

E-LEARNING AND ENGINEERING LEADERSHIP - CURTIN UNIVERSITY OF TECHNOLOGY EXPERIENCE

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Abstract

Engineering employers expect engineering graduates to possess a wide range of skills that goes beyond their technical knowledge. It is vital that graduates have skills which demonstrate that they are responsible for their own development and careers. Some of these skills include; communications, organizational skills, self promotion, the ability to work as part of a team, problem solving, critical thinking, good negotiation skills, have the ability to be a leader and being able to network effectively. Unfortunately, many units in engineering degrees do not incorporate the mentioned skills in their teachings.

Curtin University of Technology decided to integrate a Civil Engineering Project Management unit with an e-learning platform (Blackboard) to enhance and improve students' non-technical skills. The Seven Principles of good practice using technology was adopted in this unit. Students were initially tested using Dr Meredith Belbin's team roles theory to identify their team roles. According to their results, they were divided into groups of 5/6 members. Students were encouraged to share any of their findings with each other through the discussion board. At the end of the course students were questioned and asked to reflect on their Belbin's roles. The results were compared and analyzed against the initial results and considerable changes were noticed.

Methods used in the above course delivery were proven to be extremely successful. Students managed to communicate more effectively and the level of collaboration was improved drastically. At the end of the course, students' demonstrated overwhelming satisfaction in their learning journey.

Keywords: e-learning, Blackboard, Engineering, Project Management, Leadership.

1 INTRODUCTION

Department of Civil Engineering at Curtin University of Technology decided to introduce and integrate leadership skills such as integrity, strategy, communication, relationships, persuasion, adaptability, teamwork, decision-making and planning in various engineering management units.

In this paper, the Civil Engineering Project Management unit a third year course part of the Bachelor of Engineering (Civil and Construction Engineering) degree was selected.

Assignments were designed in a manner to incorporate the mentioned leadership skills. This was implemented via an e-learning platform (Blackboard). Furthermore, the Seven Principles for good practice using technology [1][2] was adopted in this unit. This is done in addition to the classroom delivery by the lecturer

2 CIVIL ENGINEERING PROJECT MANGEMENT UNIT

The Civil Engineering Project Management Unit provided participants with the following learning outcomes:

1. Understand and communicate the qualitative and quantitative aspects of project management in a civil engineering context.
2. Adopt a problem solving approach to determine those aspects of project management that are applicable and useful in civil engineering projects.
3. Apply project management techniques and methods in the civil engineering discipline either as an individual or within a team approach and appreciate the role of the manager in engineering projects.

4. Adhere to ethical principles and acknowledge the social, cultural and environmental implications associated with project management in civil engineering.
5. Identify personal skills which enable reflection and evaluation of project management processes.

This unit totalled 36 hours of teaching, tutorials and computer laboratory sessions which was divided into 3 hours per week for 12 weeks. In 2009, there were 109 participants who enrolled in this unit. The majority of participants were full time students with no industrial experience. The participants were culturally diverse and included a small number of mature age students. The experience held within the participants was diverse as some possess relevant industrial experience whereas other possessed non related industrial experience.

The unit was assessed by using a Team Assignment (50%) and a final exam (50%).

3 SEVEN PRINCIPLES OF GOOD PRACTICE

The Seven principles of good practice in undergraduate education authored by Arthur W. Chickering and Zelda F. Gamson [2] has been compiled in a study supported by the American Association for Higher Education, the Education Commission of the States and the Johnson Foundation. The Seven principles state the following:

1. Good Practice Encourages Student–Faculty Contact
2. Good Practice Encourages Cooperation Among Students
3. Good Practice Encourages Active Learning
4. Good Practice Gives Prompt Feedback
5. Good Practice Emphasizes Time on Task
6. Good Practice Communicates High Expectations
7. Good Practice Respects Diverse Talents and Ways of Learning

4 SEVEN PRINCIPLES OF GOOD PRACTICE AND BLACKBOARD TECHNOLOGY

The following Table 1 shows the Seven Principles of good practice and strategies associated with Blackboard technology:

Table 1 - Seven Principles of good practice and Blackboard Strategies

Seven Principles	Blackboard Strategies
Contact	Email, Discussion board, Chat, Announcements
Cooperation	Discussion boards with a prompt related to a current topic (enhances participation), audio/video files: provides feedback. Video students for other students to review, give feedback to faculty (survey)
Active Learning	Group assignments, Chat, review sessions in a chat, file exchange, peer reviews before projects, discussion board
Prompt Feedback	Quizzes with immediate feedback, Grade book with class averages
Time on Task	Tracking student's use, timing projects, dates for completion, etc.
High Expectations	Students posting assignments, syllabus with expectations, board postings etc.
Diverse Talents and Ways of Learning	More visuals, audio, print items, 24/7, after class. Discussion board increases participation etc.

5 METHODS USED IN CIVIL ENGINEERING PROJECT MANAGEMENT UNIT

The adoption of Blackboard and the Seven Principles of good practice was used throughout the Civil Engineering Project Management unit.

Initially, all unit material such as the unit outline, course files and other related materials were posted on Blackboard. Any other important information was announced using the announcement section of Blackboard and was subsequently emailed to users through the announcement section of the e-learning platform.

Participants initially were tested using Dr Meredith Belbin [3] team roles theory to identify their team roles. Dr Meredith Belbin defines a Team role as “A tendency to behave, contribute and interrelate with others in a particular way”. These roles are defined according to their characteristics, function, strengths for the team and possible weaknesses for the team.

1. Shaper

Characteristics: Like to Challenge, to lead and often leaders

Function: Make the team function, Make necessary changes and take un-popular decisions

Strengths for the team: Readiness to challenge inertia, ineffectiveness or self-deception

Possible Weaknesses: Can be impatient and may offend others.

2. Plant

Characteristics: Innovators and Inventors

Function: Generate new proposals and solve complex problems. Gets the project going.

Strengths for the team: Imagination and innovation

Allowable Weaknesses: May be inclined to disregard practical details and act too independently.

3. Coordinator

Characteristics: Calm, self-confident, controlled with an ability to cause others to work to shared goals.

Function: Manage a diverse team

Strengths for the team: Welcome all potential contributors on their merits and without prejudice.

Allowable Weaknesses: No pretensions as regards intellectual or creative ability.

4. Monitor Evaluator

Characteristics: Unemotional, serious minded person who do not get over-enthusiastic.

Function: To analyse problems and evaluate ideas

Strengths for the team: Judgment, discretion and hard-headedness.

Allowable Weaknesses: Lack of inspiration and might seem over-critical to others.

5. Resource Investigator

Characteristics: Quick to pick up other people's ideas and build on them.

Function: To exploit opportunities.

Strengths for the team: A capacity for finding promising ideas or opportunities

Allowable Weaknesses: Liable to lose interest once the initial fascination has passed.

6. Implementer

Characteristics: Well organized, enjoy routine and have a practical common-sense.

Function: To identify what is feasible and relevant and to follow it through.

Strengths for the team: Organizing ability, practical common sense, hardworking.

Allowable Weaknesses: Lack of flexibility, resistance to unproven ideas.

7. Team worker

Characteristics: Socially oriented. Perceptive and good listeners

Function: To prevent interpersonal problems and to encourage team members to co-operative.

Strengths for the team: Ability to respond to people and situations and to promote team spirit.

Allowable Weaknesses: Indecision at moments of crisis & some failure to provide a clear lead.

8. Specialists

Characteristics: Professional, self-starting and dedicated.

Function: To provide technical skill.

Strengths for the team: To provide knowledge or technical skills in rare supply.

Allowable Weaknesses: Contribute only on narrow front.

9. Completer-Finisher

Characteristics: Painstaking, orderly, conscientious, anxious with a capacity for follow-through and attention to detail.

Function: To focus on detail and accuracy.

Strengths for the team: A capacity for fulfilling their promises

Allowable Weaknesses: A tendency to worry about small things

The team assignment was assessed by considering two components; the first consisted of a written report and the second component was an oral presentation made by the team. Marking keys were provided for each component in order for groups to have clear idea about how they are going to be assessed.

In the next stage participants were asked to form groups of 5/6 members and each member was assigned a Belbin role according to their Belbin test results. At the time of assignment, it was made clear that these roles are only voluntary and could be changed if all team members agreed on the change. Each group was then asked to get together and introduce themselves to each other and take a group photo.

Meanwhile, a group page was created on Blackboard for each group. Furthermore, each group was requested to save their meeting agendas and minutes and any other related files in the File Exchange section of their group page. Each meeting minute, policies etc. were acknowledged and confirmed through the Group page Discussion Board. Simultaneously, participants were requested to have printed versions of their minutes, policies etc in order for them to be commented on by their tutors. Participants were encouraged to share their findings with each other through the discussion board with minimum intervention from the lecturer/tutor. Screen Captures1, 2, 3, 4, 5 and 6 shows these activities.

Each group was required to submit a proposal for their group report and use Blackboard to upload their proposals.

A weekly personal contribution, oral personal contribution and a percentage of contribution of each team member within the group should be provided by each team member via Blackboard. This is done to ensure that all team members are contributing continuously and also to identify at an early stage any likely problems with any un-incorporative members.

The final report and related presentation was submitted electronically using the Grade Centre and group page facilities of Blackboard.

Colleagues from various departments were invited to participate in group presentations and assess each group. Furthermore, attending students in the presentation sessions were also asked to assess each presenting group. Each group's presentation was videotaped as an iLecture and was uploaded on the Blackboard. Finally, participants were graded and provided with feedback verbally and written through Grade centre and Group pages.

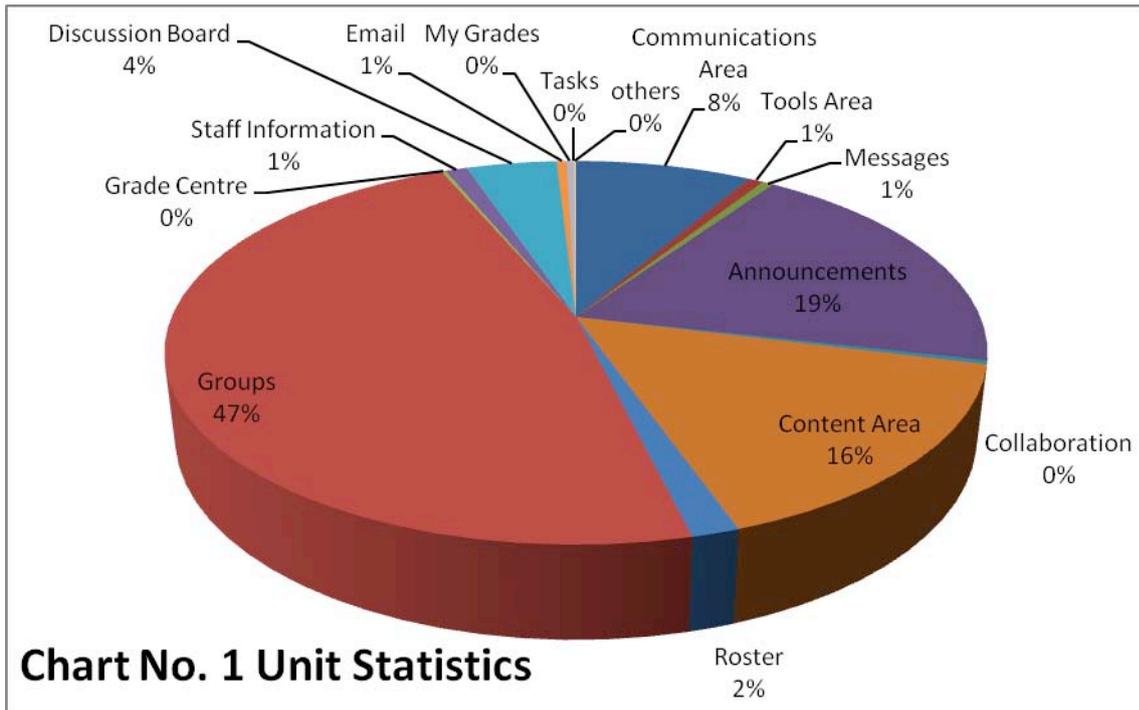
In order to encourage optimal participation within each group, 3 different prizes were nominated and awarded to the three winning groups. The first prize was a Civil Engineering Project Management book which was kindly donated by the Pearson Education Group, the second prize was a PMI Body of Knowledge CD-ROM book which was kindly donated by the Project Management Institute and the third prize was Curtin University Bookshop certificate for the value of \$50.00 which was provided by the Civil Engineering Department.

6 SUMMARY OF COURSE STATISTICS

Table 2 and Chart 1, below indicates the total usage of Blackboard by participants. This was obtained through the course statistics from Blackboard:

Table 2 Summary of Unit Statistics

Area ID	Hits	Percent
Communications Area	3075	8.3%
Tools Area	259	0.7%
Messages	193	0.52%
Announcements	7069	19.08%
Collaboration	120	0.32%
Content Area	5816	15.7%
Roster	586	1.58%
Groups	17557	47.4%
Grade Centre	75	0.2%
Staff Information	375	1.01%
Discussion Board	1580	4.27%
Email	173	0.47%
My Grades	84	0.23%
Tasks	45	0.12%
Others	33	0.01%
Total	37040	100.0%



SCREEN CAPTURE 1- ANNOUNCEMENT PAGE/STAFF INFORMATION

Home Help Logout

Home
Students
Staff
OLAS

Final Exam Coverp

Final Pres. G1 -

Final Pres. G9 -

Announcements

Weekly Personal C

Computer Lab Allo

Staff Information

Unit Materials

Assessments

Communication

Discussion Board

Tools

CIVIL ENGINEERING PROJECT MANAGEMENT 363 (11880-CU-061-01-S00X11) > ANNOUNCEMENTS

Announcements

Welcome to Civil Engineering Project Management 363

Lecturer: Ali Golshani
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Id	Task Name	Duration
1	House design	2d
2	Architectural design	1d
3	Structural design	1d
4	Execution contract	2d
5	Offer selection	1d
6	Contract signing	1d
7	Execution permits	1d
8	House construction	5d

VIEW TODAY VIEW LAST 7 DAYS VIEW LAST 30 DAYS VIEW ALL

July 10, 2009 - July 17, 2009

Tue, Jun 09, 2009 -- *Winners of Civil Engineering Project Management* Posted by: Ali Darabi Golshani

Winners of Civil Engineering Project Management 363

After going through all Reports and Presentations, it has been decided to announce the following groups as Winners of this Semester Project Management 363 Report submissions.

SCREEN CAPTURE 2 – ANNOUNCEMENT / WINNING GROUPS

The screenshot shows a web page from Curtin University of Technology. The header includes the university logo and navigation links: Home, Help, and Logout. Below the header are tabs for Home, Students, Staff, and OLAS. A left sidebar contains a vertical menu of buttons: Final Exam Coverp, Final Pres. G1 -, Final Pres. G9 -, Announcements, Weekly Personal C, Computer Lab Allo, Staff Information, Unit Materials, Assessments, Communication, Discussion Board, Tools, Control Panel, Refresh, and Detail View. The main content area features a post from Tuesday, June 9, 2009, titled "Winners of Civil Engineering Project Management 363". The post text states: "After going through all Reports and Presentations, it has been decided to announce the following groups as Winners of this Semester Project Management 363 Report submissions." The winners are listed in three categories: 1st Place - Group 12 (Ash Johnson, Bido Betiri, James Gee, Ma De La Fuente, Oliver Horn), 2nd Place - Group 3 (Benjamin Galvin, Christopher Yates, Deane Forlder, Mujtaba Hedayat, Timothy Brid, Travis Pedlar), and 3rd Place - Group 11 (Adam Lee, Andrew Hurley, Cameron Burns, Joshua Duke, Min Chie Liong, Mumba Muyanmwa Muyamwa). The post is attributed to Ali Darabi Golshani.

SCREEN CAPTURE 3 – ANNOUNCEMENT / UNIT INFORMATION

The screenshot shows a web page from Curtin University of Technology with the same header and navigation as the previous capture. The left sidebar is identical. The main content area displays three announcements. The first is from Saturday, March 14, 2009, titled "Group Pages Information and Deadline for Proposal", stating that Monday is the final date for submitting group proposals and listing nine items that need to be updated on group pages: 1. Agendas of Meetings, 2. Minutes of Meetings, 3. Group Roles, 4. Team Policies, 5. Initial Group Proposals, 6. SWOT Analysis, 7. Group Photos with Names of Students displayed, 8. Final Group Proposal, and 9. Any other related documents. The second announcement is from Tuesday, March 10, 2009, titled "Weekly Computer Lecture Schedule", announcing a "Weekly Schedule for Microsoft Project Lectures" in the Unit Materials Folder. The third announcement is also from Tuesday, March 10, 2009, titled "The Belbin Team Roles Results", stating that results for Belbin Team Roles have been added to the list of group members and that a document explaining individual roles is available in the Handouts/Templates folder. All announcements are posted by Ali Darabi Golshani.

SCREEN CAPTURE 4 – UNIT MATERIALS

Curtin University of Technology

Home Help Logout

Home Students Staff OLAS

CIVL ENGINEERING PROJECT MANAGEMENT 363 (11860-CU-061-01-S3C(X1)) > UNIT MATERIALS > HANDOUTS/TEMPLATES [EDIT VIEW](#)

Handouts/Templates

- Weekly Assessment of Personal Contribution**
[Weekly Assessment of Personal Contribution.pdf](#) (67.93 kb)
Weekly Assessment of Personal Contribution
- The Belbin Team Roles**
[BelbinTeamRoles.pdf](#) (64.918 kb)
- Agenda - Template**
[Agenda - Template](#) (29.5 kb)
- Minutes - Template**
[Minutes - Template](#) (62 kb)
- SWOT Analysis Template**
[SWOT Analysis Template](#) (34 kb)
- Table of the Standard Normal Cumulative Distribution Function**
[Table of the Standard Normal Cumulative Distribution Function](#) (24.447 kb)
- Guideline to Project Management Report**
[Guideline to Project Management Report](#) (615.244 kb)

OK

SCREEN CAPTURE 5 – GROUP PAGES

Curtin University of Technology

Home Help Logout

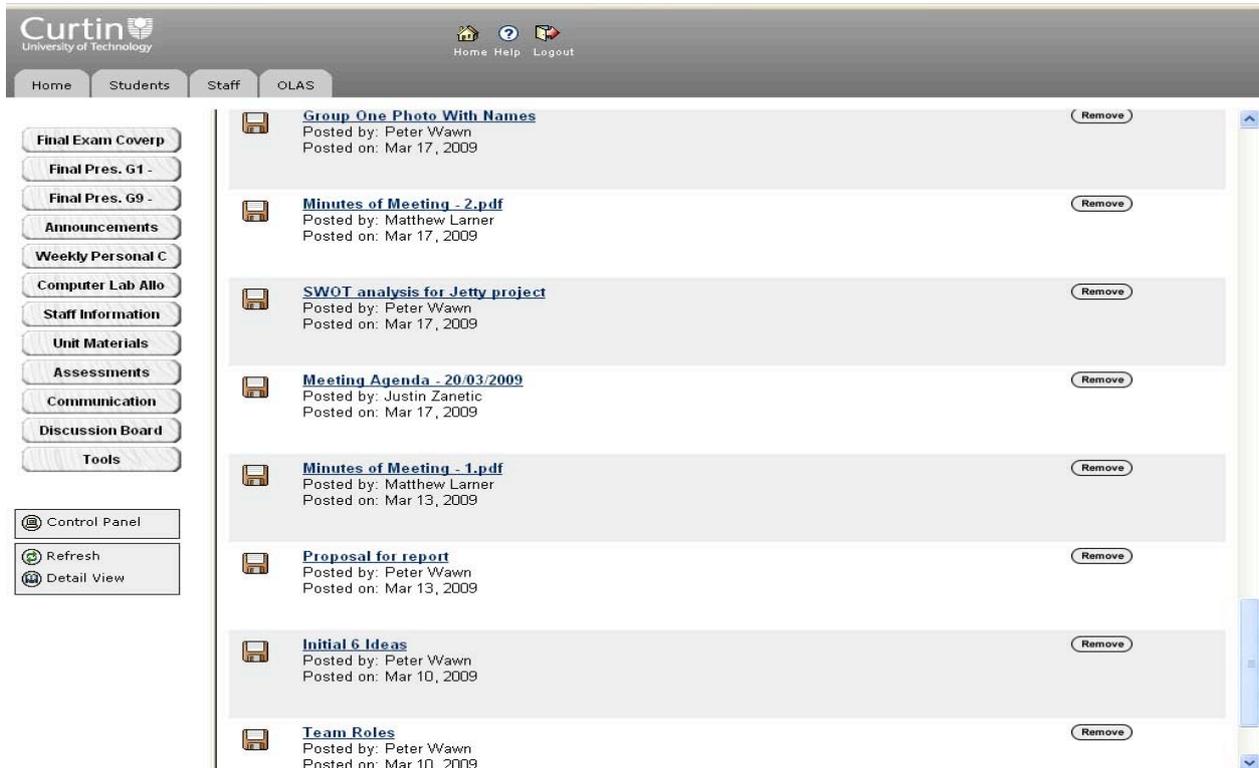
Home Students Staff OLAS

CIVL ENGINEERING PROJECT MANAGEMENT 363 (11860-CU-061-01-S3C(X1)) > COMMUNICATIONS > GROUP PAGES

Group Pages

- Group 1**
Ben,
Caiden
Justin
Matthew
Michael
Peter
- Group 10**
Albert
Brendan
Jack
Jacky
Kiung Yiung
Tony
- Group 11**
Adam
Andrew
Cameron
Joshua
Min Chie
Mumba Muyamwa
- Group 12**
...

SCREEN CAPTURE 6 – GROUP PAGE FORMAT



The screenshot displays a web interface for a discussion board. At the top, the Curtin University of Technology logo is visible on the left, and navigation links for Home, Help, and Logout are on the right. Below the logo, there are tabs for Home, Students, Staff, and OLAS. A vertical sidebar on the left contains various menu items such as Final Exam Coverp, Final Pres. G1, Final Pres. G9, Announcements, Weekly Personal C, Computer Lab Allo, Staff Information, Unit Materials, Assessments, Communication, Discussion Board, and Tools. Below these are buttons for Control Panel, Refresh, and Detail View. The main content area shows a list of posts, each with a document icon, a title, the poster's name, the date, and a Remove button. The posts are:

- Group One Photo With Names** (Remove) - Posted by: Peter Wawn, Posted on: Mar 17, 2009
- Minutes of Meeting - 2.pdf** (Remove) - Posted by: Matthew Lamer, Posted on: Mar 17, 2009
- SWOT analysis for Jetty project** (Remove) - Posted by: Peter Wawn, Posted on: Mar 17, 2009
- Meeting Agenda - 20.03.2009** (Remove) - Posted by: Justin Zanetic, Posted on: Mar 17, 2009
- Minutes of Meeting - 1.pdf** (Remove) - Posted by: Matthew Lamer, Posted on: Mar 13, 2009
- Proposal for report** (Remove) - Posted by: Peter Wawn, Posted on: Mar 13, 2009
- Initial 6 Ideas** (Remove) - Posted by: Peter Wawn, Posted on: Mar 10, 2009
- Team Roles** (Remove) - Posted by: Peter Wawn, Posted on: Mar 10, 2009

7 CONCLUSIONS AND FURTHER DISCUSSION

The methods used in the above course delivery were proven to be extremely successful. Participants managed to communicate more effectively and the level of collaboration was improved drastically. At the end of the course, participants demonstrated overwhelming satisfaction in their learning journey and produced high quality team reports.

Future improvements can be made by increasing the usage and activity of the discussion board, together with the usage of continuous online feedback and quizzes that would assist facilitators to monitor participants' progress more effectively. Video recorded presentations together with online assessment should involve more participants to provide feedback on other groups presentations.

Furthermore, merging other units in the same program and creating a collaborative discussion environment would bring the added advantage of knowledge sharing and enrich the teaching environment.

REFERENCES

- [1] Chickering, A. & Ehrmann, S. (2003). Implementing the seven principles: Technology as a lever. The TLT Group. <http://www.tltgroup.org/programs/seven.html>.
- [2] Chickering, A. & Gamson, Z. F. "Seven Principles for Good Practice in Undergraduate Education" <http://www.tltgroup.org/Seven/Home.htm>
- [3] Belbin M. (1993) Team Roles at Work; Butterworth/Heinemann