AN OVERVIEW OF ENVIRONMENTAL SCIENCES AND ENGINEERING EDUCATION IN MALAYSIA

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ABSTRACT

The importance of Environmental Education in borad spectrum has long been acknowledged and recognised throughout the world. Although traits of such education have been evident in the curriculum of a number of subjects at non-tertiary levels, much of the emphasis is often given at teriary levels. The field of Enviromental Sciences and Engineering Education rreceived a great impetus since the early 1970s. This could partly be due to the establishment of the Enviromental Quality Act of 1974. Several Universities offer such courses either as core/trust courses or electives. In the paper, a scenario of the existing Environmental Education System and future projections at all levels are discusssed briefly. In addition, the Environmental Sciences and Engineering Education offered at Universiti Teknologi Malysia in particular is dealt in depth to an extent.

INTRODUCTION

Education is often apprehended as comprising all those formal and informal processes of teaching and learning the development of knowledge, values, attitudes, and skills on a rather broad basis [11]. Although much of it occurs through formalized systems of schooling, it is by no means confined only to them.

As has often been practised, it has been a major goal of science education to prepare young people (Mokhtar, 1988) with the ability especially to deal with current and future problems. And most educators agree that in addition to teaching students the fundamentals (ie. 3Rs), school learning should expose students to the varied problems faced by society. Even the well known educator and philosopher, John Dewey (Mokhtar, 1988) saw and visualized education as a way of life. And indirectly, if applied to the general context of life, students should be provided with the tools and skills to face the problems experienced today. Similarly, the tools of the Enviromental Education must also be inculcated at various levels throughout the educational systems.

The importance of Environmental Education in broad spectrum has long been acknowledged and recognised by both developed and non-developed countries in the world.It has also long been recognised (KPM, 1981) by the United Nations (UN) as being a key component of long term environmental management strategies.

The first (Badri, 1988) International Environmental Education Conference was held in Tbilisi, USSR in 1977. Since then, many other Environmental Education meetings and conferences convened under the auspices of the International Environmental Education Programme (IEEP). Such moves have laid the framework, principles and guidelines for Enviromental Education at all levels (local, national, regional and international) and for various age groups.

Since early 1980s, with the assistance provided by UNESCO and UNEP , Malaysia had successfully (Badri 1988) hosted several Enviromental Education Conferences and subsequently implemented related programmes at various levels within the formal education system. To an extent, several other activities within the non-formal education system, too, were implemented.

Enviromental education received little attention in the curricula development in the formal education system in Malaysia during the last decade. This (Chelliah, 1987) could be attributed to various reasons.

Firstly, there was no major stimulus provided by Federal Government as emphasis was still upon the economic progression and development. Secondly, the curricula of programmes offered were not broad enough to include interdisciplinary studies such as enviromental education.

However, the government recognised the possible impacts of the changes brought by the economic development on the natural, human and ecological conditions in the 1970s. As a result, strategies for enviromental policy and planning was incorporated in the Third Malaysian Plan (TMP), 1976-1980. It stated that the mass media and educational insititutions be used to stimulate awareness among the general public on the importance of enviromental conservation and the social and economic rationale affecting decisions on enviromental issues. The plan also stressed the value of Enviromental education as an important aspect of governmental policy.

EXISTING AND FUTURE PROJECTIONS

The educational system practised in the past and currently would best be illustrated by the components comprising the non-tertiary level (priamary and secondary level), tertiary level and the non-formal educational system.

The educational system in Malaysia is, to a large extent, centralised. The Ministry of Education regulates basically all elements including pupil intake, evaluations and examinations, teacher training and curriculum development and etc..

Primary (Elementery) level

The curriculum offered at the level is comprehensive. Generally, a teacher teaches pratically all the subjects. The previous syllabus (prior to 1983) comprised several Enviromental elements especially at Standards 4,5 and 6. Components of Enviromental Sciences were incorporated in subjects such as Science and Health Sciences.

In the new primary school curriculum, 'Kurikulum Baru Sekolah Rendah (KBSR)', introduced in 1983, Science has been incorporated in the subject 'Man and Enviroment' taught in Standards 4,5 and 6 [KPM 1981, 1986]. Several fundamental enviromental principles have been moulded to give an insight into the awareness of such problems. Students are guided so that they understand and realise the importance of environment in daily life.

Secondary level

The Secondary level would include the period from Form 1 to Form 6. In other words, it refers to years 7 to 12 of the course of study.

At the lower Secondary level, students are taught a Science subject, 'Integrated Science' which is actually more or less an 'enquiry' oriented subject. Environmental principles and sentiments have to a lesser extent introduced in sections including 'The Living Things', 'Gases' and 'Earth' itself. To an extent, ecosystem and ecological balance, effects of some pollutant gases as a result of anthropogenic sources, effect of fertilisers and etc. are introduced (KPM, 1981, 1986).

The new syllabus (KPM, 1981), 'Kurikulum Baru Sekolah Menengah' Science curriculum has included Enviromental Education as one of the main objectives. It would enable the students to understand the relationship between man and his environment and instil a sense of social responsibility towards the environment.

At Upper secondary levels, the Science subjects are more defined into specialised discipline such as Biology, Chemistry and Physics. Currently, the modern syllabus followed is similar to that of Nuffield Sciences.

Environmental science principles are included mainly in Biology and General Sciences. However, the syllabus (Chelliah, 1987) is heavily oriented towards the classical principles. Environmental principles are actually accessory elements to the basic core principles. Some of them include the ecological imbalance, effects of pollutants and etc.

A study (Badri, 1988) of the impact of the teaching of ecology on environmental awareness , indicated that ecology in Secondary school level

Biology (Science students) and General Science (Arts Students) did not enhance environmental awareness in students.

Tertiary level

The Universities responded in the 1970s to the new climate of opinion gaining momentum and subsequently initiated courses for the study of the environment. As compared to non-tertiary levels (Chelliah, 1987), the organisational aspect and the curriculum development at Institutions of Higher learning is more autonomous. The courses offered at the Universities reflect a broad diversity, ranging from very superficial courses with a little touch of Environmental perspectives to courses with strong emphasis in Enviromental sciences and yet other with a heavy technical and engineering emphasis, i.e. Environmental Engineering.

As until recently, it has been observed that the only university offering a professional degree level course is Universiti Pertanian Malaysia [Badri, 1988; Chelliah, 1987; UPM, 1988). The course, B. Sc. (Env.) was intiated towards the mid-1970s. Apart from this, the other packages offered by most Universities were mainly specialised subjects of units with environment interests in sciences, engineering and humanities.

Universiti Pertanian Malaysia. The only comprehensive environmental education package leading to an undergraduate degree is offered by the Department of Environmental Science, Faculty of Science and Environmental Studies. The undergraduates on graduating become professional environmentalists with expertise in interdisciplinary skills necessary for effective management of the environment. However, it can be said that the programme is relatively a management oriented type with a heavy emphasis in Environmental Sciences. Unfortunately, it significantly lacks the strong Environmental Engineering components such as design parameters which is a strong focus now due to problems faced by local industries and the extra enforcement boost given by a few New Regulations promulgated in the Environmental Quality Act.

In addition to the programe above (UPM, 1988), several other courses such as Wildlife Conservation and Management, Ecology, Environmental Chemistry, Aquatic Ecology, Aquatic Toxicology, and etc., too, are being offered by several other Departments. Also, the Department of Biotechnology offers 2 courses, namely the Principles of Waste Management and Utilization and the Treatment of Industrial and Urban Waste, which are basically environmental courses.

Universiti Sains Malaysia. Unlike Universiti Pertanian Malaysia, no professional level Environmental sciences or Environmental Engineering undergraduate programmes are offered at the University (USM, 1989).

However, various Centres of Learning (USM, 1989) offer a variety of courses, of Environmental Sciences and Environmental Engineering nature. This include Environmental Biology, Biotechnology, Aquatic Biology, and Biotechnology. The Civil Engineering Centre of Learning has embarked on offering several courses and programmes in Environment. This include one special major programme in Public Health Engineering within the Civil

Engineering undergraduate programme. Also, the Centre for Housing Development and Planning Studies offers a course in Environmental Science specifically suited for its needs.

Universiti Kebangsaan Malaysia. Alike most of the other Institutions of higher learning, Universiti Kebangsaan Malaysia, too, offers several Environmental related courses at different Departments. These include courses such as Environmental Science Education, Ecology, Enviromental Biology and etc. The Department of Chemical and Precessing Engineering offers a few courses in Environmental Engineering at undergraduate level,and it is believed that the department would also be offering a graduate level course in Chemical Engineering with emphasis in Environmental Engineering very soon. In addition the Sabah Campus is housing the Facultly of Science and Natural Resources actively involved in teaching Enviromental related courses aligned more to Marine Recources.

Universiti Malaya. The university does not offer any professional level programmes in Environment. However, alike others, it offers a number of courses in Ecology, Enviromental Education, Industrial Chemistry and Enviroment. Also Environmental Engineering oriented courses are also offered by the Department of Civil Engineering at the University.

Universiti Teknologi Malaysia. The Environmental Sciences and Engineering courses and programmes offered at the University is dealt in depth as compared to other Universities. The Environmental disciplines offered at several Faculties and Departments is also highlighted. To an extent, future projections are also discussed.

Universiti Teknologi Malaysia has been directly or indirectly involved in the discipline of Environmental Sciences and Engineering ever since the establishment of the Faculty of Civil Engineering in the early part of 1975 [Academic, 1989; FKKKSA, 1988, 1989). The Department of Environment established at that time served to fulfill the needs to offer subjects such as Public Health Engineering. The name of the Department was however changed to Department of Enviromental Engineering. With the expansion of the various Faculties and Departments with different objectives and goals it was necessary to offer several types of Environmental Sciences and Engineering courses tailored for specific needs. Such courses directly or indirectly related are being offered by the Faculty of Civil Engineering, Faculty of Chemical and Natural Resources Engineering and to a lesser degree, the Faculty of Science.

Faculty of Civil Engineering. The Department of Environmental Engineering offers Enviromental Engineering courses both as core courses and electives to both diploma and first degree students in addition to the Public Health Engineering courses. The courses offered are highly technical with an emphasis on design parameters in water, sewerage and waste water systems. At graduate level, an instructional course at Master's level in Civil Engineering with specialisation in Enviromental Engineering is also being conducted (FKKKS, 1989).

Faculty of Chemical and Natural Resources Engineering. Although a relatively new faculty established in 1983 it has expanded significantly in inculcating and setting the foundations of Environmental Sciences and

Engineering courses. Currently there are two Departments namely the Department of Chemical Engineering and the Department of Petroleum Engineering.

The diploma and first degree students pursuing Chemical Engineering programmes take compulsary courses in Environmental Pollution Control which cover some basic principles of Environmental Sciences and there on expand on to the Environmental Engineering principles. A special attention is paid upon the waste water treatment technology and air pollution control engineering. In addition, elective courses are also offered in advance treatment technology (i.e. such as reverse osmosis, membrane technology and etc.).

The Department of Petroleum Engineering offers a course in Marine pollution and control at undergraduate level. This course incorporates principles of both the Environmental Sciences and Engineering.

The Faculty would very soon embark to set up new Departments namely the Department of Polymer Engineering, Gas Engineering, Bio-process Engineering and the Environmental (Pollution) Control Engineering. Specific Environmental Sciences and Engineering courses tailored specifically for the Departments would be offered. These would include Air Pollution Control,Enviromental Biotechnology, Hazardous Waste Engineering and etc.

In addition, the Department of Environmental (Pollution) Control Engineering which would initially cater for the instructional Master's programme in Environmental Engineering would cover a broad range of courses in Environmental Engineering. Among some of them are Industrial hygiene and Public Health Engineering, Water and Wastewater Engineering, Air Resources Engineering, Solid, Hazardous and Toxic Waste Engineering and etc.

Other Faculties. The other faculties involved in the teaching of Environmental Sciences courses are the Faculty of Architecture, and the Faculty of Science. Especially in the Faculty of Science, Environmental Sciences traits are disseminated through some courses in Environmental Chemistry and Biotechnolgy. The Faculty of Architecture offers courses pertaining the Built Environment which include the Environmental Planning design and management.

Non-formal Environmental Education

Unlike schools and Institutions of higher learning, the target group include adults and students in homes, offices, factories, shops and streets in both the rural and urban areas. In surveys (Badri, 1988) carried out by organisations, it was discovered that continued efforts are still necessary in educating people in such education.

RECOMMENDATIONS AND CONCLUSIONS

As discussed, the Environmental Sciences and Engineering principles are conducted at several levels of the educational hierarchical system in Malaysia ranging from primary levels to tertiary institutions.

In general, the pattern of the Environmental Sciences and Engineering education in Malaysia is pretty much imbalanced as it caters for at both the primary (elementary) and the tertiary levels. However, such principles are not being catered or inculcated at the Secondary level.

It would be imperative to state that the magnitude of research carried out at tertiary level is enormous. Practically, all disciplines ranging from Environmental Sciences Education, management and planning, Environmental quality - Air, Water and Marine.

Water and Wastewater Treatment, Solid Wastes Engineering, Toxic and Hazardous Waste Engineering, Noise Pollution and etc. are being carried out practically at all the Universities very extensively. It is difficult to make a clear cut of a line of demarcation on the types of research conducted at different Institutions.

It must be stressed that in order to perceive a well conformed environmental education programme, an extra emphasis or a boost must be provided in the new science subjects to be offered in the new curriculum at Secondary level. At present it is obvious that even 'Biology' offered at STPM (Sijil Tinggi Pelajaran Malaysia) level equivalent to Advance level practically does not contain any environmental disciplines/elements of any significance.

At present, the teacher training programmes offer very little orientation towards environmental education. In this respect,a study carried out in 1987 indicated a dire need to make Environmental education part and parcel of the Science teacher education programmes at teacher training colleges. However, to a certain degree, this has been given attention by the Ministry of Education by sending about twelve personnel for further training overseas in that area.

And finally, it is necessary for Universities to keep reviewing the current needs especially in Environmental Engineering. Specialised courses to keep in abreast with of recent innovations and technologies must be offered perhaps as electives from time to time.

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