

EDUCATING FOR SUSTAINABLE WASTE MANAGEMENT: A CASE STUDY FROM GRIFFITH UNIVERSITY, BRISBANE, AUSTRALIA.

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Introduction

In June 1992, the United Nations Conference on Environment and Development (commonly known as the Earth Summit) was held in Rio de Janeiro. One of the main outcomes of this summit was the Agenda 21, highly regarded as the environment action plan to take the world into the 21st century. The Chapter 36 of Agenda 21 titled 'Promoting Education, Public Awareness and Training' highlights that there is still a considerable lack of awareness of the interrelated nature of all human activities on the environment due to insufficient information (UNEP, 1992).

Part of any government's long term plan must be to incorporate environmental concerns into educational curricula in general, and into all engineering and business management courses in particular (UNEP, 1994). This will eventually reduce the need for a substantial adult education program in the industry and will also eliminate some of the barriers in implementing sustainable waste management in the industry.

For example, the need for education and training in pollution prevention is essential because the concept of pollution prevention is quite different from the familiar concept of end-of-pipe regulation of environmental problems in many ways. Most of the barriers to implement pollution prevention can be overcome by appropriate education and training of such issues.

In order to satisfy above needs a number of training programs on sustainable waste management and number of initiatives to integrate sustainable waste management in university curricula have been launched in the recent few years worldwide. However, to satisfy the specific needs of busy professionals in the sustainable waste management field, it is not only sufficient to incorporate knowledge of sustainable waste management in university curricula but, it is also necessary to implement innovative methods of delivering such knowledge. Education and training for sustainable waste management using the flexible learning and partnership approach used by Griffith University in Brisbane, Australia is one of these innovative methods.

This paper describes some of the basic concepts of flexible learning and investigates how these concepts are used to develop education and training initiatives in sustainable waste management. The paper specifically focuses on the Graduate Certificate in Waste Management offered by the School of Environmental Engineering.

Flexible Learning - Definition

Flexible learning is a broad concept that gives the priority to learner control over the requirements of institutional practices. It focuses on how the students will engage in learning activities in terms of the options available to them and also how such activities can be supported. In the traditional face-to-face learning and distance learning methods little

attention is sometimes paid to the actual learning activities of the students. Flexible learning can be regarded as an approach that builds upon the traditional face-to-face learning methods and distance education practices whilst giving high priority to learner control (Taylor et al., 1997).

In the recent years open and distance learning has gone through three generations. The first generation was the correspondence teaching where a single medium, such as a text, is used in conjunction with the postal service as a means of delivery. The next generation involved multimedia distance learning where text-based material is supplemented by interaction with the instructors either in face-to-face settings or via technologies such as electronic mail. The third and the most recent generation is called the interactive multimedia distance education where heavy emphasis is on the use of information technology to facilitate the communication. The last generation is the flexible learning generation, which is described in this paper (Caladine, 1993).

Charateristics of Flexible Learning

The characteristics of flexible learning are well described in the literature. In summary following are some of these characteristics:

- Entry qualifications
- Start/finish times
- Location
- Forms of teaching
- Learning goals
- Content
- Style of learning
- Delivery methods
- Form of assessment

Any or all of the characteristics listed above would identify a system of flexible learning. Subsequent sections of this paper will demonstrate how these characteristics are applied in courses offered by Griffith University.

Graduate Certificate in Waste Management

Griffith University's Graduate Certificate in Waste Management is designed to train and educate professionals (engineers and non-engineers) working in waste industry to achieve the above goals. The main objectives of the program are to train and educate above professionals in the knowledge required to manage existing waste generation problems and to prepare the professionals with required knowledge to face future challenges in waste management.

The program is designed to prepare current professionals working in waste related areas and for graduates who intend pursuing a professional career in waste management in the public or private sector. The program is designed to enhance the capabilities of professionals involved in managing municipal solid wastes, industrial hazardous wastes and for those who are planning to implement practices such as cleaner production and resource recovery. It is suitable for waste management practitioners in public sector (e.g. federal, state and local governments) and in the private sector (e.g. manufacturing and service industries, consulting firms) and recent graduates planning for a waste management career. In order to satisfy

different needs of the above groups, the program is offered fully externally in flexible learning mode.

The following courses are offered in the above program:

Waste Minimisation and Cleaner Production

This course examines how cleaner production practices can improve the environmental performance of business while at the same time improving the competitiveness and profitability. This course is aimed at creating a win-win situation for both business and the environment while achieving the goals of sustainable development. It includes the principles, concepts and application of cleaner production practices, cleaner production assessment, implementation and continuation, tools for identifying cleaner production opportunities, policies and strategies for promoting cleaner production, cleaner production case studies and information sources.

Solid Waste Management

This course introduces students to municipal solid waste management. The contents include municipal solid waste characteristics, storage and collection, transfer and transport, separation and processing, recycling, composting, incineration and sanitary landfilling.

Hazardous Waste Management

This course introduces students to hazardous waste treatment and disposal. The contents of the course include introduction to hazardous waste, hazardous waste generation and characteristics, regulatory approaches, hazardous waste minimisation, transportation and storage of hazardous waste, physical, chemical and biological treatment, thermal treatment and energy recovery, stabilisation and solidification and land disposal of hazardous waste.

Environmental Management Systems

This course deals with the general principles and elements of environmental management systems (EMS) which provide the framework for environmental management. The course covers developing a EMS in accordance with ISO14000 series of standards, tools such as life cycle analysis, environmental accounting and environmental performance evaluation, environmental auditing, environmental risk assessment and industry case studies.

Teaching and learning of the subjects are through following methods:

- Directed study, reading and activities using print-based study guide and the reader
- Face to face lectures or on-campus sessions
- Web-based activities using the Internet and on-line communication

Course Web Site Development

Web-based resources are best used for organisation, communication to support self-directed learning, and as a means of providing multiple perspectives and alternative viewpoints. Their use facilitates students' choice as to how, when and where they learn, and provides multiple access points to information, as well as multiple sources of information. This can facilitate student choice as to the content-focus and sequence of their learning activities.

The web site developed for the above subjects include 'upfront' information (subject information, study chart, assessment schedule, teaching team, resource lists) and

communication through the tools such as a sitemap, noticeboard, FAQ(Frequently Asked Questions), forum, real-time discussion (chat), glossary and search facility. All these tools enhance the students' learning experiences with stimulating exercises, real-world simulations, ready access to data in external web sites, and communication with peers and mentors.

Organisation of Teaching and Assessment

Students enrolled in this subject may study on-campus, in mixed mode, or off-campus. Independent of the type of enrolment, all the students enrolled in the above subjects are provided with a learning package at the beginning of the semester. This consists of a study guide containing key concepts, activities and references to readings, a reader consisting of a set of readings from books and journals, an assessment booklet outlining the assessment requirements and a study skills booklet describing the essential study methods.

One of the key components of the subject is the project undertaken by the student during the semester. One of the characteristics of flexible learning is to allow the students to determine their own learning goals. Keeping this in mind students are strongly encouraged to focus on an area of their choice to undertake this project and in most of the cases the project will incorporate some aspects of student's area of employment. The project is a relatively small-scale study which may be presented in a number formats such as a research report, a literature review, a set of guidelines or as a manual. The project title will be chosen by the student in consultation with the lecturer.

Feedback from students

The program has been in operation for several years and has received very good response from the postgraduate students in the workforce. The students who have undertaken the program arrive from various backgrounds and employment levels. For example students in the past include consulting engineers, scientists, environment officers, lawyers and health professionals. Most of these postgraduates have very limited time to attend the lectures on a weekly basis due to the work and family commitments. The most common response received by the students is their ability to continue with studies without disrupting the work and personal lives.

Delivery through Partnerships

Griffith University is developing partnerships with suitable tertiary institutions and waste management associations to offer the above program in flexible delivery mode. Current partnership with the Waste Management Association of Australia is an example of such partnership. Through such partnerships University hopes to involve current practitioners in waste management to deliver and provide advice on the course content.

Conclusions

Training and education for sustainable waste management has become essential for most professions. However, due to various reasons most of the employers find it difficult to release their employees to attend conventional courses offered at the university level. Although the short courses can overcome this problem to a certain extent, it is not possible to offer a comprehensive course during a 2-3 day session.

Flexible learning approach is one of the best options available for people in the workforce to become experts in this field. With flexible learning students are not required to attend conventional lectures, thus there is no time release necessary from the employers. Griffith University has received extremely positive feedback from the students who followed the postgraduate coursework subjects through flexible learning mode.

The flexible learning approach, which could be considered as a path between conventional learning approach and fully distance leaning approach, is an extremely valuable tool for the universities and other higher learning institutions to use in training in sustainable waste managemt.

References

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