

Integrating E-Learning and Classroom Learning for Engineering Quality

Control unit - Curtin University 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; communication abilities, organizational skills, self-promotion, the ability to work as part of a team, be an effective problem solver, be a critical thinker, have good negotiation skills, have the ability to be a leader and being able to network effectively.

Department of Civil Engineering at Curtin University of Technology in Perth, Australia offers a Master of Engineering Management degree for Engineers from various disciplines. One of the units taught in this Master degree program is Engineering Quality Control.

It was decided to incorporate these non-technical skills in this unit by using an e-learning platform (Blackboard) together with an adaptation of the Seven Principles of Good Practice and Dr Meredith Belbin's team role theory to divide participants into groups.

At the end of the unit, most of the participants were showing improvements in their non-technical skills.

Keywords: e-learning, Blackboard, Management, Engineering, Quality Control

1. INTRODUCTION

Regrettably, many units in engineering degrees only concentrate on technical skills and don't address non-technical skills such as communication, organization, negotiation, team work, and self-promotion skills.

At Curtin University of Technology, it was decided to introduce these non-technical skills in to various engineering degree programs. In this paper, Engineering Quality Control unit which is the part of the Master of Engineering Management program was selected for this purpose. Assignments were designed in a manner to incorporate mentioned non-technical skills. This was implemented via an e-learning platform (Blackboard). Furthermore, the Seven Principles of Good Practice using technology [1][2] was adopted in this unit. This is done in addition to the normal classroom delivery.

2. ENGINEERING QUALITY CONTROL UNIT

The Engineering Quality Control Unit provided participants with an understanding of the processes of quality management in the context of International Standard ISO 9001:2000. It also provided an understanding of these processes in an engineering project environment and assisted participants to manage these processes in industry.

Duration of this unit was 36 hours of teaching and tutorials which was divided in 12 weeks of 3 hours. In 2009, there were 20 participants enrolled for this unit. There were participants from many countries in the world as well as Australia. Most of the participants had many years of industrial experience and only a couple of participants had no industrial experience.

Participants were from various engineering disciplines (Electrical, Electronic, Industrial, Mechanical, Mechatronic, Petroleum, Computer, Chemical, Civil, and Mining).

The unit was assessed by using a Team Assignment (30%), a Mid-Trimester exam (20%) and a final exam (50%).

3. SEVEN PRINCIPLES OF GOOD PRACTICE

Seven principles of good practice in undergraduate education which is authored by Arthur W. Chickering and Zelda F. Gamson [2] and compiled in a study supported by the American Association for Higher Education, the Education Commission of the States and the Johnson Foundation states 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 no. 1 shows the Seven Principles of good practice and strategies associated with Blackboard technology:

Table No. 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 ENGINEERING QUALITY CONTROL UNIT

The adoption of Blackboard and the Seven Principles of Good Practice was used throughout the Engineering Quality Control 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

Allowable 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 analyze 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 and self-discipline.

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 more effectively.

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

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

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

In the team assignment, participants were asked to form groups of 5 members and each member was assigned a Belbin role according to their test result. At the time of assignment, it was made clear that these roles are only voluntary and could be changed if all team members agreed.

Each group was then asked to get together and introduce themselves.

Meanwhile, a group page was created on Blackboard for each group. Screen Capture No. 1 shows a screen shot of these pages.

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. Furthermore, each meeting minute, policies etc. were acknowledged and confirmed through the Group page Discussion Board. Screen Capture No. 2 shows Group 4 discussion board activities.

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 any of their findings with each other through the discussion board with minimum intervention from the lecturer/tutor.

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

Final report and related presentation was submitted electronically using the Grade Centre and group page facilities of Blackboard. After submission each group presented their findings and they were assessed by other participants in the class. After submission and presentation, participants were provided feedback verbally and written through Grade center.

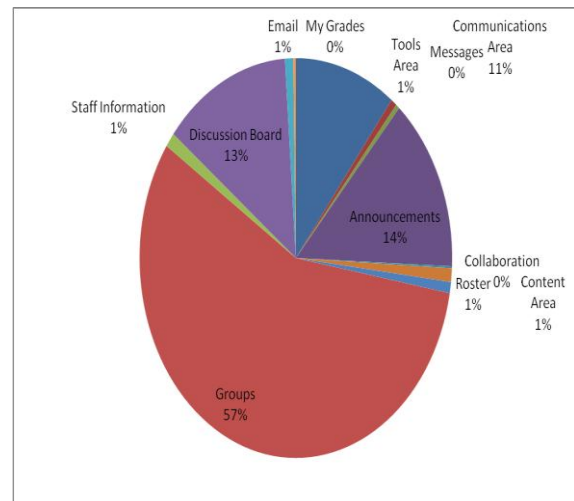
6. SUMMARY OF COURSE STATISTICS

Table no. 2 and Chart no. 1, below indicates the total usage of Blackboard by participants. This was obtained through the course statistics from Blackboard:

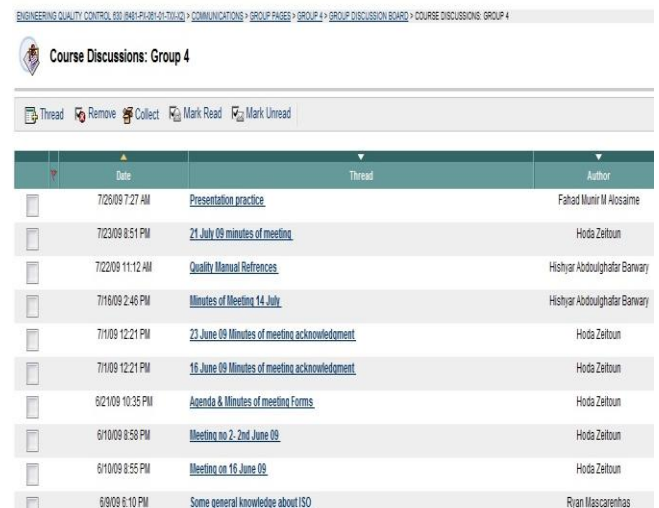
Table No. 2 Summary of Unit Statistics

Area ID	Hits	Percent
Communications Area	572	10.5%
Tools Area	34	0.6%
Messages	21	0.4%
Announcements	773	14.2%
Collaboration	9	0.2%
Content Area	60	1.1%
Roster	49	0.9%
Groups	3092	56.7%
Staff Information	64	1.2%
Discussion Board	722	13.2%
Email	47	0.9%
My Grades	14	0.3%
Total	5457	100.0%

Chart No. 1 Summary Course Statistics



Screen Capture No. 1 – Group Pages



Screen Capture No. 2 – Course Discussion – Group 4

The screenshot shows a web application interface for Curtin University of Technology. The page is titled "Screen Capture No. 2 – Course Discussion – Group 4". The interface includes a navigation menu on the left with options: Announcements, Course Documents, Assignments, Communication, Discussion Board, Tools, and External Links. Below the navigation menu are buttons for Communication, Control Panel, Refresh, and Detail View. The main content area displays "Group Pages" for four groups:

- Group 1**: Tshering, Bander, Hamansyah, Abdullah, Evy, Ali
- Group 2**: Rani, Heather, Kelechi, Sahat, Abdullah, Ali
- Group 3**: Ahmed, Mohammed, Burton, Feliscia, Kevin, Ali
- Group 4**: Fahad, Hishyar, Faisal, Hoda, Ryan

The top of the page features the Curtin University of Technology logo and navigation links: Home, Help, and Logout. The breadcrumb trail indicates the current location: ENGINEERING QUALITY CONTROL_630 (6481-FX-061-01-TXX-02) > COMMUNICATIONS > GROUP PAGES.

7. CONCLUSIONS AND FURTHER DISCUSSION

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.

For the future improvement, more usage of the discussion board, together with the usage of continuous online feedback and quizzes would assist facilitators to monitor participants' progress more effectively. 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.

8. 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 of Good Practice in Undergraduate Education"
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- [3] Belbin M. (1993) Team Roles at Work; Butterworth/Heinemann