

Environmental Education in Secondary Vocational Education: A Comparison of Five Asian Counties

Neelima Jerath*

Abstract

Technical and Vocational Education (TVE) plays a critical role in the economy of a country. The Punjab Council for Science and Technology (PSCST) and UNESCO identified initiatives in five Asian countries (China, Indonesia, Malaysia, Philippines, India) that integrate environment education (EE) in TVE at the secondary education level and recommended specific actions for their improvement.

Country reports on existing TVE structure and the status of EE at school, certificate, and diploma-level courses were prepared and policy, curriculum improvement, extra-curricular, and teacher-training initiatives were recorded.

The study indicates that EE has not been adequately addressed in TVE systems. It identifies gaps in current structure and recommends that policy, design, and delivery be achieved through partnerships among governments, employers, industry, TVE institutions, and society. A better understanding of environmental issues must be promoted through appropriate curriculum modifications and networking. International organizations like UNESCO should develop policy guidelines, standardized core curriculum, and appropriate teaching-learning materials to ensure uniformity at the international level.

**Joint Director (Environment) Punjab State Council for Science and Technology, Chandigarh, India*
neelimakj@yahoo.co.uk

Introduction

Asia is characterized by its variety of climate, geography, natural resources, population structure, literacy rate, economic structures, and forms of government. Whereas some countries are highly developed, most score low on both the Human and Economic Development Indices despite their rich natural resources. The region is characterized by recent changes like opening up of economies and the recognition of global competitiveness, changes from agrarian to industrial economies; rapid changes in technology, and aspirations for economic development.

Hence, there has been an increasing recognition of the role of Technical and Vocational Education (TVE) in developing a skilled workforce. A reorientation of TVE policies by planners and policymakers has recently taken place. Nearly all countries have introduced TVE in the terminal years of secondary education, in addition to the existing industrial training institutes and polytechnics, which are commonly at senior secondary or post secondary level.

Given the impact of increased technological development on the environment and natural resources, environment education (EE) assumes special importance within the ambit of technical and vocational education. Since the graduates of TVE schools enter into trades that have an immediate and direct impact on the environment, they play a crucial role in implementing practical solutions to current environmental problems.

This study was done in five countries --China, India, Indonesia, Malaysia, and the Philippines-- to examine the general framework of EE in the TVE system at the secondary school level, and identify good practices that might be replicated.

Environmental education is "a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops necessary skills and expertise to address challenges, and fosters attitudes, motivations, and commitments to make informed decisions for responsible action" (UNESCO, Tbilisi Declaration, 1978). Hence, in this process individuals gain awareness of their environment, and acquire knowledge, skills, experiences, and the determination to act as citizens as well as professionals to solve present and future environmental problems. In addition to providing technical expertise and skills to solve particular environmental problems, environmental education should also enhance critical thinking, problem-solving, and effective decision-making skills; and teach individuals to weigh the various sides of an environmental issue in order to make informed and responsible decisions.

Methodology

This study was a joint initiative of the Section for Technical and Vocational Education and the Section for Science and Technology Education of UNESCO in Paris in collaboration with the Punjab State Council for Science and Technology (PSCST) in India. The countries for study were chosen with mutual consultations to make the report as representative of the continent as possible. The following institutions prepared national reports:

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| China | Beijing Academy of Educational Sciences |
| India | Punjab State Council for Science and Technology |
| Indonesia | Technical Education Development Centre |
| Malaysia | Technical Education Department, Ministry of Education |
| Philippines | Western Visayas College of Science and Technology |

An Overview of TVE Courses and the Status of their EE Components

The study indicates that most countries have introduced EE at various levels, however, the extent and modalities vary from country to country. The TVE programs are offered through different channels and have different course structures and modalities of teaching. Information on each country is presented below.

China

Environmental Education in China has a history of more than 20 years. More than 2,000 specialized secondary schools and vocational high schools currently offer environmental courses. However, this comprises less than 15 percent of the approximately 15,000 specialized secondary and vocational schools.

Vocational schools in China offer 270 specialties in 12 branches: Agriculture and Forestation, Resource and Environment, Energy, Civil Works and Hydraulics, Manufacturing, Transportation, Information Technology, Medicine and Health, Trade and Tourism, Finance and Economics, Culture and Sports, and Social and Public Affairs (Li *et.al.*,2003).

EE is imparted both at the formal and nonformal levels.

Formal EE includes:

- ◆ Professional EE for majors in Environment Science offered to students who are directly involved in environment-related activities (like environment protection and monitoring, inspection and control, hydrology and water resources, water and soil conservation, etc.) Guide books have also been developed. However, not many TVE schools in China are offering these courses. In Beijing these courses are offered by only three specialized secondary vocational schools and one vocational high school.
- ◆ EE for non-environmental majors (e.g., Environment Techniques for majors in vegetation studies and tourism, Environment Friendly Chemical Engineering for chemistry majors) and selective EE courses for other trades.
- ◆ EE through extra- curricular activities in vocational schools

Nonformal EE includes the mass media, seminars and conferences by national and local bureaus of environmental protection and research institutions.

Though EE in primary, secondary, and higher education is quite systematic, it is still in its fledgling stage in TVE. The National Action Scheme on Environment Publicity and Education (1996-2010) outlines projects for environment education and building green campuses and suggests that teachers take environmental training courses. Faced with the pursuance of environmental laws, certain trades have also introduced EE rules in vocational schools (e.g., the Ministry of Oil Industry mandates EE courses in all vocational schools teaching oil industry related courses.) Some Chinese schools have also developed as model green schools.

India

In India, programs for TVE are offered through different channels and have varied course structures and teaching modalities (Jerath, 2003). In schools offering vocational courses, a compulsory General Foundation Course (GFC) has been introduced with some environmental components. The original EE component was limited to teaching environmental awareness. However, the syllabus was revised in 2002 to include more concepts of ecology and environment, causes of environmental problems, and natural resources conservation. A hands-on practical component was increased to 50 percent of the grade and a workbook was developed. However, the revised syllabus is yet to be implemented (Singh, 2003.)

At the ITI level (Industrial Training Institute), which offers vocational certificate courses (under the Craftsman Training Scheme and the Apprentice Training Scheme) to graduates of lower secondary schools. The subject of Social Studies has been recommended for all trades and many EE concepts have been included in the Social Studies curriculum. However, the EE components constitute only four out of 52 teaching hours. Thus the course is grossly inadequate for understanding and tackling work-related environment issues. Since EE is not a part of the technical trade courses, no information on issues like good housekeeping, abatement and prevention of pollution, and monitoring/sampling activities --which the ITI graduates need to handle actual work conditions-- is usually provided. (There are a few exceptions such as the Refrigeration and Air Conditioning curriculum.)

Polytechnics schools in India offer a 2-3 year technical diploma to graduates of lower secondary schools preparing them for key supervisory positions in industry and development projects. However, the Polytechnics schools have been slow in adopting EE (Subramaniam *et.al.*,1994). No system has been followed. Certain polytechnics, especially in the northern region, offer a diploma program in Environment Engineering and Pollution Control. Others have introduced EE as a separate common subject for all trades (like Entrepreneurship Development and Environment Engineering in the states of Punjab, Haryana, Jammu and Kashmir, Rajasthan and Uttar Pradesh; Applied Science in Andhra Pradesh; and Environment and Public Health Engineering and Water Resource Engineering in West Bengal). The rest have adopted an infusion approach in existing syllabi of certain trades (Civil Engineering in Uttar Pradesh and Gujarat, Chemical Engineering and Mining in Maharashtra.)

Very little information is available on EE in non-engineering trades especially Agriculture, Medicine and Paramedics (except some issues in Medical Lab Technologies), Pharmacy, Trade and Commerce, etc. Hence, though the importance of EE in education is well recognized in India, only sporadic efforts have been made to include it in TVE.

A few teacher training programs have also been taken up by technical teacher training institutes, including Central Institute of Vocational Education, Bhopal, PSCST, etc. Teaching materials include a practical workbook for **GFC** in secondary schools and instructional materials of **ITIs**.

Indonesia

EE was introduced in 1986 to Indonesian technical and vocational secondary schools with the objective of developing positive environmental attitudes among vocational students. An attempt was also made through a Swiss-assisted project in 1996. According to a report by the Director of Technical and Vocational Education (Anonymous, 1996), EE was to be promoted at two levels:

- a) As a common subject that included topics on Basic Ecology, Environmental Pollution, and Environment and Economy.
- b) As a trade- specific subject matter where EE information was integrated in to the curriculum of specific trades.

However, according to Bukit and Trenajati (2003), EE has been taken up in secondary vocational schools only by promoting co-curricular activities. Several guidebooks have been developed on solid waste management, waste water treatment and energy management through six vocational teacher training centers.

Malaysia

Malaysia's Technical Education Department plans and develops curriculum for all technical/vocational schools, community colleges and polytechnics (Khair, 2002). EE in TVE is being taken up under :

- ◆ Infusion of EE in core subjects (Language, English, Science and Religious studies) common for general academic and technical secondary schools and,
- ◆ Course-specific environmental programs at technical schools, polytechnics and community colleges (such as a school certificate in Welding and Metal Fabrication or Bakery and Confectionery.)

A special diploma in Environmental Engineering in a civil engineering course is proposed to be introduced by December, 2004.

Philippines

In the Philippines, TVE has been under the supervision of the Technical Education and Skill Development Authority (TESDA) since 1994. The Philippines Environment Code, 1977, mandates that necessary measures be taken to incorporate EE concepts and issues in educational curricula at all levels. However, TVE institutions exercise academic freedom, and although the minimum required subjects (mathematics, science, physical education, etc..) are enforced, EE is introduced only as an elective subject and is not very popular among students. In 1998 an environment education framework was also developed through an Asian Development Bank-assisted project but plans did not materialize. Misola (2003) identified initiatives in EE training as well as tools available and assessed future needs. Data indicates that although certain environment issues, such as water and waste management, are covered in TVE curricula, no specific mechanism has been followed to promote EE in TVE. Some TVE schools have an environment policy and take up research/survey projects related to environment. However, an EE framework needs to be developed, and curricula modified accordingly. The study indicates that EE in TVE has not been formalized and government support is lacking.

Gaps in the existing structure

This study indicates that although TVE has been accorded great importance in Asian countries, EE in TVE has not been adequately addressed. Some of the major problems are:

- ◆ Promotion of only the technical aspects of EE rather than developing an understanding of natural systems and cycles and environmental awareness.
- ◆ Sporadic efforts to present EE at TVE schools, rather than a systematic approach to integrate EE concepts into the TVE curriculum.
- ◆ Lack of practical components and case studies in the curriculum. Lack of appropriate teaching/learning materials.
- ◆ Lack of trained staff and curriculum developers.

General Recommendations

This study recommends that:

- ◆ A new partnership be formed between government, employers, industry, TVE Institutions and society to develop and integrate appropriate EE curriculum into TVE. All need to recognize that investment in promoting EE is not a cost, but has significant returns including the health of environment, enhanced productivity and international competitiveness through meeting global standards.
- ◆ Governments streamline their institutional frameworks to coordinate national efforts.
- ◆ A better understanding of environment and sustainable development issues be promoted through appropriate curriculum modifications. Work- related environment issues should be

discussed in trade- relevant curriculum. However, a standardized core curriculum may also be adopted to ensure appreciation of all aspects of environment in a cross-sectoral and holistic mode. Further, there is a need to ensure continuous review of curricula to keep them relevant to societal needs.

- ◆ An EE information network for secondary schools be set up. Education bases and training centers for EE should be established with national and international linkages.
- ◆ Teaching plans and curricula include issues like environmental conservation, entrepreneurship, and development of environment- friendly attitudes.
- ◆ Better training of TVE teachers and development of instructional materials be initiated. Development of training packages and educational modules have been accorded high priority by TVE teachers. It is recommended that environmental courses be taught only by teachers with professional qualifications. Furthermore, opportunities should be provided to TVE faculty for higher environmental studies. This would include industry swaps to ensure that they understand the issues in context of their work and gain an industry perspective.
- ◆ Available training facilities in various countries be utilized to their fullest and EE and Sustainable Development issues figure prominently in the training calendars of such institutions. Further, wherever required new facilities be developed (if possible, through international cooperation). Furthermore, RandD in TVE should be promoted where secondary school students can be involved in survey and analytical work. This will provide them hands-on-training at school level.
- ◆ Innovative teaching mechanisms for EE to be extended to TVE institutions especially at the secondary level.
- ◆ Evaluation parameters based on international standards need to be developed to assess the effectiveness of existing curricula and teaching methods for infusing EE in TVE.

Suggested Actions

Based on the above recommendations, the following actions are suggested for strengthening EE in TVE:

- ◆ Generate international awareness for integrating and strengthening EE in TVE. UNESCO should develop policy guidelines to integrate EE into TVE.
- ◆ Relate EE issues to the work environment with emphasis on developing problem- solving skills. This can be best achieved by incorporating case studies in the curriculum.
- ◆ Design a standardized core curriculum of EE (or extend the scope of existing curricula) at various levels, the complexity of which will increase with level of education, to provide a basic idea of environment issues to all TVE students. Define minimum teaching hours for this curriculum.

- ◆ Conduct a trade-wise analysis of the extent of coverage of key environmental concepts in TVE. Relevant EE issues should be integrated in specific trades to help students appreciate the links between environment and work.
- ◆ Develop specific guidelines for inclusion of hands-on, practical EE work activities like sample collection and analysis; industrial visits focusing on environment management, audit and pollution control; involvement in field surveys, or EIA/EA of industrial/developmental projects.
- ◆ Standardize EE in TVE in the Asian region. Develop appropriate teaching/learning materials such as guide books with the flexibility to incorporate local examples.
- ◆ Promote the use of non-formal EE and school-based projects to TVE institutions.
- ◆ Network to share experiences and information on EE in TVE.
- ◆ Promote industry-TVE institution partnerships. Make employers aware of the benefits of hiring environmentally skilled manpower. Ask industry to invest in EE training.
- ◆ Develop an appropriate funding mechanism to strengthen EE in TVE.
- ◆ Define evaluation parameters for assessment of tangible and intangible impacts of EE in TVE.

Conclusion

It is hoped that organizations will come forward to foster a better understanding and integration of EE in TVE through identification of common concerns and development of easily accessible standardized educational material for all.

Acknowledgements

The authors are thankful to Ms. Miki Nozawa, Ms. Julia Heiss, UNESCO for valuable inputs in consolidating the Asia Report and to UNESCO, Paris for financial support. Thanks are also due to Ms. Wang Yan and Ms. Ji Li, China; Dr. Masriam Bukit, Indonesia; Dr. Khair, Malaysia; Dr. Nehema Misola, Philippines, Prof. S.D. Patki, TTTI, Bhopal and Ms. Poonam Likhi and Mr. Sanjay Sharma, TTTI, Chandigarh, India for their valuable inputs.

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