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 complied 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.

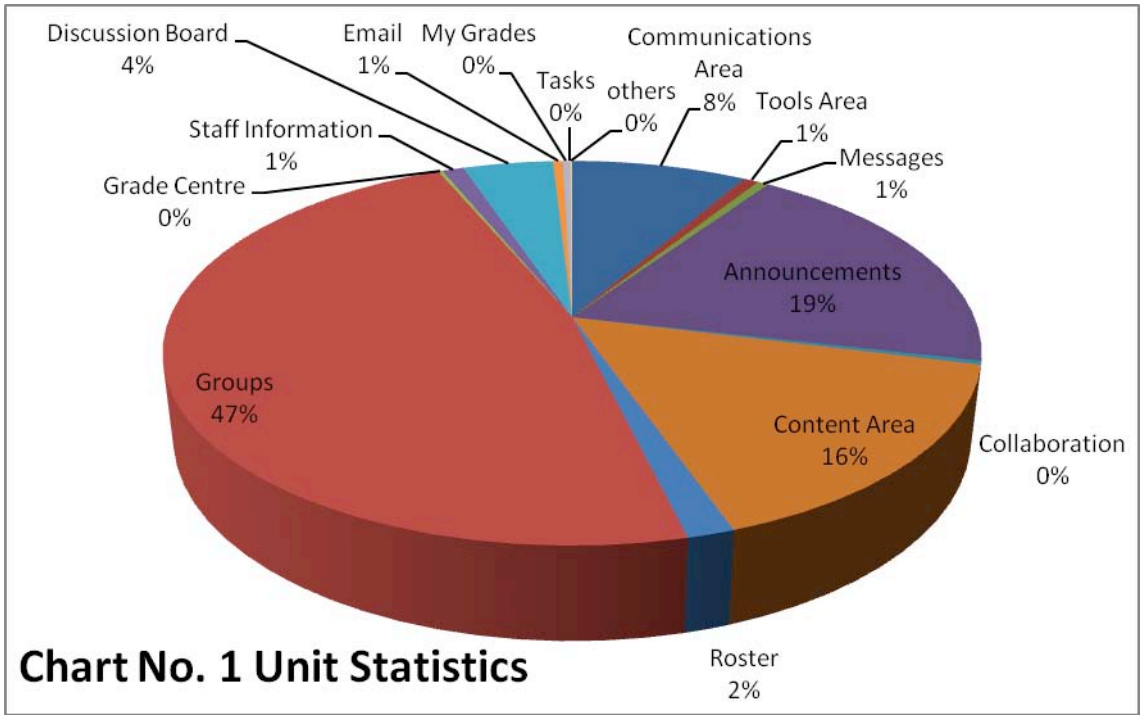
In order to encourage optimal participation within each group, 3 different prizes were nominated and awarded to the three winning groups. The first prize was a Civil Engineering Project Management book which was kindly donated by the Pearson Education Group, the second prize was a PMI Body of Knowledge 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

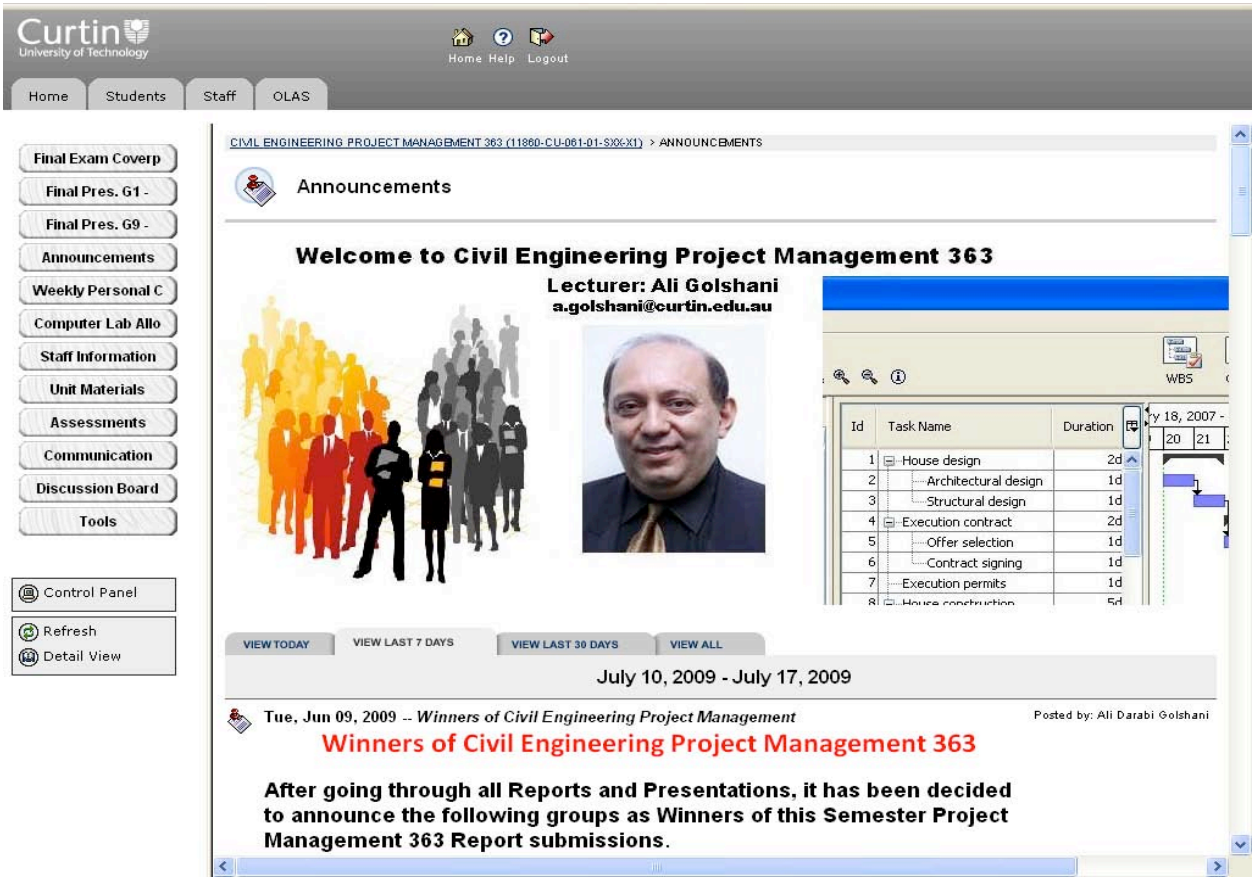
Table 2 and Chart 1, below indicates the total usage of Blackboard by participants. This was obtained through the course statistics from Blackboard:

Table 2 Summary of Unit Statistics

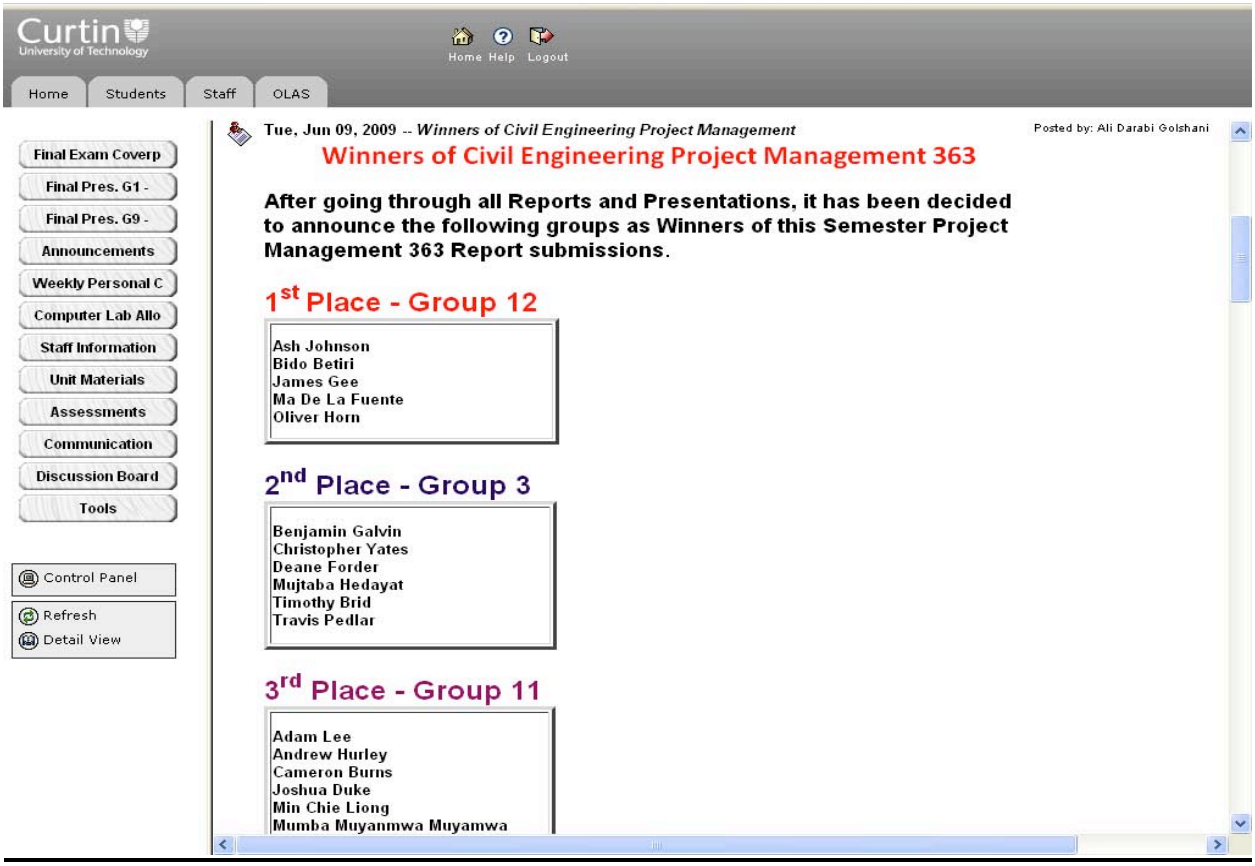
Area ID	Hits	Percent
Communications Area	3075	8.3%
Tools Area	259	0.7%
Messages	193	0.52%
Announcements	7069	19.08%
Collaboration	120	0.32%
Content Area	5816	15.7%
Roster	586	1.58%
Groups	17557	47.4%
Grade Centre	75	0.2%
Staff Information	375	1.01%
Discussion Board	1580	4.27%
Email	173	0.47%
My Grades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



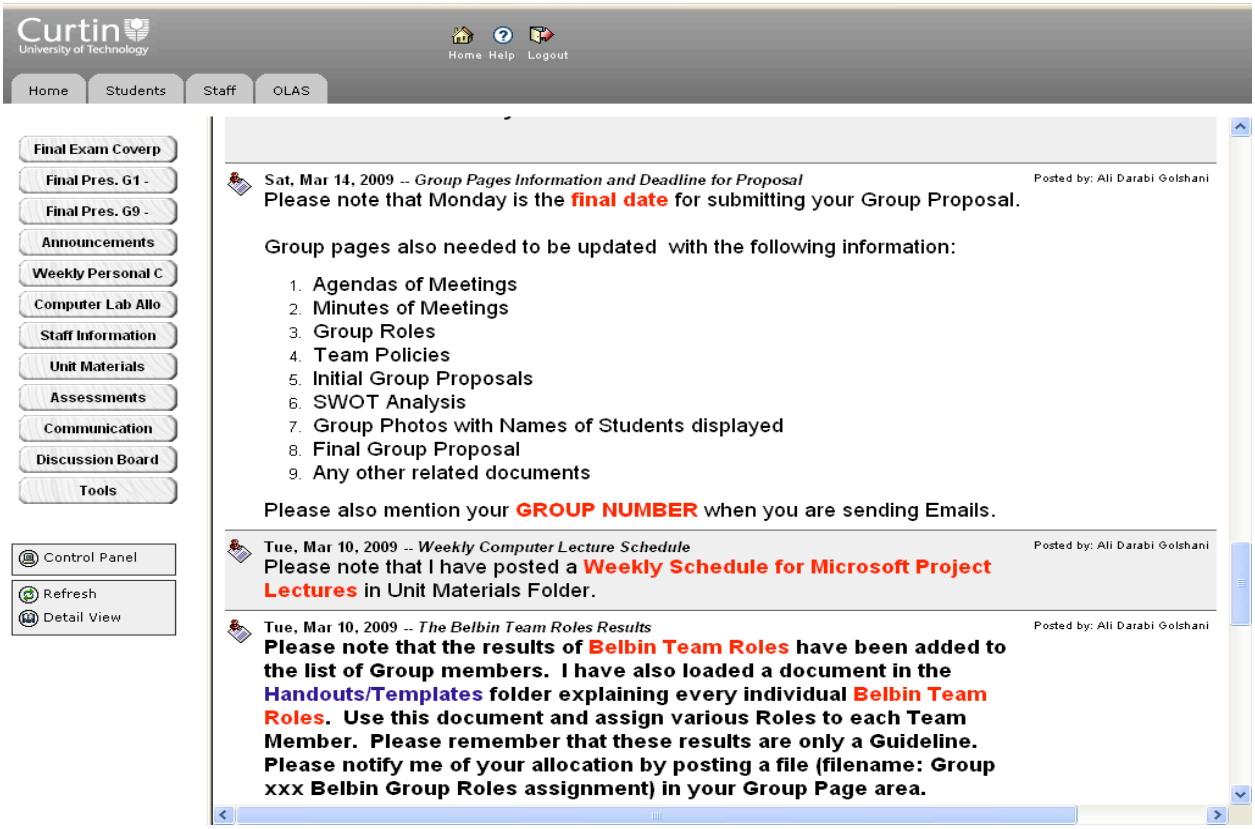
SCREEN CAPTURE 1- ANNOUNCEMENT PAGE/STAFF INFORMATION



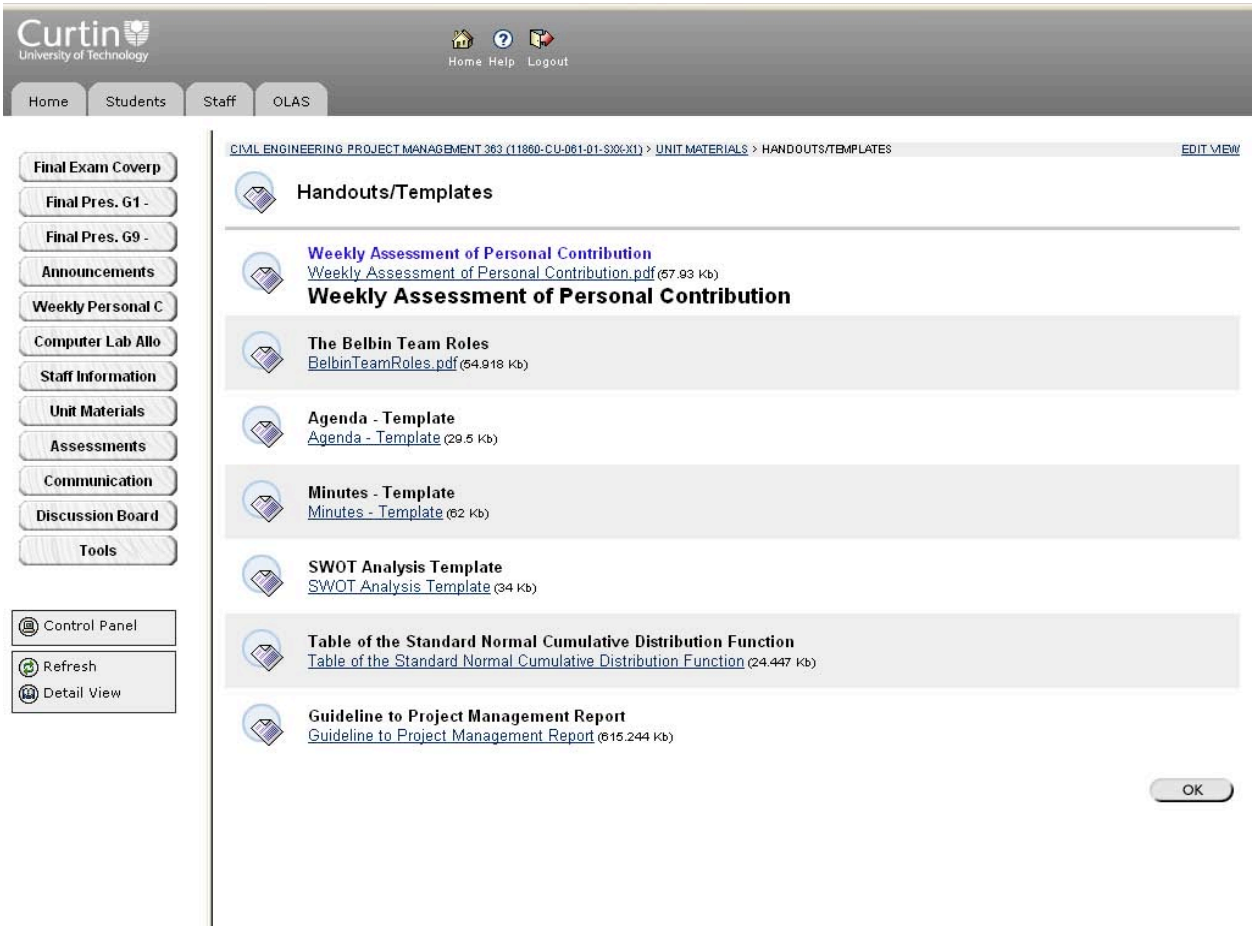
SCREEN CAPTURE 2 – ANNOUNCEMENT / WINNING GROUPS



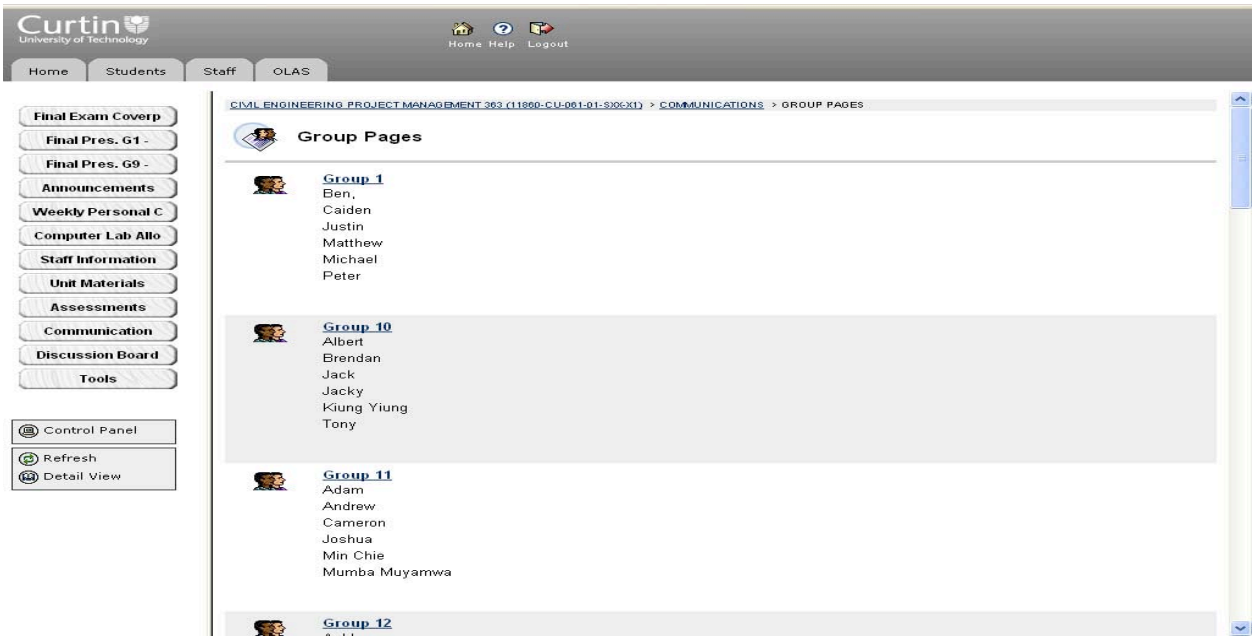
SCREEN CAPTURE 3 – ANNOUNCEMENT / UNIT INFORMATION



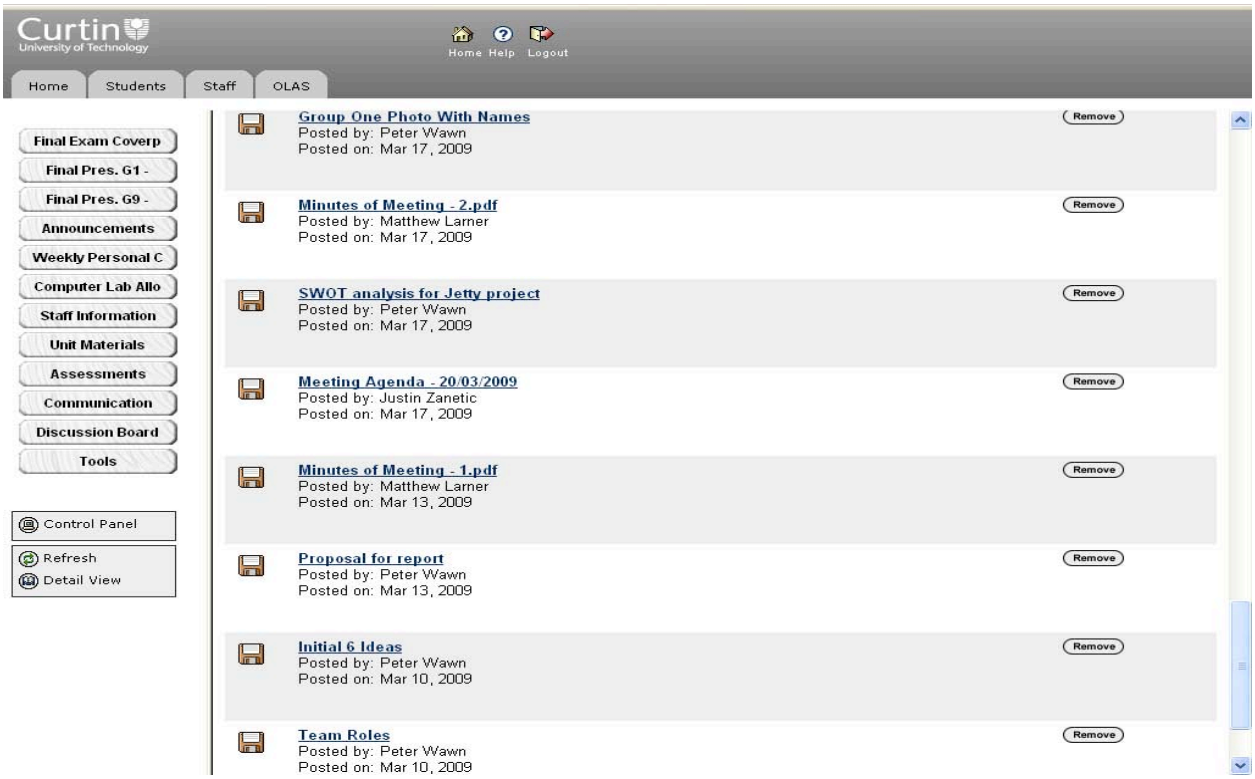
SCREEN CAPTURE 4 – UNIT MATERIALS



SCREEN CAPTURE 5 – GROUP PAGES



SCREEN CAPTURE 6 – GROUP PAGE FORMAT



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.

REFRENCES

[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