of Environmental Education in its Recommendation No. 2. A re-statement and enrichment of the objectives of Technical and Vocational Education taking this recommendation into account is now needed. Such revised objectives need to be established in each country by experts connected with Technical and Vocational Education in accordance with local needs and priorities.

In this context, it may be appropriate to review the aims of education concerned with solving environmental problems as identified by the Chilean ecologist, L. F. Capurro* of Santiago De Chile (UNESCO Regional Office for Education 1976).

(a) To develop new attitudes and behavioural patterns in pupils which enable them to make decisions concerning the necessity of preventing the deterioration of the environment, through respect for ecological equilibrium, greater solidarity with and love of nature and increased involvement with the natural environment and the "concrete jungle" in which they live.

(b) To increase awareness of our responsibility for our actions in relation to the environment and their immediate and long term repercussions.

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*UNESCO - "Prospects - A Quarterly of Education" Vol. VIII No. 4, 1978, p. 476.

(c) To protect and preserve natural resources and hence to use them rationally, in the light of the ecological situation in each particular country.

(d) To help bring in a technological world which is consistent with the real needs of individual development and the social development of each country and which does not conflict with its cultural patterns and to develop autochthonous technologies and introduce only those technologies which are suited to local or regional circumstances.

(e) To increase the part played by technical education in the existing educational system so that solutions to problems are evolved in each country's actual circumstances and not imported from abroad.

The above aims (particularly (d) and (e) which are very relevant to Technical and Vocational Education) should be considered when the objectives of Technical and Vocational Education within country are being developed. Further Vidart* in his article "Environmental Education - Theory and Practice", suggests that "Environmental Education should have technical and applicative aims, which means planning collective practices which preserve, improve or restore the quality of life ... in such a way that the demands made by economic development do not conflict with the biological rhythms of the ecosystem." This point is also appropriate to technical education and needs to be taken into account when preparing objectives for Technical and Vocational Education.

A sample set of such objectives for Technical and Vocational Education might be as follows:

(a) To educate and train middle level technical manpower to cater to the economic, technical and ecological needs of a modern society.

(b) To inculcate standards and values of citizenship, social and environmental responsibility among its students.

(c) To update and improve education and training standards.

(d) To promote research and technological innovation including areas connected with environmental protection.

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*UNESCO - "Prospects - A Quarterly Review of Education" Vol. VIII No. 4, 1978, pp. 466-479.

(e) To liaise effectively with industry and other employing organisations to provide education for its teachers and students in technological and environmental areas.

A re-statement of objectives, though a necessary first step in the change process, cannot be sufficient unless these are properly interpreted and spelt out in detail in the content of the curriculum to which we turn next. In summary, the various steps and components which need consideration and inclusion in Technical and Vocational Education objectives are indicated in the form of a Flow Chart in Figure 3.

7.2 Content.

The content of the curriculum in technical and vocational education is currently oriented towards developing competencies related to economic activities and covers operations and processes like design, construction/fabrication, testing, operation, maintenance, servicing, repair etc. Currently, there is more emphasis on optimising productivity through efficient maintenance than there is on environmental aspects in the curriculum. In reality, environmental aspects should be incorporated into a number of areas, as indicated in Figure 4 which also shows typical aspects of curriculum that need to be included into each of the major areas of Technical and Vocational Education. This, however, is a conceptual diagram and details pertaining to each discipline in industrial and agricultural education need to be drawn up by the specialists concerned.

Another approach for deciding the content of curricula in Technical and Vocational Education could be an adaptation of a model proposed by Peter J. Fensham* for the science component of Environmental Education: (Figure 5)

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*Peter J. Fensham - "A New Role for Science in a Core of Environmental Education" Bulletin of the UNESCO Regional Office for Education in Asia and the Pacific - Environmental Education in Asia and the Pacific - No. 22 June 1981, pp. 246-258

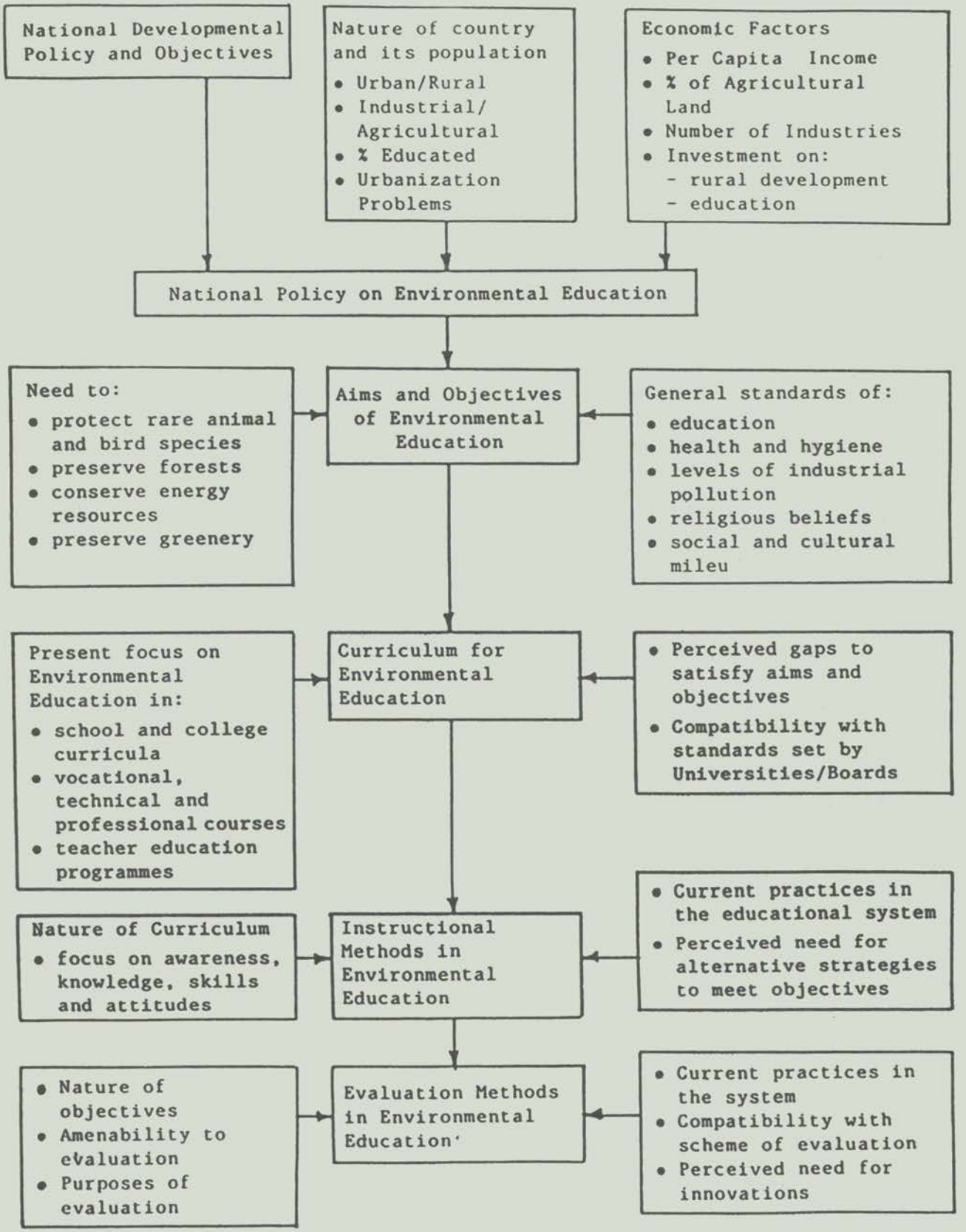
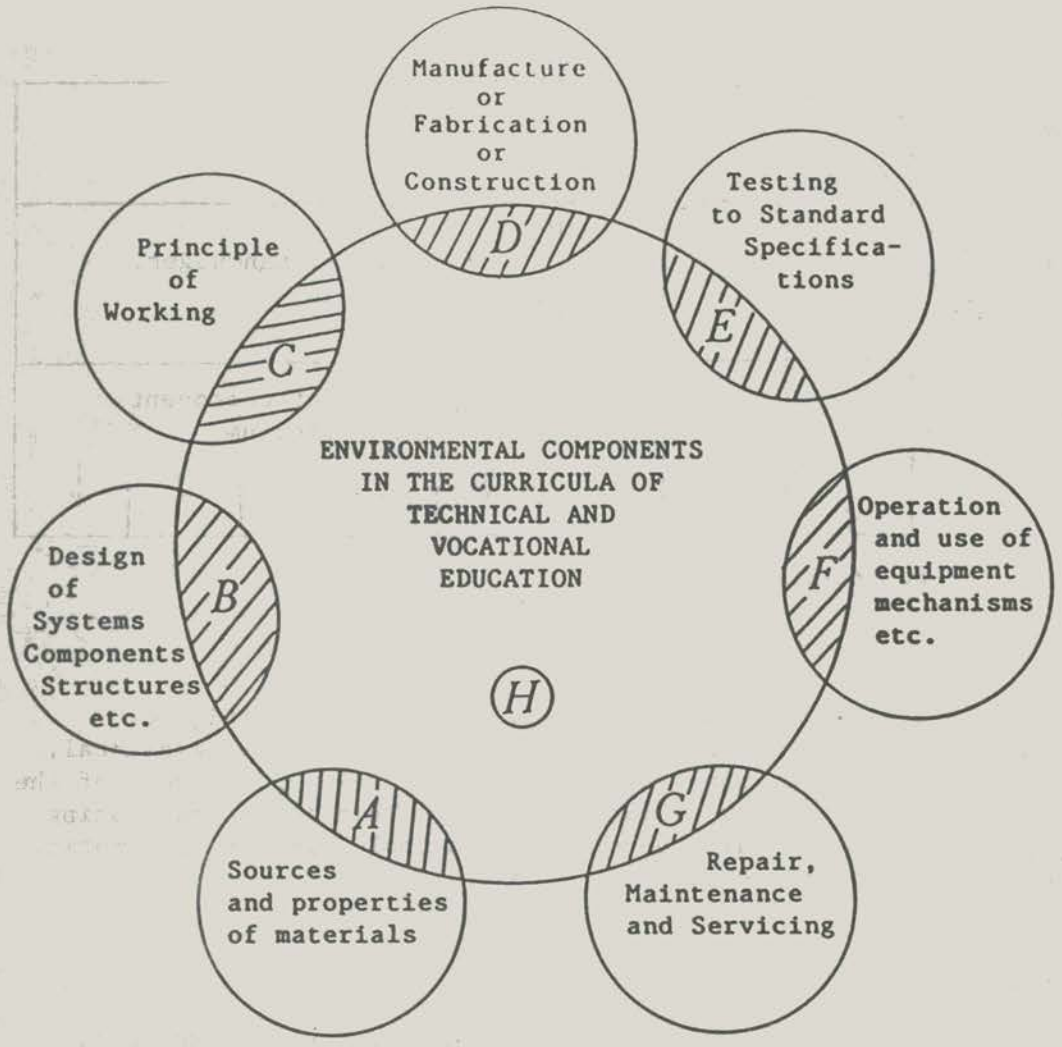


Figure 3: A Flow Chart Showing Steps and Various Components of Environmental Education in Technical and Vocational Education



A - Sources of Energy (Non-renewable)
Properties of materials, land, air, water etc.
Properties of chemicals and materials which cause pollution

B - Design aspects pertaining to ventilation, safety, waste and refuse disposal, exhaust gases etc.

C - Use of non-renewable energy sources
Nature of exhaust gases; Efficiency

D - Processes focusing on lessening waste and minimizing pollution, treatment of waste and effluents etc.

E - National and International standards and techniques for testing: air, water, food, noise, etc.

F - Operational procedures and their relationship with ecological factors

G - Repair, maintenance and servicing of equipment used for monitoring and controlling pollution

H - Research and development to produce new processes and techniques with an accent on environment
Problems and projects from Industry

Figure 4: Environmental Areas in the Curricula of Technical and Vocational Education

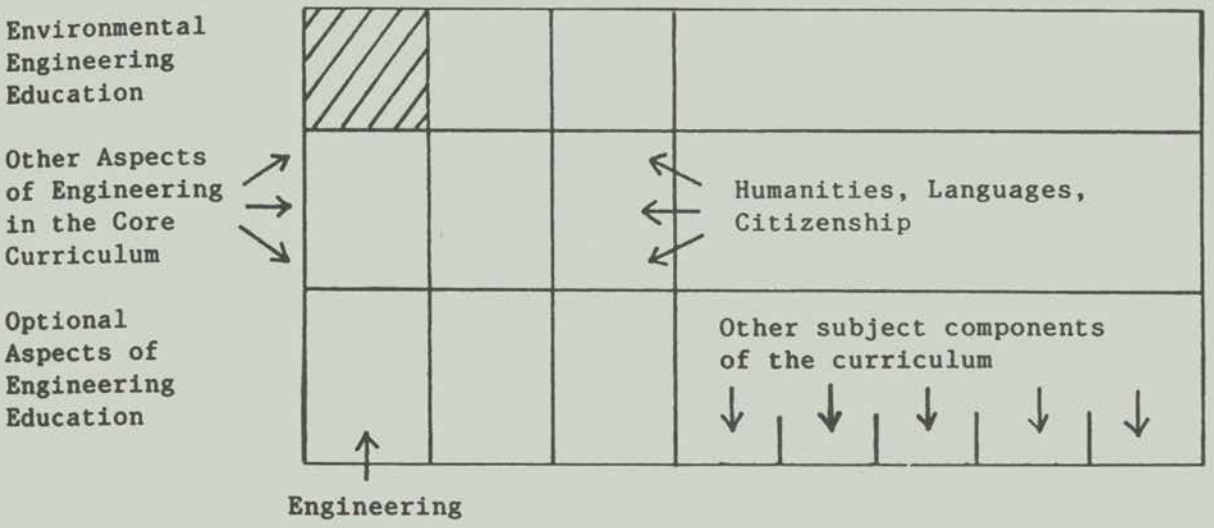


Figure 5

This matrix approach of Fensham consists essentially of dividing the curriculum into three main aspects; the environmental, core and elective (optional) and includes the relevant aspects of the subjects in each category to form the grid. This is an interesting exercise for the curriculum developers and would yield a pragmatic, and easily implementable subject content.

7.3 Methods.

The need for appropriate methods both in evolving suitable curricula and for instruction in environmental components of Technical and Vocational Education can not be over-emphasised. Curriculum development involves much more than identification of subjects, topics and syllabii for student instruction. The proper sequencing of topics, time scheduling, preparation of instructional objectives for each subject and topic together with identification of required resource materials and schemes for evaluating student performance are essential but time-consuming processes to be undergone before the philosophy is put into practice and the desired results achieved. These sequential steps, already indicated in the flow chart of Figure 3 are expanded below into broad guidelines of a discipline-free, generalised approach.

7.3.1 Models:

The main problem in curriculum formulation is the choice of an appropriate method/model to integrate environmental aspects into already existing courses in technical and vocational education. Vladimir Sergeevitch Romanov* in his article on "Environmental Education and Professional Training" proposed three different methods/models, that are relevant here:

(a) Conducting a special course or series of lectures on environmental problems in general to draw student attention to nationwide concerns. This method, though easiest to implement, has a weakness, in that it does not substantially change the traditional pattern of education, just adds another subject, running counter to the integration concepts of Environmental Education.

(b) Providing an introductory course on environmental problems during the first year and a choice of courses on some aspect of the problem or group of problems in the second year. This method may be highly suitable to university education where students have considerable freedom to spend time on a particular course of their choice, but not necessarily in higher technical schools and institutes of technology where courses are tightly scheduled.

(c) Perhaps the most effective method is to review the entire curriculum and re-organise it so as to include environmental protection as an integral part of the programme. This arrangement is however, the most difficult to put into practice. It involves breaking down traditional boundaries between disciplines and integrating the content of different study programmes with environmental protection.

Which of the above three methods is chosen may well depend on local conditions and constraints, but it is also possible that they can be combined with each other, either wholly or in part, as circumstances demand or permit.

Two other models adapted from general education philosophy useful when developing environmental education curricula are indicated in Figure 6.

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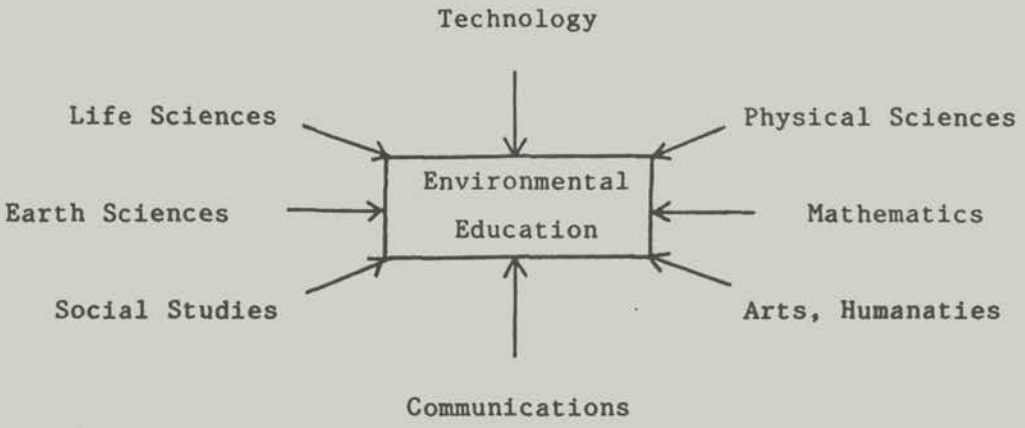
*UNESCO: "Prospects - A Quarterly Review of Education" Vol. VIII No. 4, 1978, p. 511.

A. Inter-disciplinary Model



B. Multi-disciplinary (Infusion) Model

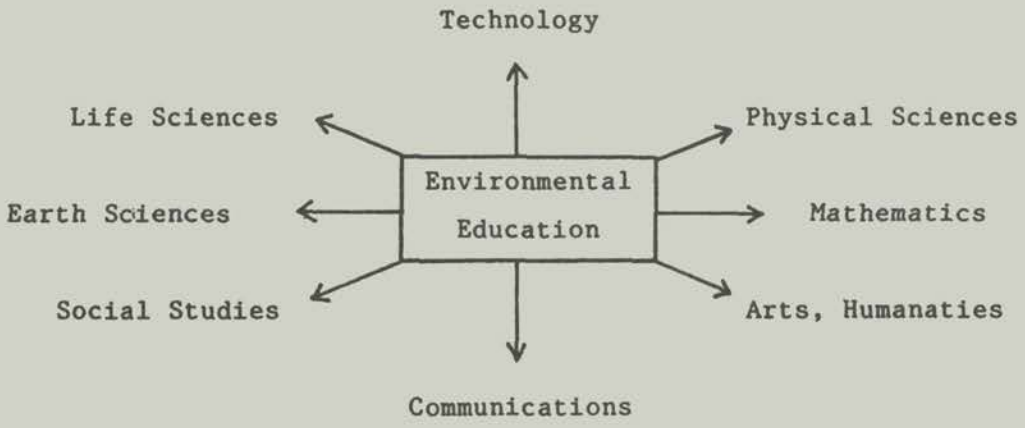


Figure 6: Two Conceptual Models of Environmental Education Curriculum

In (A) relevant components of many disciplines are drawn upon to create a distinct EE unit, course, or module. (B) illustrates the infusion of EE components into other established disciplines where appropriate.*

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*Adapted from Harold R. Hungerford and others. Strategies for Developing an Environmental Education Curriculum, (UNESCO, 1980). p.11.

7.3.2 Key Steps in Curriculum Development:

The following main steps in the process of curriculum development for Environmental Education have been proposed by Hungerford (et al):

(a) Organise a curriculum Core Development Team (CDT).

i) Choose CDT members.

ii) Establish tasks and timelines for the CDT.

iii) Collect appropriate resources, e.g. curriculum materials and professional references.

iv) Identify the constraints that will impinge upon the curriculum development effort and plan for resolving same.

(b) Identify professional consultants who will serve as a Recommended Support Team (RST).

i) Establish tasks and timelines.

ii) Identify liaison procedures to be used between RST and CDT.

(c) Develop the curriculum's scope and sequence.

i) Define curriculum goals.

ii) Define concepts, skills and attitudes to be incorporated as objectives into the curriculum (the scope).

iii) Assign objective components to appropriate grade levels and content areas (the sequence).

(d) Evaluate the existing school programme with respect to potential Environmental Education infusion elements.

i) Identify Environmental Education objectives which already exist in the present curriculum.

ii) Identify materials in present curriculum which could be modified to meet Environmental Education objectives.

iii) Identify deficiencies in present curriculum where new materials must be selected or developed to complete the proposed Environmental Education scope and sequence.

(e) Inventory and evaluate the community/regional resources available for use in the Environmental Education curriculum.

(f) Prepare the Environmental Education curriculum.

i) Review and evaluate the materials which have been collected for potential adaptations or adoption.

ii) Organise writing teams to adapt or develop Environmental Education materials needed to complete the curriculum.

(g) Develop plans for both pilot and full scale implementation.

(h) Develop a comprehensive evaluation programme.

It needs to be recognised at the outset that the process of developing curricula is a complex and time consuming task and needs to be taken up individually for each and every course.

7.3.3 Preparation of Objectives and Topic Sequencing:

Once the course structure is decided the next step is the preparation of general and specific objectives for the course related to the various topics under consideration. The topics may be also sequenced appropriately using the procedures outlined in "Aspects of Curriculum for Technician Education" (CPSC, 1982) or other similar approaches.

In this connection, it may be relevant to consider an instructional model for environmental education proposed by William B. Stapp* (Figure 7). The nature of the questions posed and the behaviours identified could give some valuable clues as to the type of objectives that could be included in a course and the types of attitudes and skills to be developed in the student.

7.3.4 Preparation of Teaching Scheme and Lesson Plans:

The next step is the preparation of detailed teaching schemes (topic analysis sheet) and lesson plans for each of the lessons to complete the curriculum document. Procedures and formats given in "Aspects of Curriculum for Technician Education"** pp. 118 to 124 could be conveniently considered for this stage.

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*William B. Stapp - "An Instructional Model for Environmental Education" pp. 495-507 from Unesco: "Prospects - A Quarterly Review of Education" Vol. VIII, No. 4, 1978.

**Published by Colombo Plan Staff College for Technician Education, Singapore, 1982.

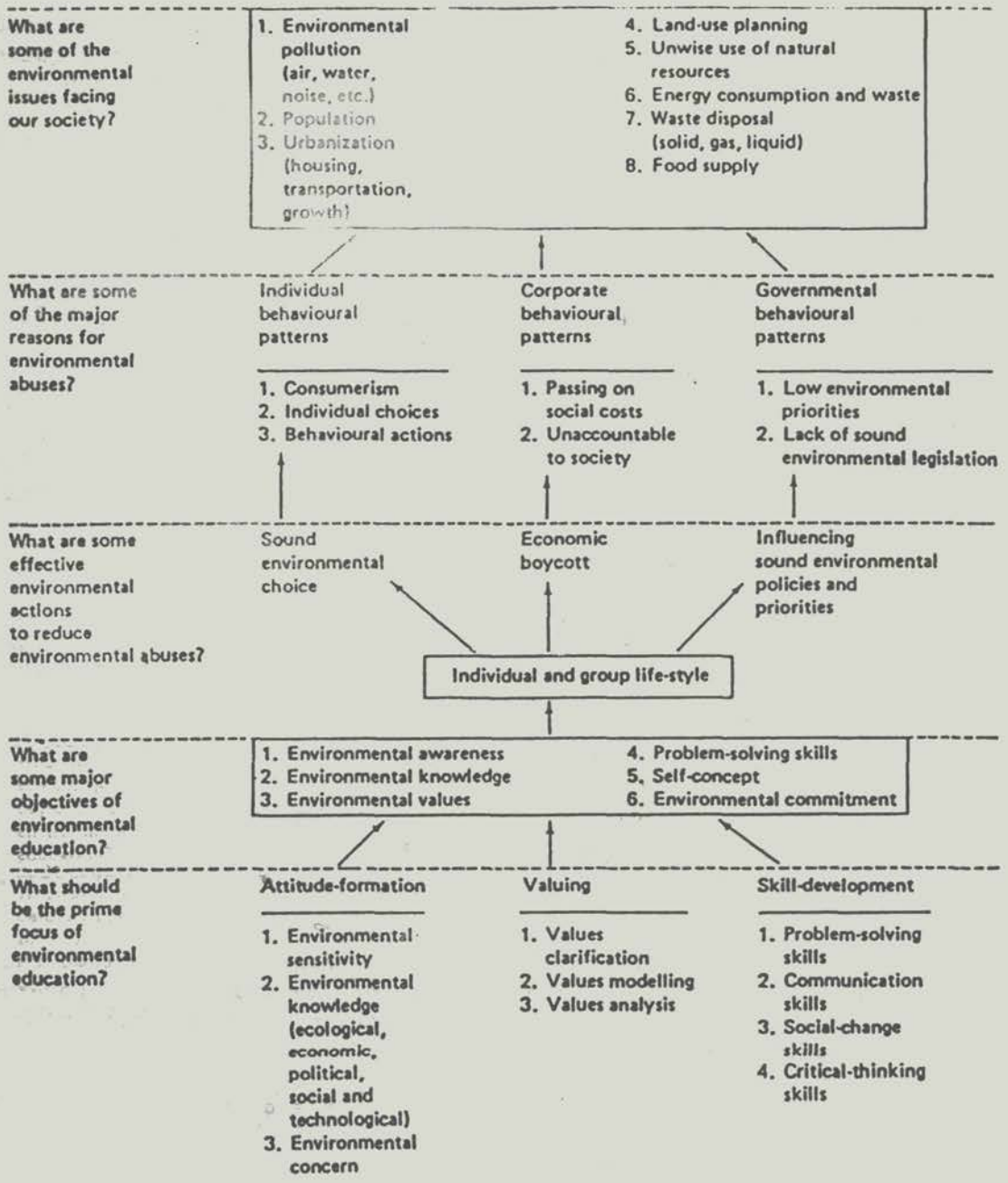

Figure 7: Symptoms Versus Root Causes of the Environmental Crisis

7.4 Instructional Methods.

Education acquired by students in Environmental areas of Technical and Vocational Education is not to be limited to mere acquisition of knowledge but must include proper attitudes to problem analysis and resolution skills. Such situations are already quite common in Technical and Vocational Education and students are normally exposed to a variety of instructional techniques in developing such competencies for shop-floor problems in economic activity.

In accordance with the recommendations of the Tbilisi Conference there should be a greater emphasis on:

(a) Community work by students (under the guidance of teachers)

- to identify environmental problems
- to gather data on technological aspects of the problems
- to apply engineering principles to analyse the problems
- to generate alternative technological solutions

(b) Laboratory and workshop activity

- to undertake experiments connected with the feasibility of the solutions generated
- to verify hypotheses evolved
- to test gadgets or mechanisms invented
- to construct new tools and machines or to improve existing ones

(c) Project work either by individuals or groups to include the above activities. Such projects may be sponsored by government agencies, community groups, industry or by the training institution itself.

(d) Social and volunteer activities which enable students to mix with members of the community and obtain their reactions, feelings and perceptions of environmental problems.

In view of the above, instructional methods in Technical and Vocational Education would need to undergo changes. Some of the possible implications are that for Environmental areas, teaching methods will have to be such that there is:

Less - reliance on traditional lecture method and information dissemination by the teacher.

- of book problem-solving and standard experiments conducted in laboratories.

More - dependence on techniques such as group discussions, seminars, role playing, simulation exercises etc.

- of practical work in the form of interaction with community and involvement in actual problems.

- individual self study to gather information, literature and data related to problems.

- creative thinking and techniques such as "brainstorming" to generate multiple solutions to problems, followed by evaluation of solutions to identify the most appropriate solution, weighting pros and cons of each.

- project centred approaches to learning.

- application of principles of engineering and technology to solve environmental problems.

However, the transformation of instructional methods as indicated above cannot take place overnight. It needs:

(a) teachers with proper exposure and training to the use of such approaches with which they may not be familiar;

(b) proper instructional resources, workbooks, assignments, games etc. to be designed preferably locally and made available.

(c) a high level of interaction between the school on the one hand and community and industry on the other, which may be presumed.

7.5 Training.

In Technical and Vocational Education, considerable emphasis is already given to practical and laboratory work and training on the shop floor in industry. Theoretical instruction constitutes fifty percent or less of the total time allotted for any course. Attachment to industry for job-oriented practical training for a total duration of six months to one year is more or less compulsory in most countries. Such training is offered either in one continuous period or in frequent assignments of short duration as, for example, in sandwich programmes. When Environmental Education areas are incorporated into Technical and Vocational Education, these field strategies become all the more necessary and relevant.

In addition to the above, it is necessary that:

- teachers give greater freedom to students to select the subjects or Environmental Education areas in which each one wishes to specialise and the nature of the problems one wishes to take up for study during training.

- the administration makes an appropriate investment in necessary resources for training. It is particularly important to equip libraries with books, documents, journals and conference proceedings related to environment.

- exercises given to students such as simulations, games etc. be designed to develop their creative thinking and spirit of inquiry and develop appreciation of and concern for technological and related aspects of environmental problems.

Evaluation and Assessment.

A critical part in any educational system is the evaluation.

7.6.1 Student Assessment:

It is of primary importance to ensure that in environmental areas, performance evaluation be such that:

- it is in accordance with the curriculum objectives and has one to one correspondence with all the identified skills.

- the evaluation assesses not only mere "knowledge" and "practical skills" but also attitudes, aptitudes, sensitivity, concern, values and the acceptance of Environmental Education as a philosophy on which would rest technological solutions to environmental problems.

- the evaluation methods include various types of instruments such as objective and essay type questions, rating scales, opinionnaires, interviews, case studies, surveys etc. as relevant to the topic and the behaviour that is being assessed. In particular, testing in the affective domain, needs to be given greater emphasis in engineering and agricultural education.

- evaluation in Environmental Education areas should be made compulsory for all students and appropriate standards of acceptable performance need to be evolved. Satisfactory completion of each course in Technical and Vocational Education should be also related to the acquisition of necessary skills and attitudes in environment related areas.

- outstanding performance in environment related areas should be appropriately rewarded with medals, awards, scholarships, bursaries etc. as found necessary.

- engineers from industry and environment agencies of the government should be involved in the assessment of student performance in environment related areas and projects.

7.6.2 Course and Programme Evaluation:

Courses/programmes introduced cannot be expected to achieve perfection and satisfy the ultimate goals in the very first instance and will need continuous updating and revision/ modification. This entails a proper mechanism to be instituted for programme review and appraisal on a continuing basis both during formative stages and summatively at periodical intervals. Standard procedures for the conduct of such evaluation need to be followed meticulously to ensure an objective appraisal of programme quality.

7.7 Non-formal Education.

The Tbilisi Conference report specifically recommends non-formal education as a strategy to achieve the objectives and goals of Environmental Education. It makes particular mention of non-formal education "addressed to technicians, members of the professions and administrators who can contribute in various capacities to solving and forestalling environmental problems".

The need for starting non-formal education programmes in Environmental Education has been adequately emphasised and established. With special reference to Technical and Vocational Education, such courses could be of the following types:

- Short courses for administrators and managers of the system to introduce them to environmental issues (summer/winter schools, part-time courses etc.).

- Courses for technicians and skilled workers from industry and agriculture sectors.

- Courses for school dropouts and unemployed rural youth to impart employable skills in occupations related to environment.

- Courses for social workers, economists, health workers etc. to orient them to the technological aspects of the environment.

- Updating courses for technicians and engineers in environment related areas.

- Radio and TV series on technological aspects of the environment for the general public and secondary school pupils.

- Teleconferences, debates, seminars etc. involving technical experts on problems and issues relating to the environment.

- Distance education programmes to upgrade environmental knowledge and appreciation of teachers in Technical and Vocational Education, persons in industry, and technical/ agricultural education etc.

7.8 Conclusion.

Technical and Vocational Education institutions have a significant role to play in Environmental Education, and have a responsibility to commit themselves to an active involvement in training for this and in generating technological solutions to environmental problems. Both formal and non-formal methods and strategies need to be adopted in this sector to complement and supplement each other. The very same technology which has been the root cause of environmental problems can equally, be used to solve the problems so created. Institutions of Technical and Vocational Education should take the opportunity to do so.

8. ESSENTIAL ENVIRONMENTAL KNOWLEDGE AND EE METHODOLOGIES FOR CURRICULA DEVELOPMENT AND TEACHER TRAINING FOR AGRICULTURAL AND INDUSTRIAL SCHOOLS

Technical and Vocational Education was defined in Chapter 5. Training in this sector is normally offered in industrial and agricultural schools and colleges which are middle level institutions supplying skilled manpower to the employment sector. Hence their curricula need to take into consideration the education and training received in the previous education sectors including the environmental components. When environmental education is incorporated in TVE, the general pattern would usually be similar. In Figure 8 is outlined an example of a conceptual framework to emphasise the relationships among the various sectors of the education system.

8.1 Factors Affecting the Choice of Environmental Education Components in Agricultural and Industrial Schools

The actual components of Environmental Education in the curricula in agricultural and industrial schools could be identified by adopting two different approaches.

(i) The organisational approach recognises factors such as the manpower needs and student characteristics on the one hand and on the other, instructional constraints arising from system structure and prevailing curriculum development strategies as shown in Figure 9.

(ii) In the second approach which is more academic, the curriculum builds on the environmental education, either structured or incidental, provided in the student's previous schooling. Its purpose is to develop an environmentally oriented skilled worker/technician suitable for employment in industry and agriculture. The approach is as explained diagrammatically in Figure 10 in which each of the three main blocks A, B and C could be construed as comprising of technical/occupational components A.1, B.1 and C.1 and environmental components A.2, B.2 and C.2.

The resulting two components of C (C.1 and C.2) would represent the occupational and environmental components respectively of the curricula in industrial and agricultural schools and colleges.

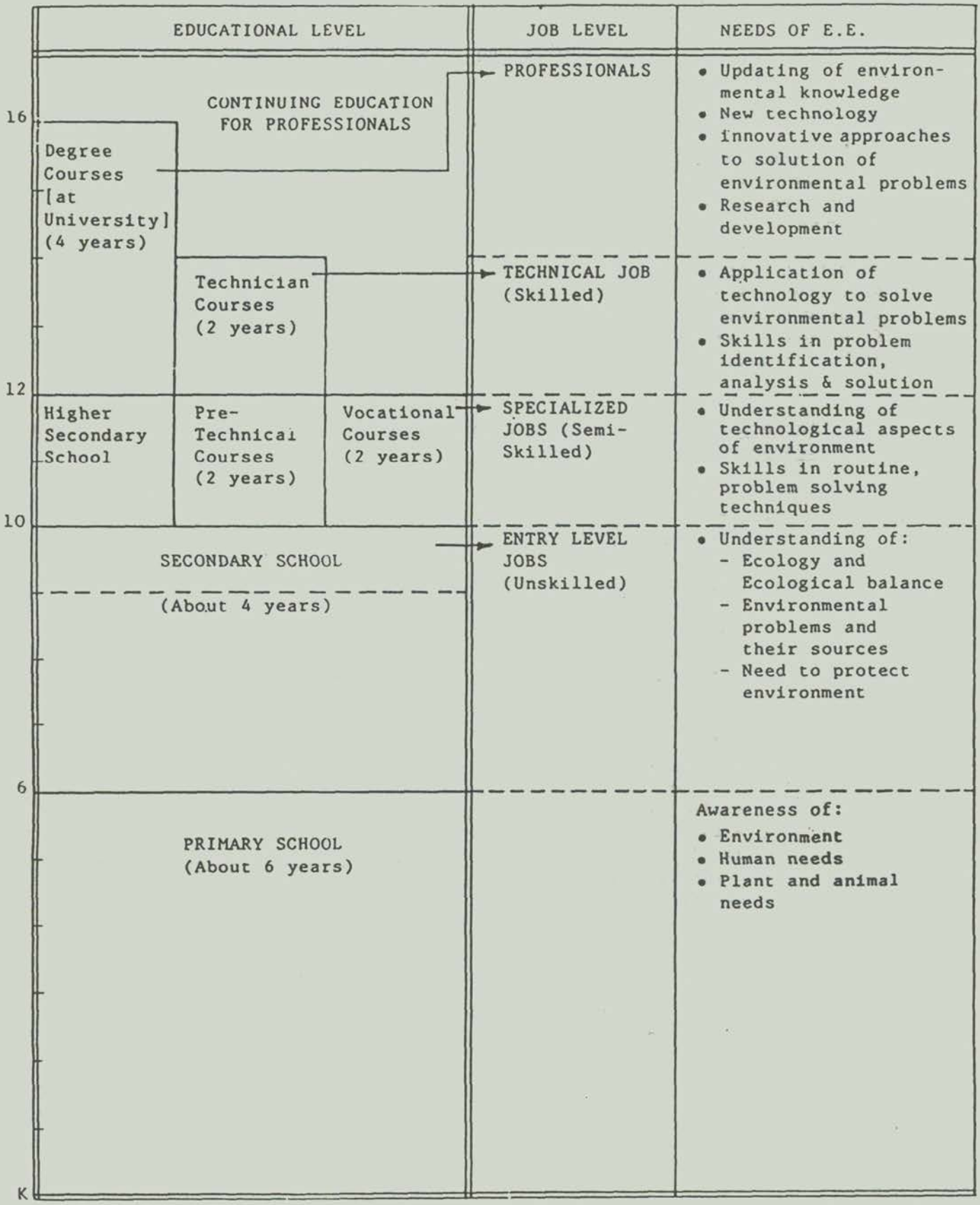

Figure 8: A Conceptual Framework for EE in the Educational System*

*Adapted from Teravuti Boonyasopon "Vocational and Technical Education in Thailand" 1984 (Mimeographed).

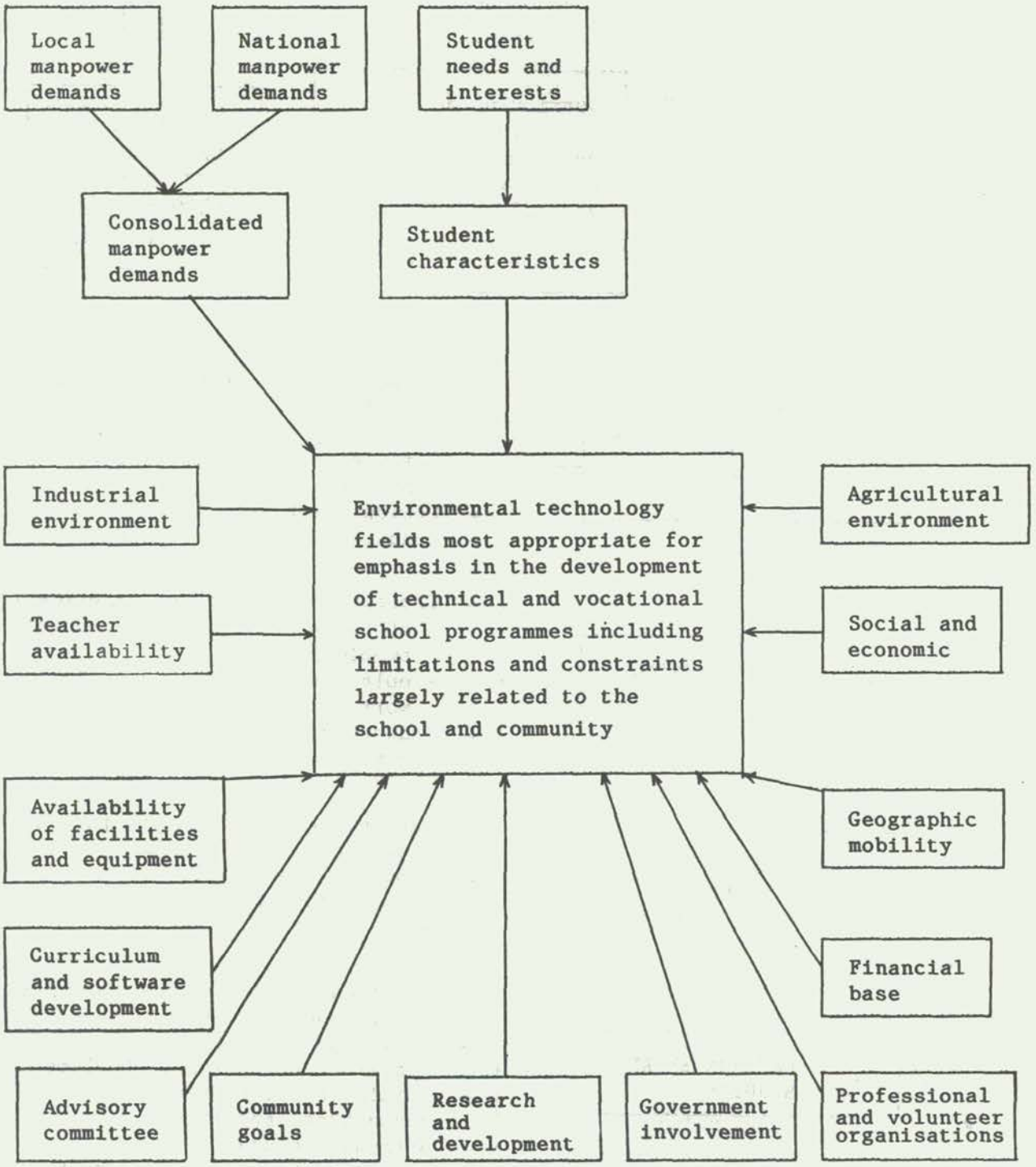

Figure 9: Factors for Selection of Environmental Technology Fields Appropriate for Emphasis in the Development of Technical and Vocational School Programmes*

*Adapted from Teravuti Boonyasopon, "Development of Technical and Vocational Education Programmes in Thailand" Bangkok: KMIT/NBC . 1983 (Mimeo-graphed)

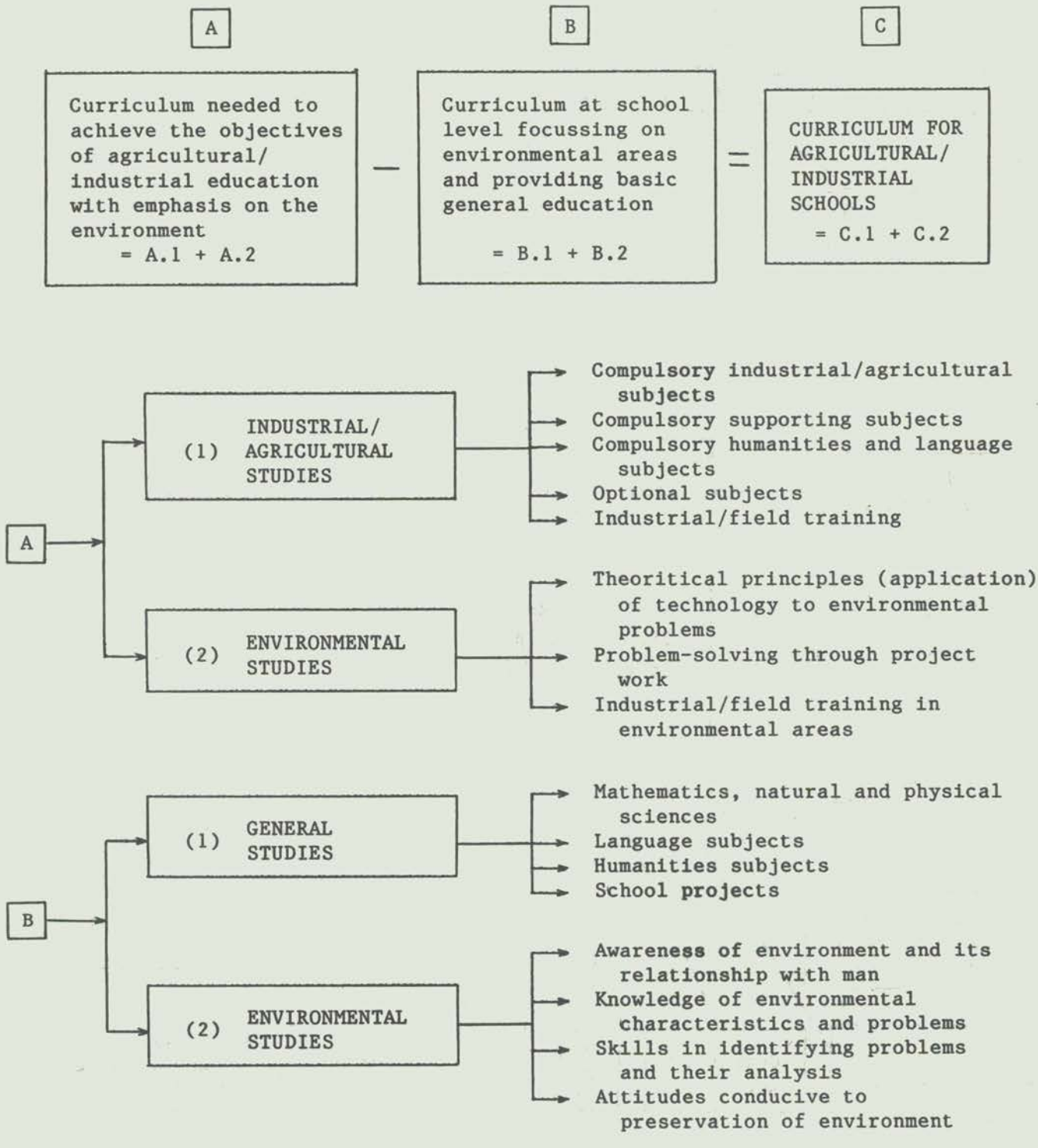

Figure 10: A Framework for Deciding on Curricula in Industrial/Agricultural Schools

It may be noted that:

(i) This approach seems primarily relevant to existing technician courses, as well as trade courses. It may be not applicable to environmentally oriented technical courses such as sanitary and public health engineering.

(ii) Although the integrated approach to teaching advocated by the Tbilisi conference eminently desirable, this may not be possible at least in the initial stages. Hence, the approach outlined in Figure 10 segregates the technical and environmental areas in categories A and B. In course of time, it is anticipated that some subjects under A.2 may be gradually integrated into the subjects under A.1. The same may also happen at the secondary school level with subjects under B.2 integrated into those under B.1.

(iii) The main advantage of this approach is that the environmental subjects in industrial and agricultural courses (A-2) can be tailor-made to suit the needs of the technicians/skilled workers, without drastically effecting the existing curricula in industrial and agricultural courses.

Both these approaches must take into account what might be covered in a broad-based secondary school curriculum with emphasis on environmental aspects. Several models have already been developed for this but the model curriculum at school level proposed by William B. Stapp* in his article entitled "An Instructional Model for Environmental Education", is a useful guide. He identified five basic and important environmental concepts as: the ecosystem, population, economics and technology, environmental decisions and environmental ethics. In each of these five areas the details of concepts to be introduced at each grade level have been identified.

8.2 Essential Components of Environmental Education in Industrial Schools

Assuming the secondary school level curriculum is as outlined above, a structure for the Environmental subjects that could be incorporated in industrial school curricula on a general basis may be proposed.

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*UNESCO - "Prospects - A Quarterly Review of Education" Vol VIII No. 4, 1978 pp. 495-507.

8.2.1 Philosophy

The basic philosophy on which this proposal is being made is that environmental subjects bearing on technician and trade courses can be divided into four main categories:

(a) Compulsory Core Subjects or Topics which students of all disciplines or a wide group of disciplines will need to study.

(b) Compulsory Related Subjects which need to be studied by all students belonging to a particular discipline or trade.

(c) Elective/Optional Subjects which relate to the discipline concerned and may be chosen by the student in accordance with his aptitude/interest or needs of the occupational field.

(d) Common Electives for all Disciplines: These elective subjects can be chosen by any student and offered as advanced topics which may be useful in the occupation which the student wishes to take up.

In addition to the above, the curriculum could include project work and related exposure to and training specifically in environment related aspects of the discipline and economic activity concerned.

Suggestions for courses and syllabus outlines in these four areas are provided below:

8.2.2 Compulsory Core Subjects

These subjects which are relevant to all courses relate primarily to personal and industrial safety, health and living standards, technological aspects and permissible standards for contamination of air, water and sound etc. The list given below is only indicative and could be altered to suit local needs or course academic level.

(i) Introduction to Environment

(ii) Capacity of Land, Water and Atmosphere to deal with Changes in the Ecosystem

(iii) Occupational, Health and Accident Prevention

(iv) Fundamentals of Fire Protection

(v) Material Handling and Storage

(vi) Sanitation and Public Health

(vii) Layout Organisation and Planning

8.2.3 Discipline Oriented Related Subjects

A. CIVIL ENGINEERING

(a) Compulsory Related Subjects

(i) Water Utilities, Production and Treatment

(ii) Wastewater (Sewerage) Handling, Treatment and Disposal

iii) Urban Disposal

(b) Elective/Optional Subjects

(i) Water Utilities Management

(ii) Applied Water and Waste Water Chemistry

(iii) Industrial Wastewater Treatment

B. MECHANICAL ENGINEERING

(a) Compulsory Related Subjects

(i) Heating, Ventilation and air Conditioning

(ii) Corrosion and its Control

(b) Elective/Optional Subjects

(i) Industrial Preventive Maintenance

(ii) Oil and Oil Spillage Control

(iii) Management of Industrial Wastes and Effluents

C. ELECTRICAL ENGINEERING

(a) Compulsory Related Subjects

(i) Power Source Hazards and their Control

(ii) Industrial, Domestic and Industrial Lighting

(iii) Accoustic Engineering and Noise Control

(b) Elective/Optional Subjects

(i) Electrical Installations in Multi-storeyed Buildings

(ii) Unconventional Sources of Energy

(iii) Escalators and Elevators (Lifts)

8.2.4 Common Electives for all Courses

(a) Environmental Energy and Chemical Hazards

(b) Human Environment Physiology

(c) Environmental Health and the Law

(d) Radiation Safety

8.3 Essential Components of Environmental Education in Agricultural Schools

The essential components of environmental education in agricultural school curricula are similar to those found in the industrial school curricula. The objective of agricultural education at higher levels is to train future researchers and agricultural professional workers. At the secondary level, the objective is to train prospective farmers and agricultural technicians and to develop a sound attitude toward agriculture as an occupation.

The traditional major fields of agricultural specialisation are Agronomy, Plant pathology, Food science, Animal science, Farm economics, Horticulture, and Farm mechanics.

The environmental subjects relating to agricultural courses can be divided into four main categories:

(a) Compulsory core subjects or topics

(b) Compulsory related subjects

(c) Elective/optional subjects

(d) Common electives for all courses

For the purpose of this discussion we will consider only two main agricultural specialisations (farm mechanics and horticulture) which are commonly found in most countries.

8.3.1 Compulsory Core Subjects

The compulsory core subjects for environmental education that might be incorporated in farm mechanics and horticulture are similar to the compulsory core subjects for industrial schools (8.2.2).

8.3.2 Discipline Oriented Related Subjects (Compulsory & Optional)

A. FARM MECHANICS

(a) Compulsory Related Subjects

(i) Power Source Hazards Control

(ii) Fuel Control Systems

(iii) Soil Erosion Control

(iv) Plant Insects and Diseases

(v) Storage and Disposal of Pesticides

(b) Elective/Optional Subject

(i) Acoustic Engineering and Noise Control

(ii) Preventive Maintenance

(iii) Water Distribution

B. HORTICULTURE

(a) Compulsory Related Subjects

(i) Plant Insects and Diseases

(ii) Landscape Design

(iii) Basic Water Supply

(c) Electives/Optional Subjects

(i) Agricultural and Soil Chemistry

(ii) Water Utilities Management

(iii) Water Distribution

8.3.3 Common Electives for all Courses

(i) Environmental Disease Control

(ii) Human Environment Physiology

(iii) Environmental Health and the Law

(iv) Radiation Safety

(v) Vector Control

The discussion so far relates to existing courses in industrial and agricultural schools where environmental areas are newly introduced. This, however, is only one approach which may be adopted in the initial stages in many countries to change the focus in current programmes. Soon new programmes and courses will emerge focussing on environmental aspects within engineering/agriculture, as is already the case in some countries like Singapore (see UNESCO report by Sastri and Malhotra, 1985). It is reasonable to expect that more such courses would be emerging in the foreseeable future.

8.4 Environmental Education in Teacher Education and Training

Teacher education and training programmes for industrial and agricultural schools and colleges vary considerably in terms of duration, nature of courses, mode of course offerings, emphasis on theory and on practical/field work etc. depending upon the types of students and curricula handled by the teachers. It is therefore not appropriate to attempt to address the detailed technicalities of such courses. The following is however a broad philosophical outline.

The successful incorporation of environmental education into the curricula of industrial and agricultural schools depends upon the teacher - his competencies, knowledge, skills, abilities, attitudes and values. To develop teaching skills of teachers who may have been recruited for their qualifications and experience which may not include adequate knowledge and appreciation of the implications of environmental matters and may not have been able to attend a teacher training programme, some retraining is needed.

Thus, there is now a felt need for exposing all teachers in industrial and agricultural schools to a teacher training programme which builds in them the competencies needed for teaching environmental subjects. A general analysis of the needs of technical and vocational teacher education is shown in Figure 11. This indicates how the curricula in teacher education may be influenced by various factors relating to technology, industry, pedagogy and general social and community needs. Environmental concerns and needs are the new factors now introduced. Based on this approach, the competencies to be sought in an effective teacher in technical and vocational education are presented in a matrix form in Figure 12. This analysis may be of help in identifying the education and training needs of teachers, teaching components of environmental education incorporated into technical and vocation education.

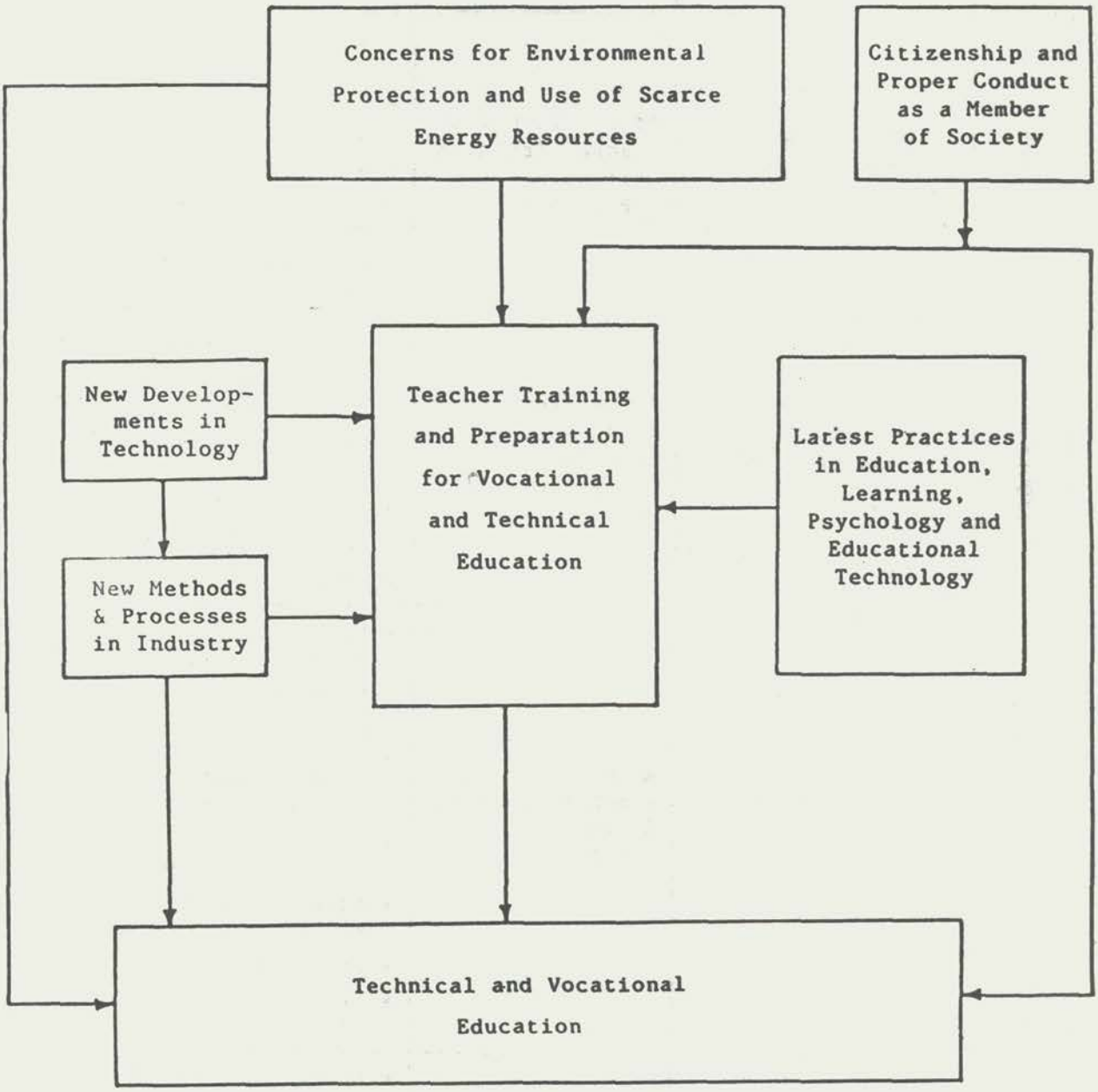

Figure 11: Needs of Technical and Vocational Teacher Education

Areas	In Technical and Agricultural Subjects	In Teaching (Pedagogy)	In Environmental Aspects
AWARENESS	As per Technical College Curriculum	As per Technical Teacher Training College Curriculum	• Impact of Environment on life • Impact of social and group habits • Causes for pollution • Need to protect environment • Renewable sources of energy
KNOWLEDGE	As per Technical College Curriculum	As per Technical Teacher Training College Curriculum	• Health and hygiene standards • Pollutants and their characteristics • Mechanics of pollution • Sources of energy • Wastage of energe • Methods of conservation
SKILLS	As per Technical College Curriculum	As per Technical Teacher Training College Curriculum	• Location of areas of pollution • Measuring extent of pollution • Applying techniques to control pollution to acceptable levels • Applying soil conservation methods • Applying water and sewage treatment methods • Rotation of crops • Disease prevention for cattle and poultry
ATTITUDES	As per Technical College Curriculum	As per Technical Teacher Training College Curriculum	• Appreciation of hazards of pollution • Value health standards • Value personal health and hygiene • Accept and use national pollution standards

Figure 12: Competencies Required of an Effective Environmental Teacher

8.4.1 Approaches

Development of skills for teaching environmental education could be achieved by adopting any of the following approaches singly or in suitable combinations:

(a) For teachers not already trained, a comprehensive teacher training programme needs to be designed incorporating enviornmental areas in the curriculum for training along with other usual subjects. If necessary, the duration of the teacher training programme may need to be proportionately increased. This curriculum needs to be examined as a future norm to be recommended to teacher training colleges preparing teachers for industrial and agricultural schools.

(b) For teachers already trained several alternative strategies are possible, such as:

(i) Conducting short refresher/retraining programmes to enable them to develop skills in environmental education related subjects.

(ii) Conducting a series of short duration courses/ workshops each focusing on a specific curriculum area newly introduced.

(iii) Producing a series of self instructional modules in each of the desired areas and implementing them as a part of a distance education scheme for environmental education.

8.4.2 Curriculum for teacher training

Any programme for teacher preparation in technical and vocational education can be broadly subdivided into the following main areas:

(a) Knowledge of related technical subjects to the required depth, to bridge gaps if any.

(b) Pedagogical skills required to teach the respective subject areas effectively.

(c) Exposure and training in related industries so as to relate teaching to shop-floor/field practices.

(d) Management of the instructional system (including supporting facilities and feedback mechanisms) so as to ensure high standards.

(i) Curriculum for subject updating:

This will primarily relate to the newly introduced subjects in the curricula for students and could be offered to teachers through a set of core/compulsory units together with a certain number of subsidiary/optional units.

The following topics are identified using this approach, taking into account the basic environmental topics on the lines suggested by L J Masterman* in his article, "The Environment and Engineering Education"; and environment oriented occupational subjects identified as compulsory for all students in industrial and agricultural schools.

Basic Environmental Topics

- Ecological foundations: including a description of the ecosystem, the atmosphere, life on earth, energy, material, water and air cycles, regenerative capacity of the environment, soil fertility etc.

- Interactions and influences: including Man and his interaction with the environment, pollution and pollution agents, environmental quality control, legislation and standards.

- Outcomes, issues and control mechanisms: including the nature of issues and problems, and their implications for the future, need for human intervention, rational utilisation and recycling of wastes/by products, new technologies minimizing wastes and management.

Environment Oriented Occupational Subjects:

- Occupational Health and Accident Prevention
- Fundamentals of Fire Prevention
- Materials Handling and Storage
- Sanitation and Public Health
- Organisation and Management

The persons responsible for curriculum development for teacher training in professional education in each country should individually take up this exercise.

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*UNESCO - UNEP Meeting of Experts on Environmental Aspects of Engineering Education and Training, Paris 17-21 June 1974, Final Report, p.32.

(ii) Pedagogical Skills

Most pedagogical skills are already developed in standard teacher training programmes. Particular stress may be placed on training in methods applicable to environmental education such as field observation and study.

(iii) Training in Industry

A short period of training in specifically selected industries working in environmental areas or environmental protection aspects in existing industries may be made compulsory for every teacher so that he may effectively relate his teaching to actual situations and problems prevalent in the environment.

(iv) System Management

The aspect that will need to be given much consideration is adoption of interdisciplinary and integrated approaches to the teaching of environmental education areas. Teachers need to be exposed to the administrative, structural and implementational problems that occur in adopting such approaches.

8.4.3 General Aspects

Some additional general points in respect of teacher-training programmes are:

(a) Teachers selected for training in this area should be well motivated and committed to environmental improvement, or else some preparatory training in attitudinal change may be required.

(b) Assessment procedures in environmental areas should be properly geared to the competencies tested.

(c) Teacher education colleges should also make use of appropriate learning techniques. They must also guide trainee teachers in solving the environmental problems in the community, thus encouraging teacher competency in this area.

(d) Satisfactory completion of required modules in environmental education should be considered as essential for the award of certificates in teacher training.

(e) Teacher educators who are qualified in environmental education areas should be utilised.

(f) Development of written materials and instructional aids to assist teaching of environmental subjects should be undertaken by teacher education institutions.

9. GUIDELINES FOR INCORPORATION OF ENVIRONMENTAL EDUCATION INTO CURRICULA AND TEACHER TRAINING

Although the importance of environmental studies in education and the need for integrating such aspects into the curricula of industrial and agriculture is acknowledged, the extent of integration achieved and the extent of fulfilment of the objectives of Environmental Education depend upon a variety of factors such as:

- Governmental policies on environmental protection and Environmental Education.
- The complexity and size of the industrial/agricultural education system
- Flexibility and adaptability of the curricula in industrial/ agricultural institutions.
- Attitudes and policies of the managements/boards of these institutions.
- Attitudes and commitment of the academic staff and students.
- Responsiveness of the institutions to society's needs.

The purpose of the guidelines presented here is to assist management in achieving a reasonable degree of success. Sections 9.1 to 9.5 deal with curricula, the remaining sections with teacher training.

9.1 Policies Aims and Approaches.

The following guidelines reflect important factors in preparing policies and aims for environmental education in curricula.

(a) Environmental Education is a component of education that is essential for the very survival of mankind on the planet earth and is a matter of global concern.

(b) Environmental education objectives can only be attained through clear and explicit policies in general planning.

(c) The policies need to stress that Environmental Education should be integrated into the system so that education becomes a means for bringing about environmental change and awareness.

(d) Components of Environmental Education must be introduced at all levels in education and certain aspects must be compulsory for all students. The compulsory aspects should be drawn up in accordance with the needs of the course and the community.

(e) The aims and objectives of Environmental Education in curricula should be carefully considered and complement those of the technical and vocational education system so that the technological aspects of environmental and ecological problems are fully appreciated.

(f) Environmental Education in Technical and Vocational Education should build on those skills, attitudes, values and knowledge acquired in the high school and relate to technological competencies in a meaningful way.

(g) In Technical and Vocational Education, an exposure to Environmental Education should not be limited to students alone, but should be extended to teachers, workers in industry and the farm, managers and supervisors etc. through appropriate formal and non-formal education programmes.

(h) Components of Environmental Education in Technical and Vocational Education should not be treated as additions to an already crowded curriculum, but as inherent in it and essential for developing an appreciation for the environment on a scientific and technological basis. A process flow chart for curriculum development in Environmental Education is shown in Figure 13.

9.2 Models and Patterns for Incorporating Environmental Education into Curricula.

There are several methods of integrating Environmental Education in an educational system. A conceptual model illustrating the integration of curriculum scope through grade levels and across subject areas is shown in Figure 14. In Technical and Vocational Education, the model adopted would depend largely upon the local context and could be decided locally. Whichever model is chosen, it is, however, necessary to ensure that:

- the needs of the community at both local and national levels are served;
- the courses are in tune with modern technological developments and the changing needs of the employment market;
- the engineering/agriculture and environmental aspects are integrated;
- Environmental Education should consider the environment in its totality, natural and built, ecological, political, economic, technological, social, legislative, cultural and aesthetic;
- it is a continuous lifelong process: it should link with Environmental Education at other levels and take place through formal and non-formal channels;

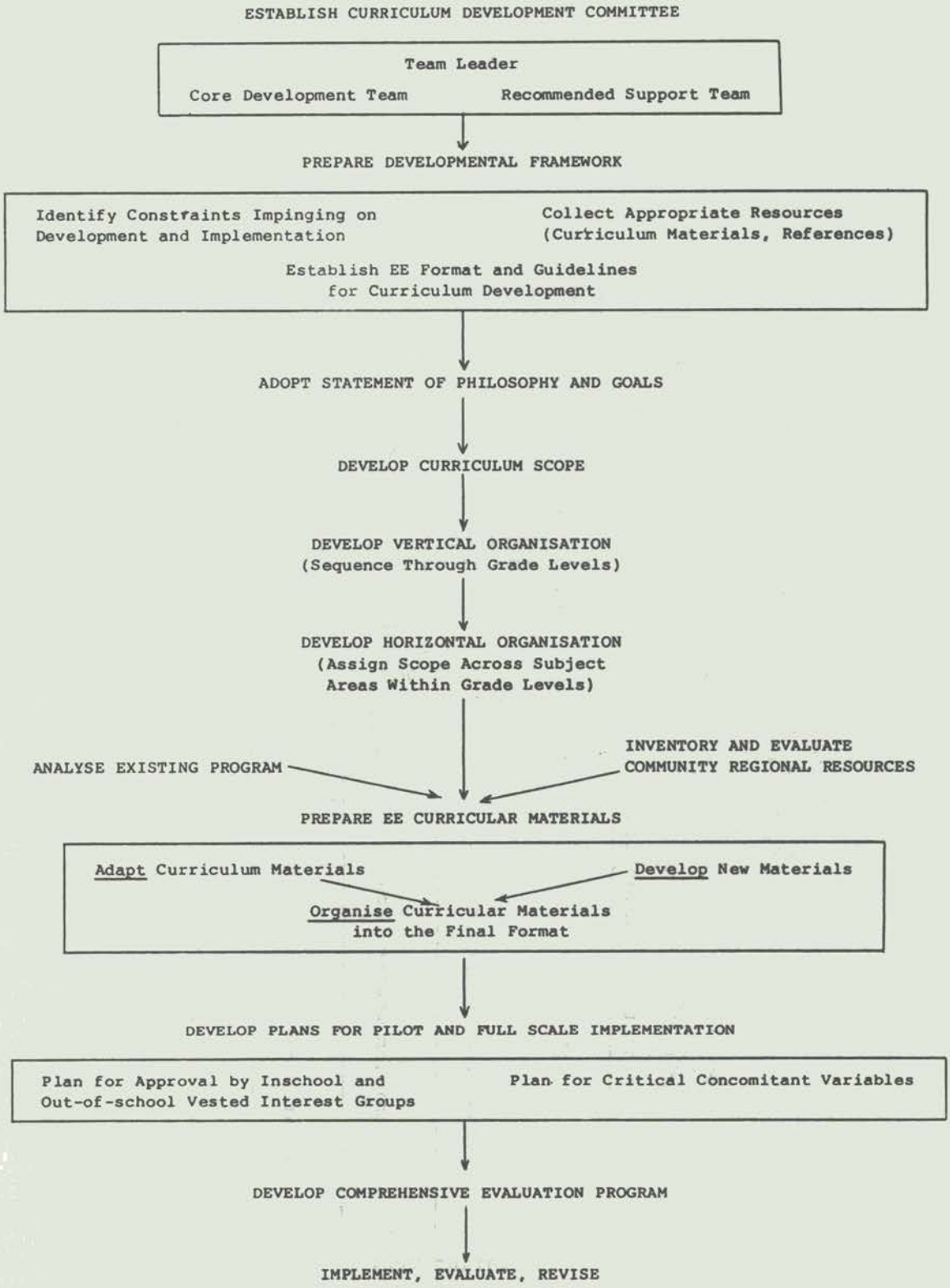

Figure 13: Process Flow Chart for Curriculum Development*

*UNESCO Document No. ED-80/WS/134 - Harold R. Hungerford (ibid), p. 61.

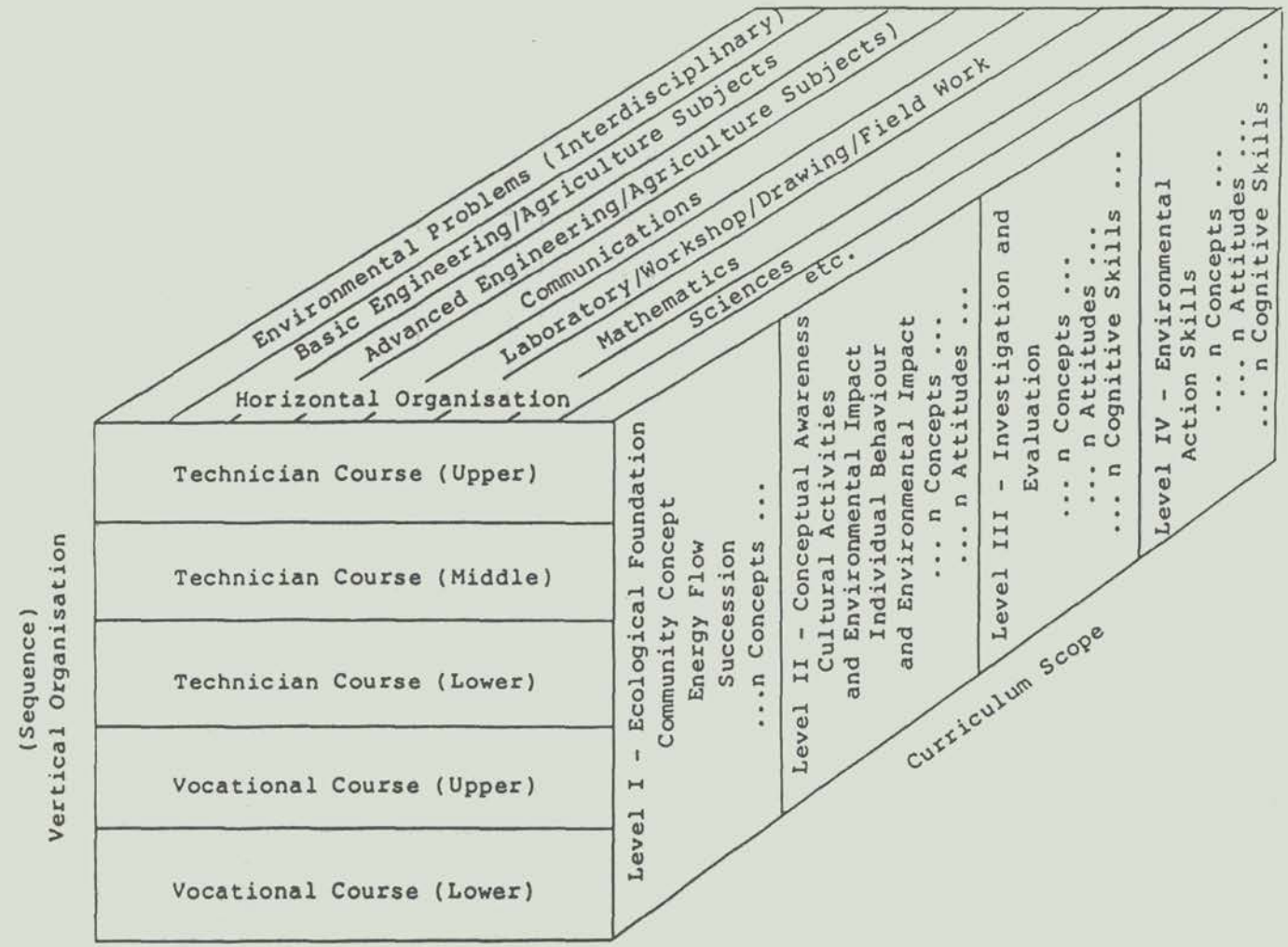

Figure 14: A Conceptual Model Illustrating the Integration of the Curriculum Scope through Grade Levels and Across Subject Areas within Grade Levels in Industrial and Agricultural Schools (Modified from Harold R Hungerford, UNESCO Doc. No. ED-80/WS/134)

- it is transdisciplinary in its approach, drawing on the specific content of each discipline to provide a holistic and balanced perspective;

- it emphasises active participation in preventing environmental problems and working toward the solution of those found;

- it enables learners to play a role in planning their learning experiences and provides an opportunity for making decisions and accepting their consequences;

- it focuses on current and potential environmental situations;

- it explicitly considers environmental aspects in plans for development and growth;

- it examines environmental issues from local, national and international points of view so that learners receive insights into environmental conditions in other geographical contexts;

- it focuses on the learner's own community and relates topics being discussed to state, regional, national and international issues and perspectives;

- it relates environmental sensitivity, knowledge, problem-solving and values at every level, but with special emphasis on environmental sensitivity among young people;

- it emphasises the complexity of environmental problems and the need to develop critical thinking and problem-solving skills;

- it utilises diverse learning environments and a broad array of educational approaches to teaching/learning about the environment with due stress on practical activities and first-hand experience.

9.3 Curricula

(a) In the case of existing courses, Environmental Education aspects may need to be introduced incrementally with major structural changes taking place in planned stages. This would ensure that present compatibility with career needs is not disturbed and employment prospects not jeopardised. Awareness and sensitivity towards Environmental Education needs to be introduced within current programmes without unduly extending course duration.

(b) The curriculum document is not just a compendium of course/subject syllabii, but includes other components such as:

- topic sequencing
- time allotted for each topic
- instructional objectives (general and specific)
- recommended teaching methods
- instructional resources needed
- assignments/worksheets/exercises
- evaluation scheme
- teacher support materials (teaching schemes, lesson plans)

(c) Curriculum documents may be prepared centrally for all the industrial/agricultural schools and colleges in a country/state and supplied to all institutions. Autonomous institutions might wish to use them as a basis on which to develop detailed curricula from an assessment of their local needs. Detailed procedures for developing these documents are as indicated in section 7.3.

(d) Part of curriculum development is the production of instructional materials for student use - for example notes, textbooks, guides, workbooks, assignment/question banks, audio-visual aids, simulations/games, projects etc. These may be developed by conducting appropriate workshops in which competent teachers and specialists participate.

(e) The curriculum materials so prepared should be adequately pilot tested (evaluated) before they are used in the classroom. Alternatively they may be trial tested on students and subsequently revised.

(f) Curriculum materials in Environmental Education subjects become out-of-date and lose relevance unless periodically reviewed and evaluated. Institutions need to anticipate this need.

9.4 Instructional Materials and Media.

In most countries, educational systems are often handicapped by a paucity of appropriate print and non-print instructional resources for use by teachers and students. In the case of Environmental Education, the efforts should be made to bridge the gap between the production of this type of material and the demand for them. The potential of the mass media in every country to spread information

about environmental matters should be utilised to achieve the goals of Environmental Education. In the light of these recommendations, the following specific guidelines may be helpful:

(a) Environmental experts and teachers in industrial and agricultural schools and colleges could be encouraged to form teams for writing textbooks and other instructional materials for Environmental Education. They could be provided with sufficient financial and other incentives to do so, for example, encouraging them to take up such work during their sabbatical or study leave periods.

(b) Book publishers and media producers in each country should be made aware of their potential role in creating environmental consciousness and be encouraged to produce books, filmstrips, movies, TV programmes, dramas, about environmental awareness for use in Environmental Education.

(c) The management of technical and agricultural schools and colleges could institute national/regional awards annually for the best instructional resource/media software relating to Environmental Education.

(d) Preferably, materials produced should be made with locally available low cost materials relevant to local conditions, and cultural traditions. Media imported from abroad may not always be the most suitable. This should not, however, preclude exchange of resources between countries (e.g. through UNESCO) and their adaptation/modification/translation to meet local needs.

(e) While many countries today have well established systems for radio and TV covering the entire population of the country, the use of these systems for educational purposes is still limited. Since Environmental Education will be a concern of most countries in the years to come, efforts should be made to establish good links between media experts and educationists to develop the effective use of these systems for the dissemination of environmental awareness programmes. In each country, national media systems should be asked to accord priority to Environmental Education, particularly for industrial and agricultural education.

9.5 Assessment and Evaluation.

The introduction of Environmental Education components into the curricula of industrial and agricultural school could require changes in current student assessment practices (section 7.6). Some important points to consider are:

(a) an assessment scheme closely tied to curriculum objectives, and hence the nature of competencies to be developed, is an essential pre-requisite for success.

(b) the assessment scheme should utilise all the tools and instruments such as objective, short answer and essay type questions, rating scales, case-studies, surveys, interviews, opinionnaires etc. normally used, which are appropriate to the behaviour being tested. In practical and experimental areas a suitable mix of process and product evaluation will need to be used.

(c) criterion-referenced testing should be used to assess objectives specifying competency and standard performance levels.

(d) specialists in environmental areas both from industry and education will need to design and implement the assessment procedures.

(e) research into assessment methods needs to be undertaken in areas such as the correlation between student performance in environmental subject areas and other subjects.

9.6 Teacher Training.

One factor effecting the successful implementation of Environmental Education programmes is the training of the personnel responsible for putting the programmes into effect. Both formal and non-formal approaches, pre-service and in-service modes need to be utilised in training programmes for teaching personnel with the objective of developing their ability to incorporate environmental components in their teaching. In addition to the various strategies and methodologies for teacher education and training in environmental areas which have been discussed in section 8.4 the following aspects also need to be considered:

(a) while determining the needs of teacher education for Technical and Vocational Education, the special needs of environmental subjects introduced into the curricula of industrial and agricultural schools should be considered.

(b) the approaches and strategies needed for training teachers in Environmental Education may be different from those normally used.

(c) the additional training needs of teachers for Environmental Education can be broadly classified into these areas:

i) knowledge of newly introduced environmental subjects.

ii) pedagogical skills particularly relevant to the teaching of environmental subjects.

iii) exposure to/training in appropriate industries concerned with environmental protection.

iv) management of the instructional system to meet the additional demands imposed by the integration of Environmental Education components (e.g. production of instructional materials etc.).

(d) the motivation of teachers to incorporate environmental components in their teaching strategies.

Teacher training colleges may first have to prepare to meet this new challenge by taking measures to orient their teacher-educators to environmental issues.

9.7 System Management.

Implementation of the kind of changes in the educational system envisaged in this report requires a forward-looking, dynamic and committed senior management. Educational systems are already undergoing changes in several respects, but the changes envisaged pertaining to Environmental Education have far reaching consequences and hence need to be handled with the utmost foresight. Some useful guides to system managers in this regard are:

(a) make special efforts to create an awareness of the need for Environmental Education in industrial and agricultural schools at all levels of the system.

(b) ensure that teachers, students and parents are aware of government and system policies on Environmental Education.

(c) invest time in planning, course design, procurement of resources and curriculum design before venturing to implement Environmental Education.

(d) be flexible in approaches, schedules and targets to ensure adequate cooperation and involvement by all the stakeholders in the project.

(e) take steps to obtain the active cooperation and support of industries (particularly those interacting with the environment).

(f) establish proper links between institutions within the system and the surrounding communities.

The success of the educational approach to solving environmental problems rests heavily on the attitudes exhibited by managements of industrial and agricultural schools.

10. RECOMMENDED ACTIVITIES AND DOCUMENTS TO BE DEVELOPED BY UNESCO-UNEP INTERNATIONAL ENVIRONMENTAL EDUCATION PROGRAMME(IEEP) FOR INCORPORATING ENVIRONMENTAL EDUCATION IN TECHNICAL AND VOCATIONAL EDUCATION

The incorporation of Environmental Education components in the curricula of industrial and agricultural schools needs to be considered as a major "change project" in the educational system. The general guidelines provided in the chapter 9 may be considered as a necessary first step. This should be followed by a series of activities leading to the development of important policy documents, guidelines, working documents etc. to be used by various groups of professionals for producing and implementing curricula. In this context the following activities and documents are recommended to be developed:

10.1 Activities.

i) Development of prototype curricula, programmes, structures, methodologies as well as teacher-training programmes.

Unesco has already initiated a number of activities under Environmental Education in a proactive manner and much progress has been made in incorporating Environmental Education into primary and secondary education. Similar initiatives are now to be taken up in the post-secondary sector, particularly in Technical and Vocational Education commencing at the level of the industrial and agricultural schools.

Workshops and training seminars at international, regional and sub-regional levels need to be conducted by IEEP for curriculum developers and teacher trainers in Technical and Vocational Education to identify possible approaches, structures and methodologies, to prepare model curricula in chosen disciplines as well as sample teacher-training programmes. These will provide the required guidance of countries and institutions desirous of incorporating Environmental Education into their Technical and Vocational Education programmes. Experts from organisations such as ILO, CPSC, FAO and WHO should be consulted in the preparation of such programmes.

ii) Development of suitable textbooks, workbooks, instructional modules, and teaching aids including film and video programmes.

Lack of suitable instructional resources could emerge as a major handicap in the successful implementation of Environmental Education. This

deficiency could be largely overcome by the production of inexpensive local resources and production of standard books and other materials of high quality with support from Unesco. Organisations with a direct teaching function, such as the Colombo Plan Staff College could be commissioned to extend their services as producers of teaching materials.

iii) Exchange of information between countries and supply of resources and media materials.

IEEP should foster the exchange of information on the incorporation of Environmental Education in Technical and Vocational Education as a part of its international network of information exchange.

iv) Organisation of periodic conferences, training seminars, and symposia.

The importance of organising training seminars, conferences, and symposia both within a country and at regional and international levels needs no reiteration. At the regional and international levels such meetings bring experts in the field of Environmental Education together and facilitate exchange of successful experiences as well as problems faced and solutions adopted. In this context training seminars should be organised. Furthermore, Environmental Education should be placed on the agenda of Technical and Vocational Education meetings such as the International Congress on Technical and Vocational Education to be organised in 1987.

v) Institution of awards and prizes for outstanding achievements in Environmental Education and for the production of innovative media and instructional resources.

Perhaps the surest way to motivate people for greater involvement and effort in Environmental Education is to recognise and reward exceptionally good work done in the field. Unesco has excellent scope to take up such activities which will eventually lead to the establishment of proper norms and standards at a global level and support such activities at country levels also.

vi) Pilot programmes and research projects.

The introduction of Environmental Education into industrial and agricultural schools might need a cautious approach through the use of pilot studies and impact studies. Such activities quite often require a considerable investment of resources and need to be supported by Unesco.

vii) Establishment of national centres.

Among the several strategies to promote intensified activities in Environmental Education would be the identification of centres of excellence and potential in each country and their designation as national centres for Environmental Education. In Technical and Vocational Education, it would not be difficult to identify such institutions through the respective governments by establishing a set of criteria for selection. If such national centres are provided with adequate funds and expertise through Unesco, it would be possible to generate replicable models for excellence in Environmental Education in each country.

10.2 Documents to be Produced.

A large number of the activities described above would lead to the production of reports, case studies or other publications which would be of use to national organisations working for Environmental Education in Technical and Vocational Education. In particular, international documents of significance would be:

i) Documents on general guidelines, objectives, concepts, approaches, methodologies etc. for incorporating Environmental Education into the curricula of industrial and technical schools.

ii) Prototype course structures, syllabii and Environmental Education components for samples of conventional industrial and agriculture courses in Technical and Vocational Education and integrated Environmental Education oriented courses.

iii) Lists of prototype projects to be undertaken by technician level students in industry/field/farm in the area of environmental protection.

iv) List of prototype research activities that could be taken up by technician institutions in Environmental Education areas.

v) National/worldwide directories of institutions in technology and agriculture which offer Environmental Education oriented technician courses.

vi) An international directory of eminent educationists/ media specialists/teacher trainers in industry and agricultural who have specialised experience in environmental studies.

vii) An international resource book of industries/farms/ organisations taking an active part in imparting Environmental Education.

viii) An international resource book of teaching aids, educational films, video programmes and gaming/ simulation exercises at post-secondary level for students in technician and agriculture education.

ix) The journal "Connect" needs to report on research and innovations in implementing Environmental Education in technician and agriculture subjects.

x) Simple and concise appreciation documents.

xi) Environmental Education guides for teacher trainers in Technical and Vocational Education.

APPENDIX 1

AGENDA

1. Opening of the Meeting.

2. Presentation on Unesco-UNEP International Environmental Education Programme.

3. Country Reports.

4. Overview of Environmental Education (EE) and Technical and Vocational Education (TVE).

   (a) EE as a common denominator for educational renewal:

   - The development of EE
   - The need for EE
   - Contributions of EE in educational renewal
   - Goals, objectives and guiding principles of EE

   (b) TVE (Industrial and Agricultural Education)

   - Definitions
   - Objectives
   - Types and levels: Industrial, Agricultural

   (c) The role of TVE in environmental change.

5. The need and place of EE in TVE:

   - Enrichment of objectives, contents, methods, training and evaluation for the protection and improvement of the environment.

6. Essential environmental knowledge and EE teaching methodologies for:

   (a) Industrial Education
   (b) Agricultural Education

7. Guidelines for the incorporation of EE into school curricula and teacher training in:

   (a) Industrial Education
   (b) Agricultural Education

8. Recommended activities and documents to be developed by the Unesco-UNEP International Environmental Education Programme for fostering the incorporation of environmental education into technical and vocational education.

9. Closing of the Meeting.

APPENDIX 2

UNESCO-CPSC CONSULTATION MEETING ON THE INCORPORATION OF ENVIRONMENTAL EDUCATION INTO TECHNICAL AND VOCATIONAL EDUCATION
(10 - 14 March 1986)

TIME TABLE

DAY & DATE	FORENOON SESSION (9 AM TO 12 NOON)		AFTERNOON SESSION (2 PM TO 6 PM)
Monday 10 Mar 1986	1. Registration 2. Opening Session 3. Election of Bureau 4. Presentation of Unesco-UNEP International Environmental Education Programme		5. Presentation of Country Reports
Tuesday 11 Mar 1986	6. Overview of EE and TVE (a) EE as a common denominator for educational renewal (b) TVE (Industrial and Agricultural Education) (c) The Role of TVE in environmental change 7. Need and Place of EE in TVE 8. Formation of Working Groups A & B	LUNCH BREAK	9. Essential environmental knowledge and EE teaching methodologies for: (a) Industrial Education (b) Agricultural Education 10. Guidelines for the incorporation of EE into school curricula and teacher training in: (a) Industrial Education (b) Agricultural Education
Wednesday 12 Mar 1986	11. Continuation of group work and preparation of reports.		11. Continuation of group work and preparation of reports.
Thursday 13 Mar 1986	12. Group reports and their consolidation.		13. Recommended activities and documents to be developed by Unesco-UNEP International Environmental Education Programme for promoting the incorporation of EE into TVE at national, sub-regional, regional and international levels.
Friday 14 Mar 1986	14. Study of Draft Final Report.		15. Closing of the Meeting.

NOTE: Morning Coffee/Tea Break: 10.30 to 10.45 am Afternoon Coffee/Tea Break: 3.30 to 3.45 pm

APPENDIX 3

Documents Presented to the Meeting

1. McCAIG R, C R K SASTRI and T BOONYASOPON (1986). Guidelines for the Incorporation of Environmental Education in Curriculum and Teacher Training for Industrial and Agricultural Schools. Colombo Plan Staff College, Singapore.

2. GRABE, S (1986). Environmental Education in Technical and Vocational Education. Draft. Unesco, Paris.

3. MALHOTRA, M M and C R K SASTRI (1985). Case Study on the Incorporation of Environmental Education into the School Curriculum and Teacher Training of Technical Schools in Singapore. Colombo Plan Staff College, Singapore.

4. MEADERS, D D, J F BOBITT and D I JOHNSON (1986). Incorporation of Environmental Education into the Vocational Agriculture Curriculum and Agriculture Teacher Curriculum. Michigan, USA. (Draft). Unesco, Paris.

5. VARGA, S (1983). Environmental Education in Vocational Education in the Czechoslovak Socialist Republic in Pt III Environmental Education in the USSR example Prague 1983.

Reference Material

1. Curriculum Development Centre. (1975). A Proposal for the Support of Environmental Education in Australia, Interim Report of the CDC Environmental Education Committee, Canberra, p.2.

2. Colombo Plan Staff College for Technician Education. (1982). Aspects of Curriculum for Technician Education. Singapore: CPSC.

3. SALASOO T, P HARDY, R HAYES et al (1984). Environmental Education in TAFE Project. NSW, TAFE, Sydney.

4. BOONYASOPON, T (1983) Development of Technical and Vocational Education Programmes in Thailand, Bangkok: KMIT/NBC . (Mimeographed).

5. BOONYASOPON, T (1984). Vocational and Technical Education in Thailand. (Mimeographed).

6. STAPP, WILLIAM B (1969). "The Concept of Environmental Education". Journal of Environmental Education. Vol I, No. 1.

7. UNESCO (1974). The Meeting of Experts on Environmental Aspect of Engineering Education and Training. Paris, France.

8. UNESCO/UNEP (1977). Intergovernmental Conference on Environmental Education. Final Report, Tbilisi (USSR) 14 - 26.

9. UNESCO (1974). Terminology of Technical and Vocational Education.

10. UNESCO/UNEP (1980). International Environmental Education Programme. Strategies for Developing an Environmental Education Curriculum. Report.

11. UNESCO/UNEP (1980). International Environmental Education Programme. Strategies for Training of Teachers in Environmental Education. Report.

12. UNESCO/UNEP (1974). Meeting of Experts on Environmental Aspects of Engineering Education. Final Reports. Paris.

13. UNESCO (1974). Prospects - A Quarterly Review of Education. Education for a Better Environment. Vol VIII, No. 4.

14. UNESCO (1981). A New Role for Science in a Core of Environmental Education - Bulletin of the UNESCO Regional Office for Education in Asia and the Pacific, No. 22.

15. UNESCO (1980). - WIKE, RICHARD J, R BEN PEYTON, and HAROLD R HUNGERFORD - Strategies for the Training of Teachers in Environmental Education.

16. UNESCO (1980). - HUNGERFORD, HAROLD R and ROBERT BEN PEYTON - Strategies for Developing an Environmental Education Curriculum.

17. UNESCO (1980). - Bulletin of the UNESCO Regional Office for Education in Asia and Oceania, Technical and Vocational Education in Asia and Oceania. (UNESCO, Bangkok).

18. U.N. (1980). The Declaration of the U.N. Conference on Human Environment in Stockholm, 1972 - from "Environmental Education in the light of Tbilisi Conference", UNESCO, Paris.

APPENDIX 4

UNESCO-UNEP-CPSC CONSULTATION MEETING ON
INCORPORATION OF ENVIRONMENTAL EDUCATION INTO
TECHNICAL AND VOCATIONAL EDUCATION
(10 - 14 March 1986)

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APPENDIX 5

Statement for the opening session
by Dr Abdul Ghafoor
Programme Specialist in Environmental Education
Unesco, Paris

Ladies and Gentlemen,

It is indeed a pleasure for me to welcome you on behalf of Unesco to the Consultation Meeting on the Incorporation of Environmental Education into Technical and Vocational Education. This Consultation Meeting is organized by Colombo Plan Staff College for Technician Education under Unesco contract, and in co-operation with the Unesco-UNEP International Environmental Education Programme (IEEP). This meeting is conceived in the context of Unesco's Programme and Budget for 1984-1985 as an activity of IEEP.

Environment is the total sum of all the factors that affect an organism. Environment in its totality encompasses the physical, biological, socio-cultural dimensions. Humanity affects the environment and gets affected by it. Humanity, by a long process, has developed a balanced relationship with the environment. Disturbing this long-established relationship could mean a stress to either or both sides. This undesired stress I call environmental problem. Environmental problems can be considered serious if they enter into and disturb the natural cycles, such as the chemical, biological, psychological and social, as well as the economical and political dimensions of human life.

Human intervention in the environment, coupled with an unprecedented use of energy and technology has scarred the environment so fast and, in some cases, so deep, that the on-going processes in natural environment fall short in repairing the incurred damages. Some of these damages, such as deforestation, desertification, groundwater pollution, radio-active pollution, will take many years and requires certain correcting measures for it to be repaired. Some damages or problems such as extinction of species, depletion of non-renewable resources (such as oil) can be permanent, with definite impact on the different dimensions of the environment.

Environmental problems found indoor and outdoor, such as depletion of some natural resources, pollution of air, water, soil, heat, noise etc., are in general man-made; others are natural disasters, such as eruptions of volcanoes, floods, earthquakes, etc.

The best strategy not to have environmental problems is to prevent them through sound planning for sound development. In economic planning and development, in addition to environmental impact assessment, the cost of prevention and solution of environmental problems need to be calculated and put in the plan. Suitable technology, which should utilize natural resources economically and would not cause pollutions of different sorts and damage to the environment, is another important measure, that should be considered and developed particularly by those in command of advanced technologies.

In general, the following broad measures are considered essential for the prevention and solution of environmental problems:

- Provision of awareness, knowledge, attitudes, skills, commitments and actions for children and adults, through formal and non-formal environmental education as a life-long process;

- Establishing the required environmental legislation and reinforcement of existing ones;

- Developing environmental ethics; and

- Developing new patterns of development along with new suitable technologies that could seed and sustain sound development with minimum waste and pollution.

The Intergovernmental Conference on Environmental Education, Tbilisi (USSR), 1977, proclaimed in its Recommendation No. 1 that "a basic aim of environmental education is to succeed in making individuals and communities understand the complex nature of the natural and built environment, resulting from the interaction of their biological, physical, social, economic and cultural aspects, and acquire the knowledge, values, attitudes and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of environment." It was further stated: "A basic aim of environmental education is clearly to show the economic, political and ecological interdependence of the modern world, in which decisions and actions by the different countries can have international repercussions. Environmental education should, in this regard, help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the environment." It was further emphasized that "Special attention should be paid to understanding the complex relations between socio-economic development and the improvement of the environment", as well as to "those ethical, economic and aesthetic values which, constituting the basis of self-discipline, will further the development of conduct compatible with the preservation and improvement of the environment".

In teaching/learning processes, environmental education makes the teaching contents at primary, secondary and tertiary levels relevant to the immediate and far environment of the individual and society. This relevance of contents makes learning more appealing for the learners. Similarly, environmental education makes educational teaching methodologies dynamic and functional, and thus it facilitates the task of teaching if the teacher has acquired environmental knowledge and experience in its teaching.

It is in the context of the importance of the environment, the need for prevention and solution of its problems, the emergence of environmental education as a common denominator for educational renewal and its dynamic role in facilitating teaching/learning processes, as well as the role of industrial and agricultural school graduates in affecting the environment, that the Consultation Meeting on the Incorporation of Environmental

Education into Technical and Vocational Education is organized. This meeting is envisaged to be followed-up by sub-regional training seminars for teacher educators and curriculum developers in technical and vocational education.

The objectives of the meeting are to study the need and place of environmental education in technical and vocational education, to develop guidelines for the incorporation of environmental education into curriculum and teacher training for industrial and agricultural schools, to recommend documents and activities in this field to be developed by IEEP at sub-regional, regional and international levels, and to foster exchange of information and experience in this field among Member States.

Major elements of agenda for the meeting are: (1) presentation on Unesco-UNEP International Environmental Education Programme, (2) presentation of country reports, (3) overview of environmental education and technical and vocational education, (4) the need and place of environmental education in technical and vocational education, (5) essential environmental knowledge and environmental education teaching methodlogies for industrial and agricultural education, (6) guidelines for the incorporation of environmental education into school curricula and teacher training in industrial and agricultural education, and (7) recommended activities and documents to be developed by the Unesco-UNEP International Environmental Education Programme for fostering the incorporation of environmental education into technical and vocational education at sub-regional, regional and international levels.

Preparations for this meeting have involved collaborations of different institutions and professionals with Unesco. Unesco has defined and prepared the objectives, agenda, information note, draft invitation letter, outline of working document, three case studies on the incorporation of EE into the curricula and teacher training for industrial and agricultural schools in Czechoslovakia, Singapore and the State of Michigan in the U.S.A., as well as a study on Environmental Education for Technical and Vocational Education.

Colombo Plan Staff College for Technician Education (CPSC), in addition to having taken the responsibility of organizing the meeting in co-operation with IEEP, has issued invitation letters and air travel tickets to participants, has housed the meeting in its premises and has prepared the working document and one of the case studies referred to above. CPSC will prepare the draft final report which will be printed by Unesco in Paris.

The third group that has been involved in the preparation of this meeting is you, as the experts in this field. You have been kindly requested to prepare country reports in accordance with a given outline and to present them at the meeting for providing up-to-date information and experience for preparing the stage as a concrete context for deliberations of the meeting.

The expected results of this meeting would involve, of course, the fulfilment of its objectives which could result in the preparation of a substantive final report that has been outlined in parallel with the agenda, the working document and the case studies referred to above. The final report is to serve Unesco and other interested educational institutions in developing Environmental Education in the context of technical and vocational education and undertaking concrete activities as priorities in this field. In order to prepare the envisaged substantive final report, it is suggested that it should include the guidelines that will be developed by this meeting as well as certain chapters or elements of the working document and the case studies referred to above after careful study and endorsement by the meeting. Furthermore, the report will reflect a combined resume of presented country reports. This way, the final report will be based on the rich work of this meeting and efforts of institutions that have been collaborating in the preparation of inputs to this meeting.

On behalf of Unesco, I thank the Colombo Plan Staff College for Technician Education (CPSC) for the preparation and organization of this meeting in co-operation with the Unesco-UNEP International Environmental Education Programme. I want to thank Dr. Robert McCaig, Director, CPSC and his staff members who have met all the deadlines in the preparation of the meeting. I want to thank the participants who have accepted the invitation and have joined us here in this meeting in their personal capacities for developing guidelines for the incorporation of environmental education into curriculum and teacher training for industrial and agricultural schools which could lead, in the long run, to improving the environment for present and future generations, as was well proclaimed in the Declaration of the United Nations Conference on Human Environment, Stockholm, Sweden, 1972: "To defend and improve the environment for present and future generations has become an imperative goal for mankind".

APPENDIX 6

Summaries of country reports presented to the meeting.

Summary: Review of Environmental Education In Technical and Vocational Education in Australia
Dr. P. Hardy (NSW TAFE)

Like many other countries Australia has a number of environmental problems: leached or saline soils in agriculture, thus reducing productivity; erratic and often low rainfall demanding extensive use of irrigation to ensure a reliable water supply for agriculture, urban and industrial use; degradation of fragile ecosystems as a result of mineral exploitation and population concentrations on the coast; pollution of air and water; waste disposal; natural hazards; and social changes resulting from changing economic activity, labour force structure and immigration. Successive governments have placed emphasis on seeking solutions to these problems through various programmes.

The National Conservation Strategy for Australia (1984) which has been endorsed by Commonwealth and State Governments alike, includes a commitment to environmental protection, to environmental education and to providing community awareness of environmental issues. A number of Commonwealth and State departments are concerned with environmental matters but responsibility for all education is vested in the state governments. Technical and Vocational Education at operator to para-professional levels for mature-aged students and those who have completed a minimum of nine years of full-time education, is offered mainly through Technical and Further Education (TAFE) authorities. New South Wales (NSW) TAFE offers over 900 such courses. Universities, Institutes of technology, Agricultural colleges and other colleges of advanced education offer Technical and Vocational Education at the professional level for students who have completed at least eleven years of full-time study.

A need for environmental education at general awareness and specific industry-related knowledge and skill levels, has been expressed by numerous employers from a variety of industries. Thus, the current provision of Environmental Education in Technical and Vocational Education in all states is quite extensive and diverse. NSW TAFE, for example has 185 courses which contain environmental input covering such areas as occupational health and safety, work environment, environmental planning and legislation, landscaping, pollution and hazardous chemicals, life oriented studies, public health, ecology, noise control, pest control, commission control, tourism, environmental aspects of mining, hygiene, soil conservation. A number of courses provide specifically for vocations requiring "Environmental Technicians" and others for the important community sector. A recently

approved policy on environmental education for this authority seeks to improve the environmental input to all courses where it is relevant. Integration of this input in existing courses is likely to occur through normal curriculum development mechanisms and through developing new curricula and resources according to proposed environmental education guidelines. As industry plays a part in this process of course review and revision the needs can be met, providing they are perceived. Priorities for Environmental Education in Technical and Vocational Education are considered to be in Occupational Health and Safety, multicultural and anti-discrimination education. Some groups also emphasise that more co-ordination and development of "Environmental Technician" courses deserves priority.

Suggested strategies for implementing environmental education fall into two areas: providing the pre-delivery framework for course development; implementation and teaching strategies.

Technical and Vocational organisations could be at the forefront of Environmental Educational development as they reach significant numbers of people with diverse backgrounds and requirements who continuously interact with the environment at a practical and individual level. However, it is not clear that environmental education needs are being voiced sufficiently loudly to make resources available and to generate curriculum development to meet this need.

Summary: Environmental Education Egypt:
Prof Dr Ali Labib Ibrahim

The concept of environmental education as supported by the experts in the Arab Region and adopted by ALESCO was presented and its objectives outlined. A list of the main environmental problems in Egypt was given among which are the following:

1. Inbalance between population growth and available resources, and productivity.

2. Continuous decrease in soil fertility due to absence of silt usually carried by the Nile after the establishment of the High dam.

3. Shrinking area of cultivable land due to its use for buildings in spite of the fact that 94% of the area of Egypt is desert.

4. Increasing pollution problems of all kinds: soil, water, air, food, noise and others; the spread of many diseases as the result of pollution (Belharzia).

5. Congestion of metropolitan and urban areas to the point that large cities are inhabited by more than double capacity, and rural areas are losing a large percentage of their labour force.

Environmental Education in Egypt developed through 3 stages:

(a) Study about the environment: started in the 1940's in some experimental schools at primary and junior secondary levels. This was considered as a step towards realizing the importance of the environment as a laboratory for school activities.

(b) Conservation education: during the 1950's few educators tried to develop programmes of conservation education mainly through science curricula. It was resisted by parents and examination personnel.

(c) Environmental Education: many projects were developed in the 1960's. The 1970's were the years of actual progress in Environmental Education. The concept of Environmental Education, its objectives, materials, were widely known among educators, and genuine efforts started to promote this at all levels of education.

The general objectives of Environmental Education to be achieved in different Egyptian institutions were listed. The Faculty of Education at Ain Shams Univ., other university organizations and some research centers are carrying on research since it is needed to evaluate the different aspects of Environmental education, expose present problems and suggest ways of dealing with them.

In-service training for graduates of technical education on the job should be looked upon as an important aspect of their training. Environmental aspects should be brought up and dealt with in a scientific way.

The availability of resource materials is basic for developing and implementing successful environmental education programmes. This should be achieved through international, regional and national efforts.

Teacher education should be looked upon as an important aspect of environmental education programmes. There must be programmes at the pre-service level to be carried out by teacher training institutions, as well as programmes of in-service training. Experts in industry and from the factories where graduates are employed should be invited to have an active role in promoting environmental awareness and skills among teachers. It should be mentioned that a programme of environmental education for technical education should be looked upon as being in need of continuous evaluation and improvement.

Summary: Environmental Education in the Technical and Vocational Schools in Indonesia:

Tri Iswoyo

1. Indonesia is the world's largest archipelago comprising of 13, 677 islands; 6,044 islands have names and the other 7,633 are nameless. Out of those 13,677 islands, only 7 percent are inhabited.

2. The total population is about 166,0 million and 63 percent of the total population live on Java island which is only 7 percent of the total land area. The total land area is of 190,5 million HA includes 108 million HA of forest, 64 million HA of grassland and deforested areas and another 18 million HA of croplands. About 70 percent of the country consists of sea.

3. The vast archipelago and innumerable islands have made Indonesia the home of a large variety of plants and animal life, both terrestrial and aquatic. The country also has a favorable climate for producing a wide range of crops.

4. The Constitution of 1945 stipulates that natural resources must be used for the maximum welfare of the nation. This welfare must be available both in the present and for future generations. Furthermore, the guidelines of state policy state that national development as a conscious effort to manage and utilise resources for the purpose of improving the quality of life of the nation, aims not only at bringing about prosperity or spiritual contentment but also at achieving a balance between the two. Therefore, the utilization of natural resources must be in equilibrium with the harmony and balance of the living environment.

5. Indonesia has launched her five year development plans by developing primary, secondary and tertiary production. Primary production development is achieved through intensive and extensive farming. It is expected that the increase of farmer income will then be used to increase consumption and thus increase the quality of their standard of living. This also means opening of larger markets for the secondary sector. Secondary production development is achieved through upstream and downstream economic development. Upstream industrial development is aimed at exploiting more natural resources as basic industrial material either for the primary or secondary sectors which will relieve Indonesia of her external dependence on industrial materials. Downstream industries at the present stage are still sustaining imports to save foreign exchange and at the same time open more employment opportunities. Tertiary production is the services sector which is to be developed by improving services such as cooperatives, medical services and other infrastructural services.

The transformation of production processes brings about negative impacts to the environment. To minimise the negative impacts, the management of living environments demand development of an integrated system. As the maintenance of good and healthy ecosystems is the responsibility, and requires the participation of each member of the community so, to develop the awareness and the sentivity of the younger generations to the environment, the government has decided to introduce environmental education in all curricula of primary and secondary students designing in 1982, including this also in the curricula of technical and vocational education.

In technical and vocational education, the incorporation of environmental education (EE) in 1982 was made in relevant subjects which each school might adjust to local conditions. In such a case, there was no "minimum" content to be given in technical and vocational schools.

In the improved curriculum, named 1984 curriculum, which is being implemented gradually in this school year (1985/1986), the presence of environmental education in the curricula of technical and vocational education becomes more urgent.

The 1984 curriculum, which is a core curriculum, consists of core programmes and optional programmes. The core programme consists of general subjects: Religion, Pancasila Education, Indonesian language, History Sport and Health Education/which are compulsory for all students at the same level of education, and basic vocational subjects. Although the names of subjects in basic vocational education vary due to the cluster of study programmes, there are several subjects which are common to almost all programmes such as Mathematics, English, and Science. The optional program comprises vocational subjects relevant to the study programme.

Based on the pattern above, environmental education in the technical and vocational schools in Indonesia is mainly given by teachers of general subjects and some relevant subjects in the basic vocational subjects.

So far, the teachers teach environmental education using the basic course outline, BCO, supplied by the Curriculum Development Centre. Unfortunately, the BCOs were designed for general schools To overcome this problem, the Directorate of Technical and Vocational Education has informed the Curriculum Development Centre and discussions to solve the problems are still in progress.

The minimum content of environmental education covers the concept of environment, resources, man and environment, national development and environment, and technology and development. Other topics that are closely related to vocational subjects and which could be grouped into environmental education are treated as topics in the vocational subjects such as, safety, health and accident prevention; fire protection; soil erosion; pest control and plant diseases.

Summary: Environmental Education in Vocational Education in the USSR: Mrs Chernova

In the Soviet Union, a reform of both general and vocational education, is in progress. The methodological basis of environmental education in the USSR implies that solving the problem of environmental quality and inexhaustibility of natural resources consists of further progress in science and technology, and not in a limitation of the use of nature.

Incorporation of environmental education into vocational education is carried out by means of both general, and special educational programmes.

Topics of ecological significance have been included into practically all the subjects of general education, such as biology, physics, chemistry, social science, aesthetics.

The course of general biology is of particular significance. It contains basic knowledge of general ecology and evolution theory as well as a special section entitled "Biosphere and Man".

In the course on jurisprudence pupils study the provisions of the constitution of the USSR and laws on nature conservation as well as the section entitled "The participation of citizens in nature conservation". Problems associated with environmental protection are incorporated in special subjects entitled "Labour protection" and "Fundamentals of labour and industrial economics". By now the programmes of all vocational and technical courses have been reconsidered. For every type of profession its own range of actual questions in the field of environmental protection is considered. Three main ways are used:

(a) distribution of specific items of environmental education among different topics and courses of technological disciplines;

(b) concentration of the bulk of such questions in a separate course, chiefly in that providing fundamentals of the speciality;

(c) preparing special large courses which directly concern the problems of environmental protection according to a concrete speciality. (in some agricultural schools for the wood industry).

Instructions for programmes of vocational training require that special attention should be provided for the ecological education of the students, for the transformation of theoretical knowledge into applied skill.

In Soviet technical and vocational schools a wide range of non-formal methods of ecological education is actively used.

The most important is to involve young people with direct work in the sphere of nature protection.

In Union Republics festivals are organized for the best work in the sphere of nature protection in vocational schools. A special course called "Nature preservation" has been introduced into the curriculum of the Pedagogical Institute of Engineering that prepares teachers for vocational schools. The same course is also delivered in pedagogical schools of industry, where the working experts in vocational training are taught. A series of concrete methodical recommendations specially for teachers has been published.

Publication of the special series of text-books on the problems of nature conservation for vocational schools is proceeding. By order of the State Committee of Professional Education three school films were shot from 1982 to 1985 entitled "Man and nature". "The Biosphere and Man", "Main ways of evolution". All the three films were awarded the highest prizes at international festivals. They are widely used by teachers throughout the vocational schools curriculum.

The State Committee on technical education has developed a strategic plan of measures to improve the level of ecological education in technical schools. This plan is to be accomplished by 1990.

Summing up, we can qualify the modern state of the art as a period of extensive introduction of nature conservation problems into vocational schools.

Despite the evident progress, these activities are far from completion, and much serious work lies ahead.

Summary: Environmental Education in Malaysia: Mr T. K. Phin

Rapid economic development since independence gave rise to environmental problems. Alerted to these problems, the government of Malaysia in the 3rd Malaysia Plan (1976 - 80) included an Environmental Policy.

Together with the Quality Environment Act (74) and the enforcing agency - the Ministry of Science, Technology and Environment the Policy aimed to harmonize man's activities with the environment.

Embodied also in the Plan was the call for Environmental Education (EE) to stimulate awareness among the public of the importance of environmental conservation and protection. The task was to be carried out by educational institutions and the mass media. At this juncture, it should also be pointed that citizens groups and other environmental societies have been and are playing a role in creating this awareness.

But even before that call by the government the Ministry of Education and some local universities had already taken the initiative. The Ministry of Education, through its Curriculum Development Centre (CDC), in the early 1970s started to introduce environment concepts and activities into the school curriculum, especially in the Sciences and Social Sciences. With the revision of the primary and secondary school curriculum, more environmental concepts will be added.

However, the technical and vocational curriculum does not place much emphasis on environmental education because its focus is on exposure to and development of employable skills, although agricultural science and home science, to a lesser extent do have environmental education elements.

It is unlikely that the current focus of technical and vocational education, will be changed. The exception will be at the lower secondary level where a new subject - Living Skills (with environmental concepts) is proposed to replace the four practical electives of technical and vocational education.

At the upper secondary level, there will not be much of an environmental component incorporated in the technical and vocational education. However, there should be no cause for worry because, by then, pupils will have received sufficient instruction at the primary and lower secondary levels, and non-formally through the mass media and voluntary environmental organisations.

Summary: Sri Lanka

Deforestation, caused by the clearing of land for agriculture, commercial logging, shifting cultivation and fuelwood gathering, has been identified as the major environmental problem facing Sri Lanka. For an island with a central mountainous core from which the radial rivers orginate, a sufficient forest cover is important from an ecological standpoint. Pressure of population and the indiscriminate cultivation of marginal lands without proper soil conservation measures have led to a grave loss of topsoil resulting in the siltation of reservoirs. Man-made causes such as sand and coral mining have aggravated the problem of coastal erosion, particularly in the densely populated south-western coastal belt.

Industrial wastes discharged into waterways by the manufacturing industries such as textiles, petroleum refining, tyre and rubber goods, oils and fats, pulp and paper, ceramics, leather and food processing have contributed to water pollution. Agricultural run-off, pesticides and domestic sewage have further compounded this problem.

An awareness of the environmental degradation facing the island in the wake of heavy capital investment to promote economic growth led to the establishment of a central environmental authority. It has, amongst other measures, attempted to incorporate environmental dimensions in the sectoral development plans - though the preparation of a National Conservation Strategy, the introduction of Environmental Import Assessment, and the adoption of environmental standards.

A large number of institutions, both in the public and private sectors engage in activities relating to technical and vocational education. In the formal school system, technical and vocational subjects are introduced at the junior secondary level (Year 7 to Year 11). Except for the syllabii for Agriculture and Home Gardening, not much emphasis is placed on environmental education in the teaching of technical subjects.

Technical education, now assigned to the Ministry of Higher Education, is implemented through twenty seven technical colleges. The courses of instruction provided at these institutes vary from the four year Higher National Diploma, two year National Diploma in Technology to Certificate and Craft Certificate courses ranging from three months to one year. They cater to the needs of commerce, industry and construction activities of the government. Not much emphasis has been given to the environmental education dimension in their curricula.

Vocational training programmes are increasingly diverse. They are handled by various ministries, departments and other agencies in the state sector. The Institute of Workers Education a fully-fledged higher educational Institute of the University of Colombo, functions as a centre of vocational education for those employed on wage-labour or who are self-employed persons. An examination of the existing curricula of the long and short courses for small scale farmers or worker education and skill areas, reveals a lack of an environmental content and approach. In the craft level vocational training programmes offered by the National Apprenticeship Board, the Construction Industry Training Project, the Departments of small industry and labour, not much emphasis has been placed on environmental aspects.

In the vocational training programmes conducted by the Sri Lanka Jathika Sarvodaya Campaign, a non-governmental organization, at training camps, greater emphasis has been given to environmental aspects.

While formal agricultural education at a University level is offered at the faulty of Agriculture, University of Persdeya, the technician (middle) level programmes are offered at the schools of Agriculture. Junior extension workers and overseers are trained at practical farm-schools. Generally the training curricula of agricultural workers, extension officers and supervisors reveals that environmental dimensions are incorporated to a significant degree, particularly in topics relating to soil conservation, compost making etc. At the major plantation crop research institutes and training centres, a variety of training programmes is offered to field officers and extension staff where adequate attention is given to soil and water conservation, crop and livestock integration, inter-cropping, bio-gas production and the establishment of bio-fuel systems in addition to crop botany, agronomy, plant protection and extension methodology. Environmental aspects of the use of perticides need greater emphasis in all the training curricula.