

# **TEACHING MONASH GRADUATE ATTRIBUTES**

## **CASE STUDY CIVIL ENGINEERING**

### **THE LEARNING CENTRE**

#### **SUMMARY**

This case study illustrates a teacher instigated, developed and maintained learning resource that addresses the development of Monash graduate attributes for undergraduate engineering students. The underpinning and reinforcement of the experiential and conceptual processes of learning about Monash graduate attributes within discipline based curriculum material, is illustrated. This case study highlights some of the factors that can influence development of extra curricula teaching material and that may affect its ongoing viability

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## TEACHING MONASH GRADUATE ATTRIBUTES CASE STUDY

### CIVIL ENGINEERING – THE LEARNING CENTRE

The Use of a Web Based Learning Site, The Learning Centre, to support Monash Graduate Attributes of Team Work, Communication, Problem Solving and the Effective use of Information Technology.

#### SUMMARY

This case study illustrates a teacher instigated, developed and maintained learning resource that addresses the development of Monash graduate attributes for undergraduate engineering students. The underpinning and reinforcement of the experiential and conceptual processes of learning about Monash graduate attributes within discipline based curriculum material, is illustrated. This case study highlights some of the factors that can influence development of extra curricula teaching material and that may affect its ongoing viability.

#### 1.0 OVERVIEW OF BACHELOR OF CIVIL ENGINEERING

The Bachelor of Engineering in Civil Engineering at Monash University, is a four year, full time course, that commences with a faculty-wide common first year. After a review in 1998 that included re-accreditation for the Institution of Engineers Australia, traditional didactic styles of teaching and learning were largely redesigned, and replaced or complemented by problem-based, project-oriented, experiential and team based learning methodologies. The Department of Civil Engineering made a very specific commitment to this style of learning which is articulated in its course objectives. These objectives are congruent with several of the key Monash graduate attributes, notably communication; problem solving; research and inquiry; critical thinking and analysis; team work. The course objectives state:

*The student should be able to :*

- identify civil engineering problems
- identify what needs to be done to solve the problem
- find information they need to know, e.g. from other people, lectures, books, journals , libraries, the Internet etc
- think in a number of different ways e.g. identify facts , brainstorm possibilities , list advantages and disadvantages, consider emotional responses and monitor their thinking
- use various specialist engineering techniques for solving & recognizing problems
- communicate their ideas to other people
- manage their time , other people and resources

- develop lifelong learning skills  
(Civil Engineering. Faculty of Engineering Curriculum Review Documentation 1998)

## 2.0 APPROACHES TO TEACHING AND LEARNING

### 2.1 Learning and Teaching Strategies

Learning and teaching strategies employed by the Civil Engineering curriculum, manifest the department vision for the provision of high quality under and post graduate educational experiences which are, student centred, responsive, contemporary, flexible, meaningful, interactive and accessible. Learning strategies are structured around problem oriented, project based teaching methodologies. There is also a growing movement towards flexible and distance modes of curriculum delivery.

### 2.2 Project work and graduate attributes / generic skills

Real world civil engineering applications, chiefly in the form of project work, form the vehicle for teaching the stages, phases and dimensions of work in Civil Engineering. Lectures, tutorials, workshops, seminars, laboratories, and the extensive use of computer packages support this. Embedded in this teaching, is a strong focus on the development of what are referred to by the profession, and the curriculum, as generic workplace skills.

### 2.3 Problem Based Learning Focus of Curriculum

Problem Based Learning ( PBL) is the characteristic central feature of the Department of Civil Engineering's philosophical and applied approach to learning and teaching. The graduated, project based assignments that form one of the major features of the curriculum are delivered within this educational framework.

The PBL educational orientation also underpins the conceptual format and material offered by The Learning Centre. Engineering students are introduced to the characteristics of PBL in the following way:

' Problem-Based Learning is centered on learning that emanates from real problems . The learning is more important than the solution to the problems. ...In problem based learning you will spend much of your time learning - by identifying what you need to know, finding out, teaching each other, and then applying your new knowledge. Thus the primary aim of the exercise is learning, not the completion of the project.

The project is the means to this end. Problem-Based Learning encourages independent learning and a deeper understanding of the materials rather than superficial coverage. It will give you practice in tackling engineering problems and defining your own gaps in understanding the context of these problems ' (Prpic & Hadgraft, 2001 ).

Dr Hadgraft's account of his personal academic journey in using the process of Problem Based Learning within the Monash Civil Engineering curriculum is available as a case study report on the Monash HEDU website.

<http://www.adm.monash.edu.au/ched/resources/reports.html>

## 2.4 Civil Engineering Online (CLEO) Teaching Resources

CLEO ( Civil Engineering Online ), ( <http://cleo.eng.monash.edu.au/about.html> ) is the Department of Civil Engineering teaching website, built to support its undergraduate teaching. It forms a '*significant part of the Civil Engineering Department's flexible learning strategy*' ( CLEO 2001)

CLEO is designed to deliver easy student access to

- the home pages of civil engineering courses/ subjects/ units
- written and visual lecture, tutorial, workshop material, and associated supporting documentation such as course notes.
- pertinent Internet links, sites, search engines
- e mail communication with staff
- relevant subject - related chat room forums
- library and search engines

The site was developed in 1994 through combined grant money from Monash University and the Faculty of Engineering. At the beginning of each semester, all students are given a CLEO CDROM containing web site curriculum related material, resources and information . This reduces the time that students need to spend searching for courseware and downloading files, some of which are quite large. They can work on curriculum material through use of the CLEO CDROM either on their home computer or at some other convenient site. A CD with updated material, is available each semester

The Learning Centre is located on this teaching web site, and forms a major part of the Department's teaching and learning strategy.

## 3.0 THE LEARNING CENTRE

### 3.1 Overview

The Learning Centre supports the problem-based, project oriented thrust of undergraduate teaching in the Civil Engineering curriculum. Its user-friendly design provides students with an accessible mode for learning and development of graduate attributes. Features include

- visual design of site with Clip Art and cartoon illustrative graphics

- organization of site around professionally relevant generic '*hot spot*' topics supported by graphics and easy illustrations.
- textually embedded hyperlinks between Learning Centre *hot spots*
- textually embedded hyperlinks to other web -based resources
- individual student centred, experience- linked presentation of material
- illustrative quotes
- provocative questioning style that encourages reflection and further learner inquiry

Conceptually the Learning Centre Material relates to

- Civil Engineering curriculum focus on Praxis, Projects and Team Work Learning, Problem Based Learning
- Focus on the Learning process and ownership of this by the learner
- Life Long learning and the encouragement of thinking skills

The site is organised into 6 learning hot spots. Several Monash Graduate Attributes are specifically addressed as topics:-

- Problem Solving
- Team Work
- Communication comprising Report Writing; Presentation Skills
- Information Skills comprising Library Use, Computing, Statistics

There is also a hot spot for Staff containing information on resources and learning links, and a hot spot entitled You and Engineering. This hot spot encourages students to explore their relationship to learning, develop insight and take personal responsibility for their learning commitments and styles. It covers areas such as:

- Your Learning
- Teaching and Learning
- Knowledge and Wisdom
- Learning Preferences Your Feelings
- Psychological Personality types
- You as an Individual
- Project Management
- Time Management

The material on individual learning and personality styles is oriented towards project and team work within engineering, prompting student reflection about possible personal and other behavior within a team, and the influence of their preference and style on team work process and product. It also encourages general reflection about the learning process and the relevance of graduate attribute development to the study and practice of engineering.

### 3.2 Development of The Learning Centre

The Learning Centre was built and authored by Dr Roger Hadgraft from Civil Engineering, in 1994, with co-authorship of topic input from Dr Kaya Prpic, and with student assistance for web building & development. The Learning Centre grew out of a Civil Engineering department project supported by a Monash multi media grant, to build a supportive web site for first year undergraduate teaching. This template was then used to build a site for all of the undergraduate subjects, and became CLEO. A dimension of the original project was the development of a manual called ' Bridging the Gap ' written by Dr Prpic, that was designed to assist students make the connection between school and university learning.

Although this original project did not achieve its intended outcome, its developmental material was subsequently used as the basis for the Learning Centre site and since 1994 its authors have continued with its development. More recent developments include a menu structure to help students access the site; addition of material from other web based sites ( e.g. the section on mind mapping ); inclusion of material on good resources; hyperlinks to relevant topic material; and cross referencing of site contents.

### 3.3 Factors Influencing the Development of the Learning Centre

Although the original CLEO developmental work was supported by grant monies, the subsequent creation of the Learning Centre was largely driven by the personal enthusiasm, experience and interest of its authors based on their involvement with, and commitment to problem based learning. This occurred quite a number of years before formal institutional articulation of Monash Graduate Attributes.

Other formative drivers and shapers in developing the Learning Centre, as identified by Dr Hadgraft included:

- a desire to engender passion, enthusiasm, excitement, reflection and engagement in undergraduate learners
- a desire to connect learners to their purpose for involvement Civil Engineering
- a desire to assist student development of focus and responsibility for their learning process
- commitment to the process of life long learning
- interest in involving other staff in PBL
- interest in a skills based approach
- a concern about students attitudes to learning
- a concern about students learning habits
- a concern about students with poor writing skills and, later
- the redesign of the entire Faculty of Engineering Curriculum in 1998.

The overriding influence however on the development of this Learning Centre has been the enthusiasm of the author and his involvement in a variety of professional and academic forums that address the area of generic attribute development alongside problem-based and life-long learning.

Other factors critical in the development, shaping and on-going viability of this facility were identified as :

- problem based learning was the focus for the author's PhD
- strong support and commitment from department head
- author being the director of teaching at the time of development and thus able to engage with re-sculpting orientation and shape of some key subjects
- being part of an external support network.

### 3.4 Influence of Professional Bodies

The 1998 redesign of the Civil Engineering Curriculum, (as part of the total Engineering Faculty curriculum review), was influenced by local and international discussion and movement within professional and academic engineering domains about the importance of teaching professional skills. Professional discussion and debate has also revolved around the adoption of enlarged, process, outcome-focussed paradigms for engineering practice and the education of engineers.

The Learning Centre has continued to develop within this context, as the importance of fostering professional generic attributes and skills became one of the influential factors in the redesign of the civil engineering curriculum. Teaching about engineering as a process rather than as a collection of narrow disciplines, with a strong emphasis on the development of professional skills, generic attributes, and the habits of life long learning, began to be seen as highly desirable approach.

## 4.0 MONASH GRADUATE ATTRIBUTES AND LEARNING CENTRE MATERIAL

### 4.1 Learning Centre material related to communication

Communication is the subject of a key hot spot and covers report writing and oral/visual presentations. Writing also receives additional attention under a hot spot topic entitled 'Desk Jobs'. This covers the use of discipline specific organisational writing such as the Log Book.

### 4.2 Learning Centre material related to inquiry

Under the hot spot heading '*Information*', this material is mostly an introduction to the conduct of Library and Virtual Library inquiry processes.

### 4.3 Learning Centre material related to problem solving

There is a major hot spot topic on the problem-based learning thrust of the Civil Engineering curriculum. This covers problem solving processes and strategies, including material on thinking skills and mindmapping. There are Hyper links to additional material.

#### 4.4 Learning Centre material related to teamwork

Teamwork is the subject of a key hot spot that includes

- Working as a team;
- Goals and objectives;
- Group development:
- Roles in the group;
- Features of effective teams.

Also relevant to team work is material contained within the hot spot topic Learning Preferences. This includes material on diversity, and on making diversity a strength. Important aspects of diversity are related to the team and group work in which students will be engaged, with suggestions for related exercises, such as the creation of a group logo reflecting the diversity and dynamics of a student team. Quotes from popular and classical texts are also used to reinforce this attribute.

*' Try to see it my way, only time will tell if I am right or I am wrong  
While you see it your way  
there's a chance that we may fall apart before too long  
We can work it out . We can work it out. '*

Lennon and McCartney quoted by The Learning Centre

#### 4.5 Learning Centre material related to information technology

Information Technology is covered in a variety of ways. Desk Skills addresses the use of specific software e.g. Autocad; Microsoft Word. There are web-based sites within the inquiry section. The use of the Learning Centre website itself supports the development of confidence and skill in the effective use of certain aspects of Information Technology.

#### 4.6 Teaching and Assessment of Monash Graduate Attributes in Civil Engineering Curriculum

Teaching and assessment of Monash Graduate Attributes within the Civil Engineering curriculum is almost exclusively embedded and integrated within discipline specific project work.

#### 5.0 PERCEIVED PROBLEMS

In developing and maintaining a site like The Learning Centre, there are some very real resource, organisational and educational implications.

*' What has understanding my learning style got to do with designing a bridge ? '*

Student attitudes and approaches to learning are perceived as a continuing major hurdle. These include their tendency to think narrowly; 'to mind dump' and pay little attention to process or detail. Both students and staff are perceived to be time poor and product focussed, so are unable, unwilling and even hostile to engagement with material and processes that are considered irrelevant to the main focus of their studies. Much of engineering student education is perceived as very 'doing, praxis' focussed, with reflection and the pursuit of knowing not being a huge part of its educational tradition.

Staff are concerned about the possibility that within a tight and stretched curriculum, attention to non core discipline material will result in quality decline and graduate failure to know key core material and to perform discipline tasks.

The approach offered by the Learning Centre as a supportive learning process to supplement attribute development is a useful educational model to consider. However, for the developer, the loneliness associated with a lack of a collegiate, conceptual & intellectual support base can be a central issue, as can ongoing financing of such a Centre.

To date, there has been surprisingly little feedback from students or others about the Learning Centre. Occasional feedback from external persons who have wandered on to the site serendipitously however has been extremely positive. No formal evaluation has been undertaken. Perhaps this lack of feedback from students and academics may be due to their perceptions of the programme as an integrated aspect of the learning support offerings of the Department's website.

## 6.0 FUTURE PLANS

Genesis of the programme was supported, in part, by the outcome of a grant process. Since that time however development has been largely dependent on the time, energy of and generosity of its authors. In most recent times the maintenance and management of the site offerings has rested exclusively on shoulders of one person, who has continued to add to the programme and refine its material.

However this work is done over and above his other paid commitments and there is no funding to support this venture. Thus the ongoing maintenance of this site can be seen as an achievement in itself and current developments need to be seen within this context.

Plans for future developments include

- Broadening of offerings to include skills for post graduate students
- Refinement of topics to really address students learning needs
- Attempts to arouse enthusiasm, widen responsibility for and increase contribution to web site throughout the Civil Engineering Department

- Foster a greater influence of the use of The Learning Centre on the curriculums of the whole department

(POSTSCRIPT. Since the production of this case study, Dr Hadgraft has left Monash)

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