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Partners in learning : proceedings of the 12th annual Teaching and Learning Forum, Edith Cowan University, 11-12 February 2003

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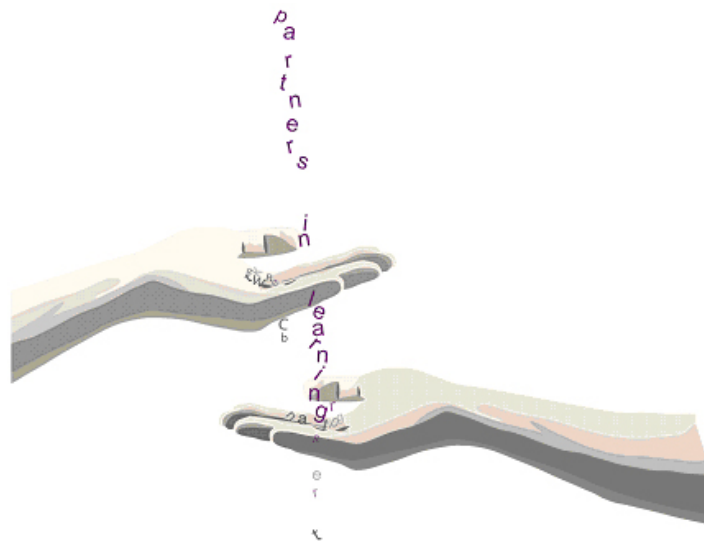


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12th Teaching and Learning Forum 2003

[Title Page](#)[Welcome](#)[Preface](#)[Reviewers](#)[Contents](#)

Partners in Learning

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For the Teaching Learning Forum 2003 committee.

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12th Teaching and Learning Forum 2003

[Title Page](#)[Welcome](#)[Preface](#)[Reviewers](#)[Contents](#)

Welcome



This publication of selected papers addressing the 12th Annual Teaching and Learning Forum theme of *Partners in Learning* provides an overview of the issues facing staff in higher education in Australia.

The articles chosen for this post-forum publication provide innovative ideas that bring the opportunity to share and learn about teaching and learning into focus as lecturers consider ways to improve students' learning and experiences in higher education through partnerships with them and with others. With the advent of Higher Education at the Crossroads by Federal Minister Brendan Nelson, it is evident that staff will face new challenges.

I thank the authors for their participation in the forum and for their enthusiasm to take up the challenge to be Partners in Learning in higher education.

Linda McLain
Manager
Professional Development @ Learning Development Services
Edith Cowan University
July 2003



12th Teaching and Learning Forum 2003

Title Page

Welcome

Preface

Reviewers

Contents

Preface



The 12th Annual Teaching and Learning Forum for Western Australian Universities was held at the Joondalup Campus of Edith Cowan University on the 11th and 12th of February 2003. The theme, "*Partners in Learning*", was chosen to explore partnering in education, with a focus on university staff, students, government, community and industry representatives. Participants were invited to explore issues, present ideas and experiences, lead a discussion, or create a poster. Conference abstracts can be viewed on-line at <http://lsn.curtin.edu.au/tlf/tlf2003/contents.html>

This is the fourth year in which a reviewed publication has been produced and we have followed a similar process to that used in previous years. Participants were invited to submit their papers for peer review after the forum to allow re-work of the papers in the light of discussions at the forum. Full papers were then submitted to a double blind peer-reviewing process where the papers were assessed according to a number of criteria including relevance to the conference theme, importance and applicability of the ideas, the quality of the research and its connection to existing research on the topic. Again, the standard was high: of the 42 papers submitted for consideration, 28 were recommended for publication. We are very grateful to the reviewers for their constructive feedback and we trust that the authors of these papers also appreciated the feedback provided. The reviewers are listed at the end of this preface.

The papers have been grouped using the sub-themes from the conference programme.

The first group of papers focuses on the student-teacher partnership in the learning context. Rozz Albon discusses contract-based learning with Education students; Gina Arena writes about problem-based learning with Health Science students; Clive Barstow describes a model of authentic learning that links educational, commercial and industrial activity for Visual Arts students; Dawn Darlaston-Jones and Lynne Cohen explore what happens when alternative, more student-centred approaches are used in traditionally teacher-centred contexts; Shelda Debowski argues the case for tertiary teachers to develop and model effective information seeking competencies; and Georgina Fyfe and Marilyn Bennett-Chambers share the experiences of staff and students involved in final year project work.

The second section contains case studies of student support. Fran Banytis describes a successful post-graduate support programme, and Zora Singh and Martijntje Kulski describe a model for deliberate intervention at critical stages in the research process. Amanda Willis, Sally Male and Yarra Korczynskij explore some of the effects of partnerships between equity programmes and Science and Engineering courses.

The third set of papers addresses the critical issue of assessment. Alistair Campbell considers the use of an online tool to aid multiple lecturers to record and moderate marks. Donella Caspersz, Judy Skene and Madeline Wu explore issues of fairness in marking team projects and Leanne Sheen describes a tool developed to increase reliability and validity in assessing clinical skills.

The fourth sub-theme is reflection in learning. Dell Dennis explores how teaching approaches that emphasize critical reflection and emancipatory learning are more likely to develop the kind of learning necessary in adult education. Maria Northcote describes an instrument to investigate the relationships between beliefs of teaching and learning of both teachers and students. Carol Pierce reports on the use of reflective log books in encouraging a reflective approach to practice and Lorraine Sim reports some problems in peer learning partnerships.

The next sub-theme looks at situations where the teacher-learner partnership is mediated by the online environment. Lauren Breen, Lynne Cohen and Paul Chang explore the first-time use made of the online environment by staff and students and question the value of simply adapting existing materials for the online medium. Dorit Maor and Archie Zariski explore the link between technology and pedagogy in a study of teachers whose teaching incorporated the online environment. Catherine McLoughlin considers the partnership between learner needs and

instructional design in the quest for a good online experience. The next paper is an example of such a partnership between learner needs and instructional design: the development of an e-learning module to challenge and change students' mental models, reported by Romana Pospisil and Sue Stoney. The final paper in this set, by Clifton Smith and Peter Hosie, describes the philosophy and pedagogy informing the design and development of online units in Security Science.

The penultimate set of papers looks at the partnerships that can be established across disciplines. In the first paper, Peter Bullen and Peter Davis describe a learning activity where final year architecture and construction students work together on a project each bringing their specialist set of skills and knowledge to the situation. Tanya Dalziel and Susan Gourvenec consider the opportunities of new partnerships in curriculum development when there is a shift to outcomes-based education. Anne Fernandez and Mary Peat examine the value that can be added to the first year experience when staff teach across disciplines. Daniel Midgley takes us into a classroom and offers practical suggestions for moderating student anxiety in cross-discipline situations.

The final set of three papers addresses the wider partnership between university programs and professional and industry groups. In their case study, Sue Colyer and Judy Tan describe a partnership between a golf industry organization and a university to create a new major to meet identified industry needs. The next paper, by Terry de Jong and Sue Sharpe, explains the theoretical basis for partnering higher education with its industry or profession and reports on noteworthy examples of partnership between schools and universities in North America. The final paper in the publication, by Susan Krieg and Sue Sharpe, reports on the benefits for both students and the industry when institutional barriers can be reduced.

We hope you enjoy reading this collection of papers and that they encourage you to develop and improve the numerous partnerships in the learning process. We would like to thank, on behalf of all conference participants, the numerous people behind the scenes who gave their time and expertise in the various stages of planning and hosting this conference. As editors, we are particularly grateful for the financial and administrative support from Learning and Development Services @ ECU that has made this publication possible.

Alison Bunker and Mardi O'Sullivan
Edith Cowan University



12th Teaching and Learning Forum 2003

Title Page

Welcome

Preface

Reviewers

Contents

Referees



Rozz Albon	Martin Forsey	Jim Millar
Matthew Allen	Georgina Fyfe	Mauro Mocerino
Roger Atkinson	Ann Galloway	Maria Northcote
Ann Backhaus	Allan Goody	Ron Oliver
Craig Baird	Julia Gross	Mardi O'Sullivan
Clive Barstow	Robert Guthrie	Anne Pratt
Lauren Breen	Anthony Herrington	Sally Reagan
Christopher Brook	Lekkie Hopkins	Jenny Silburn
Mark Canny	Peter Hosie	Clifton Smith
Donella Caspersz	Adrianne Kinnear	George Spyker
Gail Chittleborough	Tina Kulski	Len Therry
Barnard Clarkson	Rick Ladyshevsky	Graham Thompson
Sue Colyer	Monica Leggett	Eileen Thompson
Barbara Combes	Jane Long	Greg Tower
Geoff Cooper	Bob Loss	Keith Truscott
Tanya Dalziell	Joe Luca	Bert Veenendaal
Dawn Darlaston-Jones	Dorit Maor	Beverley Yardley
Dell Dennis	Kenn Martin	Archie Zariski
Mark Dixon	Linda McLain	

Contract- based learning: Is it effective?



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The contexts for learning are changing. Universities must not only keep abreast of effective and efficient learning strategies but embrace these within their own particular contexts. Learning has moved from a solitary activity to involving partners of many kinds and at varying levels. Student diversity, globalisation of knowledge through the Internet and the information age demand teachers develop innovative ways to promote learning. Contract-based learning (CBL) and its emphasis on teamwork or partners was proposed as the framework to address these demands. It was trialled with a cohort of first year education students enrolled in a core unit. The learning plan and its delivery and their role in the trial are reported along with the outcomes of CBL as an effective approach to learning.

The sheer diversity of students and the globalisation of education suggest different teaching approaches are needed to cater for all students' learning. Educators must rethink, restructure and reorganise their present delivery system to benefit all students (Petch-Hogan & Haggard, 1999). Past perceptions of learning in universities are inadequate with potential to alienate or marginalise future students who approach learning differently or need to learn in a way which accommodates work needs of the future. Teacher-directed learning may be economical as a platform for dissemination of information but its effectiveness in terms of learning for transfer is highly questionable (Klionsky, 2002; Toole, 2000; Weld, 2002).

Students of the future need to problem-solve, deal with uncertainty and competently use technology in environments of partnerships, teams or communities. Use of the Internet has imposed its own demands on learning and more than ever requires students to be self-regulatory in their learning (Zimmerman, 1994) to deal effectively with the information age. The speed information can be accessed and the cognitive load (Cooper, 1998) imposed by the Internet means students can no longer rely only on information from an outdated and limited source such as a text book, but must explore alternative sources. These have become the catalyst to pursue innovative teaching and learning approaches and recent evidence of student-centred approaches in universities (Albon & Trinidad, 2002) heralds the movement to address these issues.

Background and Theoretical Position

Contract-based learning (CBL) is proposed as an effective and appropriate learning strategy for university students to promote the use and acquisition of self-regulated, organized, constructive and reflexive approaches to learning. CBL was popular for school learning during the 1970's and 1980's but its application in universities appears minimal, although successful. Sonner (1999) reported business students who used a

contract or examination program did better than those in traditional or televised courses. Bing-You, Bertsch, Thompson (1998) noted that medical students who focussed on writing themselves goals in a learning contract, defining effective feedback and practising the feedback were most effective in their learning. Others (Berts, 1975; Boud, 1988; Wolfson, 1997) simply reported on the success of contracts with business and nursing students. Button and Davies (1996) used a learning log with nursing students which combined a reflective journal and learning contract practices and resulted in student capability in managing their own learning, setting goals and identifying achievements. Iverson (1995) noted how a group contract fostered intense teamwork whereas Hill and Hill (1990) acknowledged the learning outcome using group contracts. Although these studies claim to be successful in promoting learning very little research documents the evaluation of CBL. One evaluation of contracts (Harris, 1994) concluded that while they were effective, they should be carefully evaluated in terms of their purpose and student willingness.

On-line learning may be the impetus for the revitalization of contracts. As early as 1992 Reigeluth and Garfinkle (1992) explained learning contracts among others as the new image of education. The fault finding, as belonging to either instruction or learning (Dillon, Greene, Mansell, 2003) has been replaced by the learning process.

It follows that the implementation and evaluation of learning approaches, including CBL, should be underpinned by theory. Motivation to learn affects and is affected by other factors, and for adults the need for self-determination and be in charge of their own behaviours is significant. This addresses the need to experience choice in what is done and how it can be done (Woolfolk, 2003). It is the desire to have one's wishes determine actions rather than meet the pressure to conform to someone else's desires for us. Teachers often do not empower students in their own learning, that is, students are powerless over external controls and demands. Knowles (1975) recognized this powerless factor in the motivation of adults. He articulated a self-directed learning approach and later (1986) developed contract learning. Contracts were a formal way of scaffolding adults in their approach to independent learning. His contract approach involved eight steps in which learners themselves were responsible for diagnosing learning needs; specifying learning objectives; specifying learning resources and strategies; specifying evidence of accomplishment; specifying how the evidence will be validated; reviewing the contract with consultants; carrying out the contract and finally evaluating the learning.

Contracts generally came to reflect a content plan but Cristiano (1993) developed a process plan in which students identified relevant problems, stated learning objectives and named learning resources. A process plan is similar to a learning strategy (Biehler & Snowman, 1997) in which analysis, is used to ascertain the type of task, type of material, personal characteristics and identify useful tactics to achieve the task. This is followed by planning how the task will proceed and then the actual implementation of the plan. The plan is monitored for effectiveness to achieve the task and finally the success of the task or otherwise may impel the learner to modify or re-evaluate the complete process or part there-of.

CBL proposed in this paper expounds these and other key theoretical principles from Vygotsky (cited in Woolfolk, 2001), Piaget (cited in Woolfolk, 2001) and Bruner (cited in Le Francois, 1995). Applying mediated learning (Albon, 2001, 2002;

Vygotsky cited in Woolfolk, 2001) and the design of a community of learners model through the application of technology (Albon & Trinidad, 2002) strengthened the learning design and delivery style of CBL and addressed the limitations and barriers previously noted.

Description of the project

As student-centred approaches are used in the Faculty of Education, Curtin University of Technology, Western Australia CBL was introduced as an extension of student's previous group learning experiences involving the technologies of webCT.

CBL was used with a first year, second semester Educational Psychology unit titled 'Teaching, Learning and Assessment'. The assessment of the unit was a composite principal group task being the creation of a web site. It was expected that time management, organisation, self regulation and leadership within the groups would be the major inhibitors to learning to be addressed in CBL. The contract was viewed not only as a commitment to learning but as a means of defining the parameters for student's self-development and learning. It provided a framework for reflection, exploration and cognitive apprenticeship. Within the self-selected groups, regular meetings, in which agendas were prepared and a scribe rotated, and two scheduled meetings with the lecturer, were to be compiled as one aspect of a journal of andragogy. The journal functioned as an authentic working document as well as served the purpose of an organizer. The completed website had to address seven sub-tasks: a critique of three research journals, a teacher interview, chapter summary, links to two other chapters and a website, application to a movie and a quiz, all of which were reflected in the journal.

The group contract sought to formalise the time management process, commit individuals to self-regulation, better enable them to deal with leadership and enhance learning. The research attempted to explore the role and effectiveness of group contracts in university student's learning. Rich qualitative data was gathered through reflections and analysed using NVivo. In addition, a questionnaire was used to gather information about specific aspects of the contract.

Methodology

Objective: To evaluate the effectiveness of the CBL approach by analysing the learning strategies of students. Two questions were posed.

- 1 What factors contribute to CBL's effectiveness or militate against its effectiveness?
- 2 Is there a relationship between CBL and motivation?

To address the objective, the following evaluating questions were proposed: What learning strategies emerge as a result of CBL? Are these strategies different to previous learning? How effective is group CBL for all students as well as mature age, school leavers and minority students?

To address question 1, the following evaluating questions were proposed: What role does self-regulation play in CBL? Were the time management strategies useful?

Which aspect/s of the contract contribute to, or detract from effective learning and for whom?

To address question 2, the following evaluating question was proposed: How does group CBL affect motivation to learn?

A second semester cohort of 194 first year students completing a core unit in their bachelor degrees (equivalent of 8 semesters) used CBL to complete an assessment task. Students were enrolled in an ECE, Primary or Secondary Bachelor of Education Degree at Curtin University of Technology, Western Australia. Two tutors, including the author taught the unit.

The contract was group based, with each group self-selecting four members. Students had completed first semester as a cohort and had, it was assumed, developed sufficient friendship affiliations to form voluntary groups. A formal contract template was attached to the unit outline. It requested the group name, group members, focus area of study, the problem/question to be investigated, group goals/objectives, group outcomes, specific resources, a weekly plan for 10 weeks, documentation of the learning strategies prior to and after completing the group contract, reflections, and signatures from all members. It was submitted and filed in week 2 of semester and added to at the completion of the semester.

In the first week students were informed officially of the unit, how it would be delivered and the assessment framework. They formed groups, selected a focus area around which to design a web site and selected a fun group name for easy identity. Progress meetings with the tutor/lecturer were to be scheduled twice in the semester. Tutors/lecturers were to be invited to group meetings to meet a specific purpose planned in advance of the meeting. An expert in web design would facilitate sessions in weeks seven and nine. Attendance would be voluntary.

Data was collected using informal interviews, group meetings, open reflections on learning and a forty five item Likert-style questionnaire. Qualitative data was analysed using NVivo and quantitative data was analysed using percentages and correlations.

Descriptive Results and Conclusions

The data (Table 1) confirms the support and use of CBL as an effective learning approach. Table 1 reports all students in agreement as well as the percentage with strong agreement. Of particular note was the 64% who believed the task could not have been completed without the contract. This figure would seem to account for students with existing good time management skills as 83% agreed the contract was an effective learning strategy. Further, an overwhelming 90% of students perceived the group as providing support to their learning as it was constructed. Students preferred a group contract as opposed to an individual contract. Interview data concurred with this result with many students stating their initial dislike for group work had been overturned. They believed the group structure, experience and contract met their needs and assisted them in producing high achievement outcomes.

Group work, learning plan and delivery confound clear-cut results for considering CBL as a distinct learning strategy. Some 77% believed the contract could not have been completed without weekly planning, and 64 % believed it could not have been completed without the contract. Further, 85% believed setting goals made them more effective learners and that the contract enabled individual and group goals to be constructed.

Table 1.

Total percentage in agreement and sub group of strong agreement; Self-regulation and goal setting items of the questionnaire

Item no	Item	% in agreement	% strongly agree
1	Could not have been completed without weekly planning	77	30
2	Could not have been completed without contract	64	18
3	Could not have been completed without others	91	36
4	Used weekly goals to monitor progress	64	21
5	Setting goals made me a more effective learner	85	36
6	Contract enabled me to set group goals	85	33
7	Contract enabled me to set individual goals	81	37
8	Important to set group goals as question or problem	67	6
9	Negotiation with lecturer was essential	62	21
10	Flexibility of initial time frame important aspect of contract	85	31
11	Essential to have reflected on learning journey using CBL	67	15
12	Setting goals aided motivation to achieve	85	31
13	Setting goals motivated me to adhere to the time limits	75	44
14	Higher order thinking attributed to my learning	87	30
15	Have engaged in deep processing	79	30

There was an increase in individuals' repertoires of learning strategies from twenty one pre-learning strategies to twenty five post-learning strategies (Table 2). Of greater importance was the doubling in number of the interactive strategies, and a decrease in the solitary strategies. Students were receptive to interactive strategies such as those involving feedback, working in groups, accessing expert others, co-operating with individuals, active participation and mediated learning. Solitary strategies such taking notes and writing things down, listening and highlighting key points were common to both pre and post strategies. Forming pictures in one's mind, using diagrams and forming rules only appeared in pre-contract learning strategies.

It was noted that the group structure as opposed to working in isolation was very important to all students. Data from Table 1 supported the interview data which stated that much of their learning was achieved through quality interaction within the group but within the parameters of the subtasks. One group of students debated definitions of terms by drawing on personal experiences. Students stated the tasks involving teacher interview and movie contributed to the deep processing of knowledge. Mature students particularly liked the flexible but clear cut, 'no messing around' aspect and

responded well to the time management aspects. They met, presented work, assigned new tasks and left each meeting with clear goals. Mature students, in difference to younger students and school leavers were reticent about 'sharing'. They used the group as a resource to discuss, talk about issues, solve problems, review work in a similar way to school leavers but would have preferred greater independence of mark to represent their individual efforts. Minority students, although small in number, supported CBL and expressed that, despite it being quite contrary to their cultural views of learning, they valued the learning emerging from an enjoyable experience and hoped they could teach using the same approach.

Table 2.

Results from a content analysis identifying solitary and interactive strategy use in pre and post contract learning strategies

	No of solitary strategies	No of interactive strategies	Total number of strategies/references
Pre-contract	14	7	21
Number of references in NVivo	36	18	54
Post-Contract	11	14	25
Number of references in NVivo	62	76	138

The content analysis concurred with the strong support for the group as a resource. Students felt empowered by group decision-making. Most students valued the mediated approach of the lecturers.

Table 3.

Total percentage in agreement and sub group of strong agreement; Group and Group Dynamics

Item no	Item	% overall in agreement	% strongly agree
27	Group provided support as learning was constructed	90	50
28	Group contract was effective learning strategy	83	40
29	Became more aware of issues related to group learning	87	39
30	Group of 3 was referred size	49	35
31	Group of 4 was preferred size	74	56
32	WebCT was important when working in groups	83	57
33	Lecturer should have used random grouping	16	10

Choices relating to when, and in what sequence tasks could be completed were appreciated. Almost all students preferred independent learning with a clear support structure than teacher-directed learning. Feedback indicated they likened the task to interesting work and finding out information relevant to their careers, rather than an

assessment task for the sake of assessment. Others admitted they gave priority to this unit over other units.

The following factors contributed to CBL's success: access to the lecturer for feedback and clarification; the establishment of a time plan, opportunity for self-regulation, progress meetings, flexibility, responsibility and motivation. The learning strategies enabled students to discuss, argue, provide support to personal positions, analyse, and produce summaries and text in creative ways, not possible in other approaches the opportunity to link theory to practical tasks. Learning became a social occasion with coffee and popcorn often mentioned. Students commented that the challenge of producing a web site made them want to be successful. Creating a focus question and setting goals gave purpose in developing the site.

Several factors, such as the short time to complete the project, stress, meeting times and changes to weekly plans, detracted from CBL's success. Communication between groups took longer than students planned. They noted it was time consuming to organise a teacher interview which then impacted on other related tasks. Group friendships were shaken when tasks were not done on the agreed time. Insufficient knowledge to produce the web site was cited by some students but not in relation to the contract itself. A few students disapproved of the editing of other group members work. When asked 'next time I would,' students listed: ask lecturers more questions, don't be afraid; get organised at the start – in the first week; keep to plans; stick to deadlines; go to classes to help with computer skills; get more help when compiling the website.

Self-regulation reflected goal setting, ability to deal with flexibility and the demands of the task. Students liked the opportunity to self-regulate. Pre-contract strategies included asking questions, paying attention, outlining key points which would then direct them to book and internet searches, working with others, doing repetitive tasks, seeking task relevance, reading book/ internet, taking notes and talking to others. Post-contract strategies, supported more by mature students, focussed on the latter four. Goal setting and completing meeting agendas enabled the flexibility offered through CBL to be realized.

The post-contract strategies indicated more awareness of learning. Mature students used their peers less to explain, relied less on repetition and feedback, than school leavers and made comments indicating their awareness and appreciation of the need for constraints if they were to achieve the outcomes. They did not respond to sharing, preferring to reflect, discuss and keep to individual and group goals within the time plan. They were more cognisant of the need to link new information to prior knowledge. School leavers depended more on the group for talking about the task and all its parameters, were conversant of active participation in the group and mediated learning wrote things down, revised within the group and were more willing to share. School leavers made more comments related to staying committed to time plans and being organised from week 1 than mature students. All students constructed knowledge but used a different process. There was more agreement to mark up or down than receive equal marks for group work.

Time management strategies although discussed separately (Table 4) are closely linked to self-regulation. Developing a time plan assisted with on-task behaviour with

many students (85%) believing the contract made them more aware of using time productively. Weekly group meetings were also an effective time management strategy (79% agreed).

Table 4.

Total percentage in agreement and sub group of strong agreement; Time Management

Item no	Item	% overall in agreement	% strongly agree
16	Imposed time plan helped stay on task	74	35
17	Group contract committed me to contributing to tasks	83	29
18	Weekly time plans were appropriate	75	35
19	Contract allowed time frame suitable for academic lives	81	23
20	Contract made me aware of using time productively	85	23
21	Flexibility of appointments with lecturer met needs as a learner	81	35
22	Documenting meetings was effective time management strategy	79	46
23	Setting weekly time plans essential for fulfilling contract	73	37
24	Let group down if didn't fulfil my weekly goals	81	52
25	Dividing responsibility was effective time management strategy	82	56
26	Contract allowed new time plans to be established if needed.	81	27

The first question can be concluded by reference to the student comments citing a general happiness with everything with no reasons for change. No data emerged to indicate any ineffective strategies which detracted from learning. Opinions were divided over the membership number, some suggesting three others agreeing with four.

The second question concluded that CBL affected student motivation. They were highly excited and couldn't wait to begin. They liked the choices offered and appreciated that their creativity was considered important and valued and that opportunities for it to be demonstrated motivated them to complete the web site. They particularly liked the quiz subtask in its value as a learning strategy. However, they found the collation of four quizzes marked by others very frustrating and time consuming.

Students felt they were accomplishing something worthwhile and listed pride, effort and commitment in their comments (Table 5). Students contributed much of their success to personal commitment to the weekly plan, being on task and the two compulsory progress meetings with the lecturer. Some students felt stressed at times but knew they were learning in a deep and meaningful way, as summarised by one student: it was 'stressful, challenging, but darn it I learnt!'

Table 5.

Total percentage in agreement and sub group of strong agreement; Motivation

Item no	Item	% overall in agreement	% strongly agree
34	Presenting work at group meeting motivate me to do task	79	37
35	Motivation was having work ready for next meeting	90	35
36	Achieving small subtasks was important to motivation	87	37
37	Taking responsibility for subtask motivated me to achieve	90	44
38	Completing website was motivation in itself	85	58
39	Presenting work motivated me to do my best	87	54

Presenting work at group meetings motivated students in several ways as evident from the data in Table 5. Taking the responsibility for a single subtask proved highly motivational with 90% in agreement.

Limitations of the Study

Clearly, the application of group contract-based approach in an education context is in its infancy. It will be re-instated in the subsequent year after reflection and review of particular limitations. The omission of a larger and more comprehensive problem in which all groups had a responsibility to solve is recommended. Group goals were identified and listed at the start of the contract but may not have been used to regulate progress and outcomes. A strategy in which these will be recorded in the ten-week plan is recommended. Negotiation with lecturer was claimed not to be essential which translates into a more careful monitoring of what is negotiated and when is needed. Anecdotal reflections and mediation was not recorded well during this trial. A recording device will be used to capture the discussions and thus the extent of the negotiations in the re trialling of CBL. An end of semester on-line survey is recommended as well student interviews to identify how individuals used the contract. Together this additional data should provide more information about CBLs effectiveness for the benefit of all students.

Further Research

Motivation as framed within a self directed/regulated approach, achievement motivation and within a constructivist philosophy needs further analysis to better understand adult learning in a contract-based approach. Less successful groups need to be contrasted with successful groups in order to find ways in which all learners can benefit from this effective teaching and learning approach. In addition, an examination of a cognitive apprenticeship with adult peer groups may provide information with which to modify other group approaches.

Conclusion

In conclusion, students felt that a contract assisted in becoming independent learners and better able to cope with other assessment tasks. A growth in learning strategies was also evident. However, such outcomes cannot be attributed to the contract alone. Students felt they could not have achieved to the level they did if it were not for the available support structures contained within the whole learning plan of the contract. Therefore, CBL was most effective as a learning strategy for students studying in a first year Educational Psychology unit in a teacher education course when the group was supported by particular structures and delivery

Importance of the study

This current research indicates that group CBL has the potential to develop autonomous learners, an approach which will contribute to meeting global needs of the future and contribute to the scholarship of the university.

The outcomes, although derived from first year students suggest that greater achievement may be possible by students in later years of study, where autonomy is expected. Equally important is that the results cannot be attributed to CBL alone. The author's philosophy to teaching played a role in the success of CBL. The power of CBL to motivate and its effectiveness as a learning approach resulted in positive affirmations sufficient to recommend it as an approach for other universities to examine and adopt. However, further research in developing a seamless approach to learning in university contexts which draws on CBL, its delivery and its suitability to diverse learners with different thinking and cultural styles, remains.

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Problem-based learning vs. standard tutorials: A student evaluation



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Until recently, the problem based learning (PBL) approach has been largely an undertaking in the medical curricula; however PBL in non-medical curriculum is increasing. Changing from a traditional didactic style of learning to a problem based method of learning may provide new learning challenges for the student. The aim of this investigation was to evaluate the student's perception of the development of skills and knowledge in newly developed PBL style tutorials for a Health and Research Methods course. This was the first time the third year Health Science Degree students (School of Population Health) had participated in problem-based learning at the University of Western Australia.

A two page questionnaire was distributed to students at the end of the semester during the final PBL session. Students were asked to evaluate different areas of learning on a 4-point Likert scale, to rank the measures of learning, to indicate the effectiveness of standard or PBL tutorials against a number of learning outcomes and provide comments regarding the impact of PBL on their learning. An open ended question was also included at the end of the questionnaire. Results of the analysis suggest that students preferred PBL tutorials over the traditional style and that overall it was a much more enjoyable process. The application and content of the subject area (epidemiology) ranked as the top areas of development and learning. Implications for future course developments and the application of the PBL style will be discussed.

The traditional format for the transmission of knowledge in the tutorial has been the review of lecture material in the format of small group discussion, but there are numerous alternatives in order to provide opportunities for students to engage actively in the construction of knowledge. These alternatives may also help to develop a perspective on the kinds of critical thought that are central to understanding the discipline. The literature suggests that when students construct knowledge from their active participation, understanding, satisfaction and retention of knowledge can occur (Camp, 1996).

Problem based learning (PBL) was introduced in the late 1960s after McMaster University introduced it into the medical curricula (Camp, 1996). A considerable number of medical schools throughout the world have implemented a PBL component to their curricula. The use of PBL in non-medical curricula is also increasing in popularity as an educational mode of learning. Schools in health science; nursing, pharmacology, dentistry, public health and schools of architecture, engineering, law, police science and many other professional fields (Michel, Bischoff, & Jakobs, 2002; Rideout et al., 2002).

The strength of the PBL is based on the 'learning-by-doing' concept and that students need opportunities to make sense of the material on an ongoing basis (Race, 2000). In PBL, students find answers to their own questions and acquire the ability to seek out knowledge and skills. The emphasis is placed on problem-solving, thinking, teamwork, communication, time management, information and computing skills in PBL. Traditional tutorials are typically a designed group of questions derived from lecture material. The questions are answered in the smaller tutorial group and reviewed with the tutor. The emphasis is placed on review of lecture content and discussion of lecture material.

Previous studies have shown that measures of knowledge have remained somewhat the same when comparing traditional styles of learning to PBL, yet clinical reasoning, diagnosis ability, clinical skills, level of satisfaction, communication and self-directed learning have increased (Norman & Schmidt, 2000). When transferring this information from the medical curricula to non-medical curricula it is assumed that the application of reasoning, understanding, skills and satisfaction are also increased when using PBL. A lively ongoing debate regarding the tenets of PBL and traditional forms of learning remains in the literature (Michel et al., 2002).

The aim of this study was to evaluate the perceptions of student's skills and knowledge in a PBL style of tutoring in a Health and Research Methods course (non-medical) in comparison to the traditional styles of tutoring. This paper is not an argument about whether or not PBL should be implemented throughout an entire curriculum. It is hypothesized that PBL approach may be an innovative and effective way to present multiple-modes of learning in curriculum.

Methodology

Participants

The participants in this study included students in the second year of the Bachelor of Health Science degree offered by the Faculty of Medicine and Dentistry at the University of Western Australia. The degree combines a broad base of knowledge of both health and science disciplines and commences in the students' third year of university. There were a total of 31 students (mean age = 21.4) enrolled in the Health and Research Methods course. An 84% response rate (26 students) was achieved with the end of year PBL evaluation.

The students were divided into three tutorial groups with three different tutors. The three tutorials were held at different times during the week but the PBL format was the same for all three groups. None of the students in the sample had previous PBL experience in any of their education.

Methods

For the purpose of this study, a questionnaire was developed to collect the information about the PBL style of learning. A previous questionnaire used in the medical curricula, the University of Western Australia's Student Perceptions of Teaching

(SPOT) survey and information from a review of the current PBL literature were used to construct the questionnaire. The questionnaire involved both quantitative and qualitative components.

The first section of the questionnaire asked students to select (on a 4-point Likert scale, where 4 equals strongly agree and 1 equals strongly disagree) how they perceived they had developed or improved their skills and knowledge in relation to a number of different measures of learning, including; reflection on performance and learning, problem-solving, application of epidemiology, epidemiology (content), validating information, working within a group, discovering information, integrating material from multiple sources and communicating with others. Students were then asked to rank the top three areas from the previous question in which they perceived they had most developed and/or improved. The next section of the questionnaire asked students to compare standard tutorials to PBL tutorials in relation to a number of learning outcomes; understanding content, student satisfaction, meeting requirements for assessment, preparation for professional life, enhancing communication skills, retaining knowledge and understanding statistics. The final component of the questionnaire asked students to provide feedback and comments regarding how PBL had impacted on their learning.

Data Analysis

The questionnaires were analysed using SPSS. Basic descriptive statistics are presented on each of the sections of the questionnaire. The first question asked students to rate the different measures of learning on a scale of 1-4. A mean score was derived to represent the rating of the different measures. The second component of this question asked students to rank the different measures of learning and this was analysed using a reversal scoring system where students ranked scores (1, 2 or 3) that were then reversed in order to present the additive figures (1=3, 2=2, 3=1). Standard tutorials and PBL tutorials were also scaled in relation to what students preferred regarding a number of learning outcomes and a mean score was represented. Some of the qualitative quotes are presented in relation to the open ended question.

Results

Figure 1 presents the different measures of learning and the mean score of the sample. The mean result of all nine measures of learning was 3.12. The students found that the application of epidemiology, discovering information for themselves and epidemiology content were strengths in their skill and knowledge acquisition. It is important to note that the mean scores for all measures of learning except reflection on performance and learning were above 3 (agree).

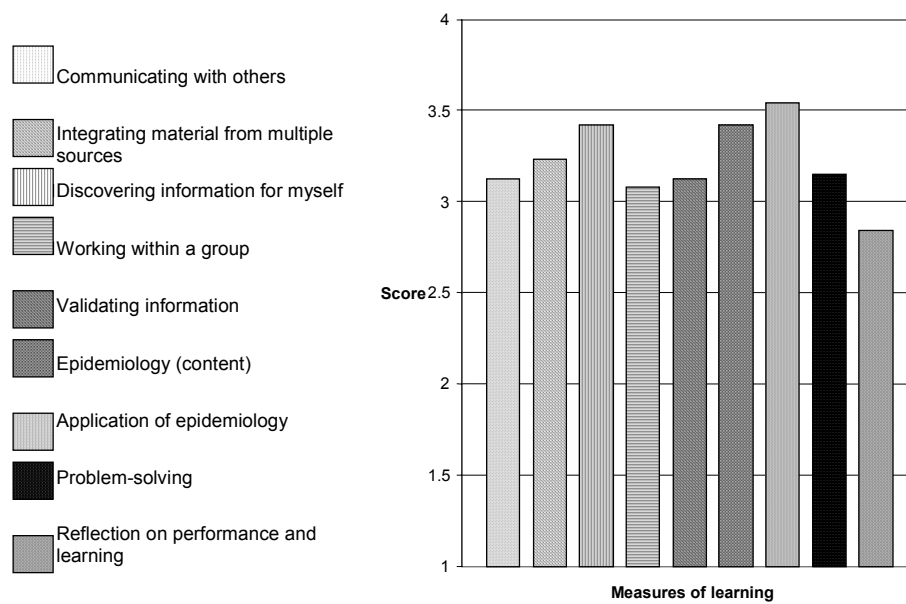


Figure 1. Mean presentation of selected measures of learning

Students were then asked to rank the measures of learning in relation to what they felt they had developed/improved the most during the semester (Figure 2). Students felt that the application of epidemiology, epidemiology content and discovering information were the areas most developed/improved during the PBL tutorials.

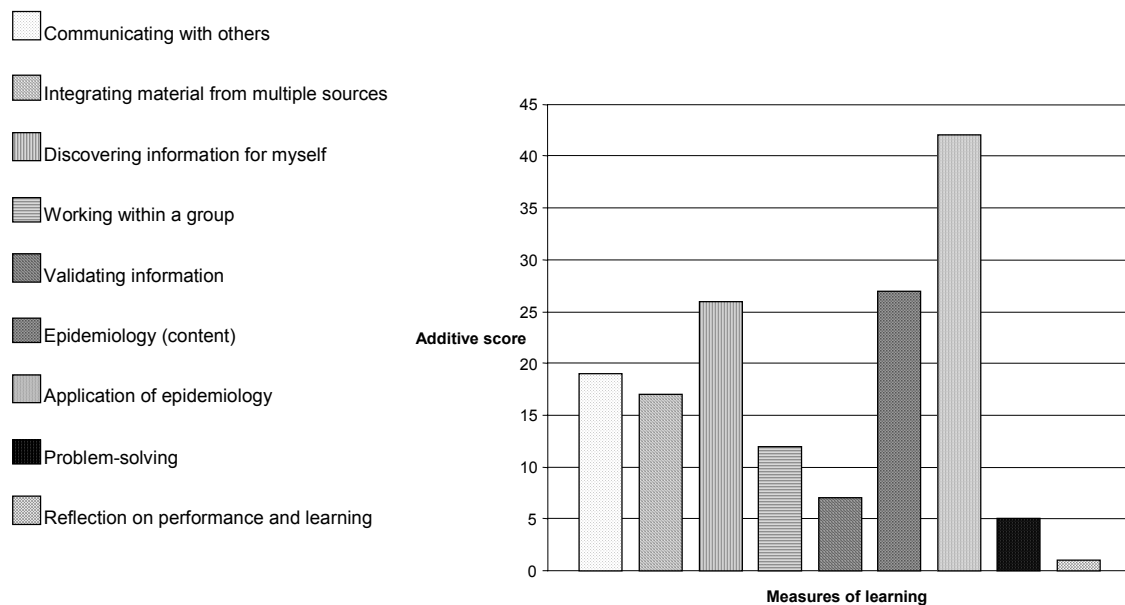


Figure 2. Ranking of measures of learning

The next component of the evaluation asked students to select on a continuum what style of tutoring they preferred for a number of learning outcomes. All students selected PBLs as the method of tutoring most preferred (Figure 3). Students perceived that preparation for professional life, enhancing communication skills and enhancing self-directed learning were outcomes that PBL tutorials were strongest compared to the traditional style of tutorials.

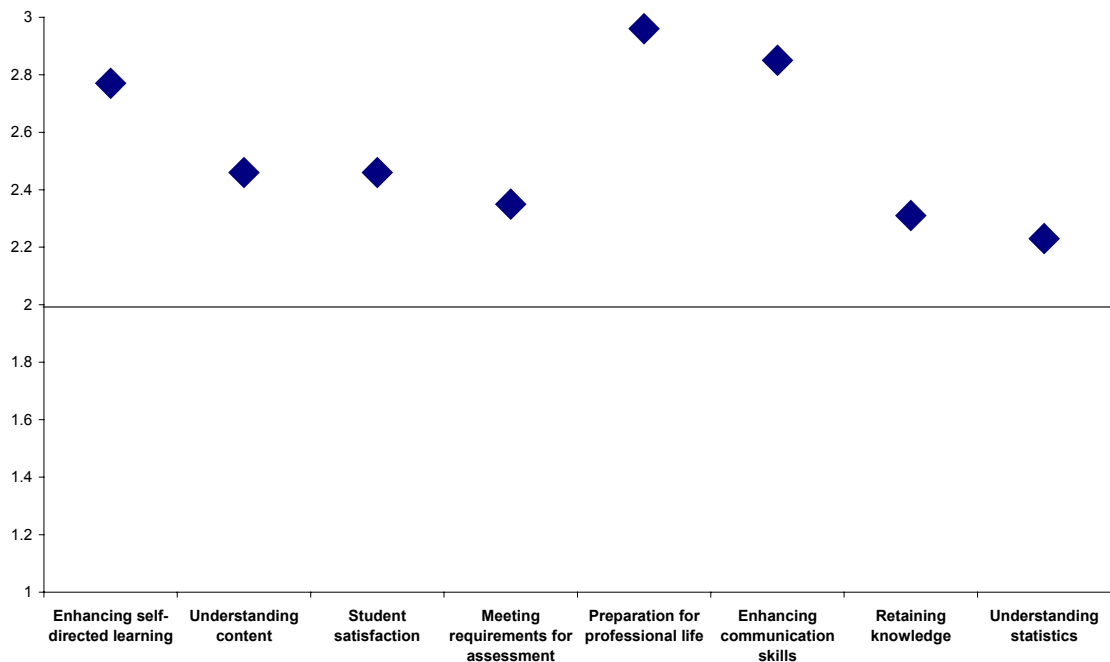


Figure 3. Comparison between standard and PBL tutorials for a number of identified learning outcomes.

Discussion

This study examined the student perceptions of PBL tutorials in relation to a number of learning measures in comparison to traditional style tutorials. It is important to note the limitations of the study before discussing the results. The questionnaire itself was subjective in nature and does not have validity or reliability measures. Efforts were made to develop a questionnaire that was easy to understand and complete in a short amount of time. There was no comparison group to measure the difference between scores, therefore students were asked to rely on previous tutorial styles as a measure of comparison. This may have inherent biases that affect the results of this evaluation. Also, it is difficult to separate learning outcomes in tutorials from that of lectures. The questionnaire was introduced as an evaluation of the PBL tutorials and separate from the lectures.

The results of the study show that during the PBL tutorials, students perceived they had developed or improved their skills and knowledge in all measures of learning, especially in the application and content of the material and the ability to discover information for themselves. Students also rated PBL tutorials more positively on all learning outcomes compared to the standard tutorial style. For example:

“Because the tutorials have been based around real issues it has made them more interesting and motivated learning.”

“It was fun and interesting.”

“I particularly enjoyed the PBL component of this course because it was much more comprehensive way to tackle the study component of this course.”

“The fact that we have to physically go out and find information makes you learn as you research.”

In comparison with students in traditional lecture-based curricula, studies have found that students engaged in PBL report favorable changes in cognitive behaviours, such as decreased use of rote learning, and increased importance of and greater satisfaction with their learning experience (Kaufman & Mann, 1996; Lieberman, Stroup-Benham, Peel, & Camp, 1997). The findings of this study support the evidence relating to these benefits. Some studies suggest that the expense and resources required for PBL may bias the benefits of PBL (i.e., they are more timely and costly than traditional tutorials), however the time and resources for this course were no different than running a traditional-style tutorial.

It is important to note that one student commented that the style of learning was not effective as she had only ever been exposed to the standard tutorial style and had figured out what she needed to do with this approach in order to learn. This type of comment was expected as the PBL tutorial format was introduced in the third year of the degree program. Some of the students had previous post-secondary education and again, this was the first PBL experience.

The fact that the tutorials provided a new and different mode of learning may have increased the students' interest in the style, as opposed to the actual PBL method itself. Addressing the components of PBL that produce positive educational outcomes and the mediating process of PBL have largely been neglected in the literature (Hak & Maguire, 2000).

“PBL are (sic) different so you often pay closer attention and remember things better.”

“Has helped understanding the statistical part. Also made me realize how many areas there are to epidemiology.”

“I liked applying the epidemiology theory to evidence from real studies.”

“It was good (PBL) in that it made me do work regularly for presentations.”

This study did not address the relationship of the tutor to the tutorial (i.e. experience, expertise, etc.) however, the role of the tutor is to facilitate the process of active learning and foster the skills therein. The tutor may also play a significant role in regards to achieving the learning outcomes as measured in this study. This was not

within the scope of this study and may be an important area to consider in future research.

Conclusion

Findings such as these may not stand up to the rigors of a randomised controlled trial however they provide evidence to the degree of satisfaction and advantages that PBL provided in this learning environment. The curriculum in this course continues to develop and the feedback from evaluation is an important part of this process. PBL provided an innovative method of learning health research methods and presented students with the opportunity to engage actively in the construction of knowledge.

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The devils triangle: An academic perspective on the relationship between creative, industrial and educational partners through the activities of *Open Bite Australia* print workshop



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This paper outlines some of the activities of “Open Bite Australia”, a print workshop established in 1997 within the print media studio of the School of Visual Arts Edith Cowan University. The workshop offers a sympathetic and responsible relationship between artist printer and agent, in light of a history of exploitation of Australian indigenous artists particularly in the areas of reproduction and copyright. Within a teaching and learning context, the workshop acts as a catalyst for a number of teaching and research related activities that support and supplement the academic programs to which they are aligned. The workshop therefore combines educational, commercial and professional activities through partnerships that bring together artists, students and professional arts administrators. Its broader ambition is to promote arts practice for students within a cross cultural and cross disciplinary context.

The paper also explores the ethics of cross-cultural collaboration, particularly within the context of contemporary Australian indigenous artists. The historical framework of the relationship between euro-centric attitudes to the naïve native and their expectations within the cultural stereotypes that result, are explored as a basis for Open Bite’s philosophical position and contribution to the commercial domain.

This paper accompanies an illustrated presentation utilising the Open Bite Australia web pages, accessible at: <http://waapa.cowan.edu.au/disc/sova/openbite.htm>

Education and creative partnerships

The Open Bite Australia Print Workshop was established in 1997 to give access to specialist facilities for students who had completed their studies at undergraduate and post graduate level. The ability to continue art practice beyond the confines of an educational program is essential for all young artists attempting to establish their practice within a national and global community. While the workshop fulfilled this simple mission in its early days, the workshop developed a number of partnerships with industry and the local indigenous communities through its artist in residence scheme. This allowed artists to use the facility under the guidance of their agents and more importantly in collaboration with our students, setting up a unique relationship which has since fostered life long partnerships and creative collaboration between artists, students, indigenous communities and the global arts industry.

Open Bite is taking advantage of its privileged position as part of an educational program, to establish an ethical and inclusive relationship with its artists. These

relationships are driven by educational rather than commercial demands and offer both artists and students a neutral space in which to work collaboratively and cross culturally. The triangle of artist and printer is completed by the agent, perhaps the most influential driver of this relationship and undoubtedly the most powerful. Through an association with local agents Desert Designs and more recently Indigenart W.A. the workshop has developed industrial partnerships and residency programs for indigenous artists already involved in the West Australian art market. Artists are invited to work in conjunction with local students in the print studio in Perth and in their regional arts communities, to produce prints and develop print technologies that can be utilised in the remote desert areas of northern and western Australia. Most of these artists are established painters and in a similar manner to the European resurgence of printmaking in the 1960s, are looking to printmaking as a means to reproduce and distribute their work to a wider audience.

Any dual relationship between artist and printer needs negotiation and respect, particularly when cultural control is at stake. If we add to this the artist's agent, whose motivation is mostly always commercial, then the age-old problems of ownership, artistic integrity, authentication and copyright will re-surface. This is particular to the print medium as its origins lie in the established role of the professional print workshop, that of replicator. Historically, respect for ethical and cultural values has often taken second place to the expectations of style and marketing, the artists therefore assuming a subservient role within the triangle of the industrial / educator / artist relationship. The question therefore is could an educationally driven community workshop such as Open Bite Australia break this cycle while facilitating the production of creative works that would not normally be marketed.

The ethics of cross cultural collaboration

Exploitation of indigenous artists is endemic and surfaces in many forms within the arts community, and in the brief history of white colonial rule in Australia this can certainly be said to be ubiquitous. A number of contemporary texts (Crowley 1976) (Elkin 1979) and (Goehring 1993) have developed a historical and political context by which global indigenous communities can be framed. Within the specific context of Australian indigenous arts and its contribution to stereotyping, paintings and photographs from early colonial settlement have provided a unique visual legacy in which the depiction of the native and the myth of the noble savage are grounded within the European classic style. The photographs of J.W.Lindt (1845-1926) of aboriginal hunters build on Augustus Earle's paintings of the early nineteenth century (ref 1) in which the European classical painting assumes a particularly colonial attitude toward the Indigenous family unit. The perpetuation of this stereotype has enabled euro-centric cultural structures to survive to the present day, structures that demand cultural hierarchy, stylistic control and ownership plus the ever present need to categorise indigenous art within western ideals. Although the constructions of indigenous stereotypes are now less blatant, the colonial mindset that created them is still fundamental to their market niche. Cultural perceptions are therefore market driven to sustain an industry that feeds our timeless hunger for the naïve and the exotic. This point was made clear to renowned indigenous artist Judy Watson by Sothebys of London who requested that she categorise her work as either "aboriginal" or "contemporary" but not both. (Croft. B 2002)

In a recent article by Brenda Croft (curator of indigenous art at the Australian National Gallery and an Open Bite project artist) the inherent problems associated with this are exposed. In the highly charged days of the late 1980's when art and politics were co-joined, her work was denounced as not being "traditional" enough, being an inauthentic or a bastardised version of the real thing. She says, "We were used to being told that if our work did not fit certain stereotypes then it was not real aboriginal art". (Croft.B 2002)

This is driven as much by the demands of commercial classification as cultural incommensurability. In response to this and other classification issues, the National Indigenous Arts Advocacy Association launched the 'label of authenticity' in 2000 with the main intent to protect the rights of the individual. In the context of the history of exploitation this was an attempt to redress the past and to account for the ownership of artworks. However, many indigenous artists see this as membership of a "club" (ref 4), a particularly colonial approach and perhaps one that was responsible for the problems in the first place. Brenda Croft refers to this as "dog tagging" and likens it to the government pass issued in the 1980's that allowed indigenous people to move around unhindered by the authorities, and therefore seen fit to be considered as full citizens of Australia. They were considered fit because of their accountability and conformity to that of a euro-centric social ideal, the basis of cultural dominance and stereotyping mentioned by such authors as Elkin and Goehring.

An educational perspective

So how do we break this cycle while respecting the needs of both the artist and the agent?

The industrial partnerships established by Open Bite Australia acknowledge the historical cultural dilemma in which it operates, and in the long term seeks to address some of these problems through a more collegiate approach to artistic production and publishing. Within the field of printmaking, we inevitably enter into the debate of copyright and authentication due to the reproductive nature of the medium. The term "print" can mean many things, from pure printmaking to commercial reproductive technologies, the latter of which has facilitated some of the worst cases of unauthorised reproductions of indigenous artworks. Open Bite attempts to break this cycle by removing the power of the agent and replacing it with an educational framework that allows artists and students to approach cross cultural dialogue from a position of neutrality.

The project

The first major project involved the late Jimmy Pike, and his uncle Peter Skipper who were founder members of Desert Designs in Perth and unlike most other artists we have worked with, had already gained some experience in basic print processes. The students worked with Jimmy and Peter on bush camp for one week at Leewana in the south west of the state to experience printmaking under very basic conditions. Here a makeshift print studio was set up in an abandoned garage to encourage the artists to produce work directly, and to develop a sense of multiple ownership with the students.

The following week saw the artists returning to the studio, students in turn were exposed to the discipline and rigours of proofing and professional printing methods under controlled conditions. Because of the skill of the artists and the intensity of this two-week inaugural project, nine suites of images were editioned and published over the following six months including relief prints, etchings and stone lithographs. This huge creative outpouring was neither expected nor planned, but did help cement the viability of the workshop within academic and institutional thinking. The immediate success of this project for both artists and students opened the floodgates and almost by chance established the workshop as a main producer of limited editioned prints in Western Australia. The workshop now regularly produces limited edition fine prints for Mary Maclean, Gordon Landsen, and others, in addition to running community workshops within remote communities.

Cultural issues aside, industrial partnerships of this kind invariably construct an asymmetric and hierarchical relationship across aesthetic, technical and commercial boundaries. Because the priorities of Open Bite are educational, product is viewed more as a documentation and celebration of the artistic experience and therefore seeks to advantage both artist and students. This frees up the artists to work in a completely uninhibited way and allows the development of lasting relationships based on trust and community spirit. Beyond the payment of printers, any profits from publishing activities, which may result from projects such as this, are fed back into technical research, community workshops or local arts sponsorship. The prints produced by Open Bite are strictly limited and distributed through the Australian Print Network in Sydney. More importantly the artist controls the production of the artworks.

Creative research and community engagement

Open Bite has integrated research and development projects with community workshops run in the remote regions of WA. Our most recent workshop was held in Ninga Mia, east of Kalgoorlie, as part of a major research project we are undertaking with the University of Maine, examining non toxic print chemistry suitable for the extreme desert conditions of Western Australia. Acrylic polymer technology was developed by fellow researchers in the USA and trialed in the Ninga Mia arts community by Open Bite artists. These workshops serve a number of educational, cross-cultural and research needs in addition to promoting the print medium beyond the traditional studio based approach.

A number of important long term concerns have been raised about the introduction of printmaking to aboriginal communities, one of which is the continuation of these being delivered by non indigenous artists. It was always the intention of the project to take the print processes back to the communities that requested them, and for local indigenous artist groups to be involved in these projects. As part of our educational philosophy therefore, we involve as many indigenous students, community leaders and mediators as possible in the delivery of our workshops. In order to foster a greater understanding of the problems associated with this type of collaboration, our students are educated in cross cultural theory, social ethics and indigenous protocols as a longer term insurance against the indiscretions of the past.

Open Bite activities are not limited to working with contracted indigenous artists. The project page of the web site acts as an archive for our activities, and demonstrates the breadth of international artists that have worked with us since 1997. Artists from America, Europe, Africa and Asia have undertaken a number of diverse projects with us, many of which have not produced tangible outcomes, but have enabled the artists to engage in work of a cross-disciplinary nature that often reflects our unique position both geographically and philosophically. It has also benefited our students through the ability to work on real life projects with artists and administrators of international standing.

Open Bite has developed both an inter-dependent and pro-active position where educational philosophy works hand in hand with commercial activities, in turn funding industrial research and development projects and community workshops to strengthen its educational base. The student has in effect replaced the artist agent in the triangle at least temporarily. This has allowed Open Bite to direct its energies toward the creative act, and more importantly has promoted a boundless collaborative spirit within all of its artists.

The following is a summary of opportunities and outcomes that derive from the Open Bite Australia project:

Cross cultural understanding

Indigenous protocols and cultural ethics for students plus special opportunities and experiences beyond the educational program.

Respect for cultural difference / dialogue beyond arts

Opportunities for artists outside of the commercially driven environment

Student / professional artists

Experience in collaboration / professional engagement and mentoring opportunities

Inter-disciplinary

Teaches a broader creative context / encourages dialogue and interchange of ideas

Real life outcomes

Students involved in commercial publishing (work-based learning)

Publishing through the Australian print network/

Professional activity and employment

Industry partnerships

Indigenart / Desert Designs

Sponsorships

Western mining awards / Xerox / Pearl & Dean /etc (attracting art associated sponsors particularly to benefit the local communities)

Community

Students have access to professional facilities and artists beyond their educational programs

Workshops in the Ninga Mia communities forged links with industry and local agents. Students benefit from community support through public art projects

Commercial

Publishing raises revenue which funds research and development and community projects / sponsorship

Research

Develop desert friendly technology with community involvement. Research partnerships with University of Maine USA.

Student centred learning

Empowers students and artists to establish creative and collaborative practices which complement the learning environment

Promotion and reputation

Reputation of programs and its students. International reputation through R&D and web projects

Internationalisation

Attracting international artists / researchers and exchange / exhibition opportunities

Conclusion

The re-assessment of priorities and the resurgence of collaborative practices for many artists are not confined to cross cultural activity. Cross-disciplinary practice on a global scale has radically redefined ownership and copy write laws due mainly to the development of communication technologies. In a recent paper by Simon Ringe and John Pengelly given at the 5th Annual Computers in Design Education Conference in the UK, they argue that, “as a consequence of new technologies, creative practice is becoming an increasingly ‘nomadic’ activity. It may be the case that the artist has to relinquish control over final outcomes and that end results are less important than process” (Ringe S / Pengelly J 2003). This is also the case within the artist / agent relationship as a consequence of this project. While Open Bite seeks to re-establish ownership and control to the artist for ethical reasons, its concentration on process

rather than outcomes is consistent with recent post modernist attitudes toward the focus of creative collaboration in general. Interestingly, this approach has its roots set firmly in eastern philosophy and culture, where ritual often takes precedence over the permanency of an artwork. Ritual within visual culture has been predominantly concerned with the connection between people and their land, and is a characteristic of a synchronic culture. Open Bite has therefore created a significant shift toward recognition of this through its pedagogic processes.

To summarise, the Open Bite project has achieved a redefinition of the relationship between artist and agent through the context of an educational framework. The quality and relevance of the learning outcomes are more difficult to quantify within educational parameters as these are often particular to the needs of indigenous communities or individuals. Within the context of teaching and learning, this and other projects have attempted to bridge the gap between the demands of academia and pure creative and commercial practice. It also attempts to integrate teaching and learning and research and development practices through the establishment of networks and industry partnerships. These partnerships take many forms, and above all serve to empower artists, students and professionals alike within a creative and supportive environment.

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National Association for the Visual Arts www.visualarts.net.au

National Indigenous Arts Advocacy Association Inc www.niaaa.com.au/index.html

Open Bite Australia <http://waapa.cowan.edu.au/disc/sova/openbite.htm>

Using a Student Centred Learning Approach in a Large Class Context



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Teaching large classes has become a reality for most courses in Australian universities. While many academics recognise the benefits to students and themselves of using alternative teaching methodologies, many resort to the traditional formal lecture approach when it comes to teaching large classes. This paper examines the tension between providing a meaningful learning experience for university students and the constraints of increased class sizes. Presented as a case study, it challenges the assumptions of staff and students in terms of what constitutes an appropriate learning environment and identifies strategies that could usefully be transferred from a small class to a large class context. The unit presented as the case study was co-ordinated by the first author with the support and guidance of the second author. Sections of the paper are written in the first person and it is the voice of the first author as she discusses her personal experience of, and response to, the challenge of using small class strategies within the context of a large class.

The context of higher education in Australia has seen an increase in enrolments across courses and institutions as we move from elite to a mass education system (Nelson Report, 2002). This increase in enrolments though has not seen a corresponding improvement in staff numbers, which has had the effect of higher staff student ratios. Higher enrolments have also resulted in greater heterogeneity within the student population requiring an understanding of the diversity among students in terms of background and learning styles (Ward & Jenkins, 1992). This paper examines the tension between providing a meaningful learning experience for university students within the constraints of large class sizes. The context is a first year psychology unit delivered for Bachelor of Social Science students by the School of Psychology (SoP) at a Western Australian University. Presented as a case study, it challenges the traditional idea of staff and students in terms of what constitutes an appropriate learning environment and identifies strategies that could usefully be transferred from a small to a large class context.

The realities of teaching large classes (those in excess of 50 students) means that educators often resort to the traditional 'sage-on-stage' delivery format with the lecturer standing behind a lectern delivering the material with students passively

taking notes. This is particularly true in undergraduate psychology classes with the discipline being highly conservative in nature and relying on the traditional approach to education. Student feedback over the past forty years suggests that this style of learning is not effective and leads students to 'tune out' (Bloom, 1953; Biggs, 1999; Papo, 1999; Ward & Jenkins, 1992). Staff too often find this a less than satisfying way of delivering material. However, the financial imperatives currently facing Australian universities make the large class structure a reality.

Critical pedagogy provides a framework for educators to address both the needs of students and the limitations of the large class structure by providing strategies to engage students and encourage them to become active participants in the learning process. These include the use of visual aids and multimedia, group work, student centred discussion, handouts and role-plays. This approach has found empirical support from a number of studies (Slavin, 1990; Smith, & Boyer, 1996; Tinto 1995; Vachris, 1999; Wink, 1997). It also has the additional benefit of encouraging students to critically engage in the material being delivered in that they actively question, debate and challenge the research, theory and assumptions of their chosen profession. This degree of debate and critique allows students (and academics) to voice concerns and provide a different perspective on long held 'truths' which in turn has the power to effect change. Critical theory in psychology and education holds that the values of society are influenced and shaped in large part by the values and 'truths' taught in educational institutions (Prilleltensky & Nelson, 2002).

The strategies employed by critical pedagogy are particularly useful in small class settings (less than 30 students) as critical pedagogy as a learning tool recognises and values the various experiences and expertise students bring to the learning environment and provides a setting for this to be utilised to enhance the learning process (Varan, 2002). Student centred discussion is one such strategy that encourages students to become active participants in the learning process by sharing ideas and experiences. The benefits and management of such a strategy are easily identified in the context of a small class but would be far more difficult to facilitate in a large lecture theatre with hundreds of undergraduate students all with differing needs, expectations, and learning styles.

Philosophy

My previous teaching experience consisted of small classes of up to 30 students and I had adopted a critical pedagogy approach to teaching long before I discovered the term or the literature explaining and supporting such an approach. My ideas of effective learning were based in large part on my own undergraduate experience of feeling that there needed to be something more than simply passively taking notes in a lecture, and a few fleeting experiences of debate and discussion with a handful of exciting, supportive lecturers and tutors. However, it was when I entered the postgraduate programme in psychology that I realised what learning could be like. We had small classes of approximately 10 students and our lecturers wanted to hear our views and ideas. Suddenly I felt valued as an integral part of the learning process and as a result learnt more about my discipline and what education could be than at any time in the past. This experience influenced my own approach to teaching and learning and I adopted a student centred discussion format whenever I could.

Case Study

In the second semester of 2002 an opportunity arose for me to implement the philosophy of critical education with a large class of approximately 80 students studying lifespan development. Because I had previously only taught small classes I felt a little daunted and anxious at the prospect of managing a large group and also of teaching in a formal tiered lecture theatre. This was compounded by my lack of experience in teaching first year students. The decision to use a student centred discussion approach in this class was made partly to reduce anxiety in that I was familiar with the techniques and felt that students would benefit from the experience.

Essentially the intention was to use a combination of traditional structured lecturing, activities, group work and discussion as well as the use of multimedia. Tutorials were then organised to follow the lecture and provide further group and individual activities to consolidate the concepts discussed in the lecture.

The entire first lecture was devoted to the proposed teaching methods and rationale, and the benefits students could derive from this. It also served to establish rapport with the group, as well as providing an opportunity to discuss and negotiate ground rules. To initiate conversation students were asked to spend a few minutes thinking about their expectations of the unit, the role and responsibilities of the lecturer and themselves in the learning process.

The majority of the students saw the role of the lecturer as that of a 'teacher', to 'teach' them and impart knowledge to them. Their own role was defined as receiving information, listening attentively, and producing assignments. Discussions followed which explained the role of an educator in a university setting. The notion that the lecturer was a facilitator to guide and support their learning was presented and debated and this generated a great deal of discussion about what constituted learning.

Students were made aware of the goals of the unit in terms of the proposed content and the issue of confidentiality. Some students expressed surprise at this but it was explained that human development contained many topics that could be distressing for a number of reasons. For example students might have experienced involuntary infertility or the distress of miscarriage, therefore the mechanics of conception and birth could be highly painful and difficult. Likewise issues such as parenting, adolescence, and death could raise problems for students. Because of the emphasis on discussion and debate of issues in class there was the potential that students might make personal disclosures and the need for discretion was highlighted should this occur.

Students expressed some surprise that so much time was devoted to discussion rather than the 'teaching' of course content and they were worried that little actual learning would occur. To alleviate this anxiety, it was decided that weekly handouts based on the lecture material would be produced that synthesised the information and this was readily accepted as a useful tool. It was apparent during the discussion that the proposed form of learning was vastly different to anything these students had experienced previously. For some students this was their initial university experience

and they had preconceived ideas about what constituted a lecture. In order to ensure their experience was positive, the provision of detailed weekly summaries of the content material would alleviate some of the apprehension students were experiencing.

In the second and third weeks the lecture content was interspersed with questions to the class as an impetus for discussion. Initially few students were confident at speaking in front of the whole class and these tended to be the ones who responded in the early days. Videos and cartoons were also used to illustrate concepts. The content of the early lectures included conception, birth, and infancy, topics that almost everyone had some detailed knowledge of if not personal experience and this encouraged student participation in the class discussions.

A change of pace and structure was needed by week four and instead of talking to the class and posing questions they were asked to form into 6 groups. Each group was assigned one of the topic areas so that two groups examined each of the areas of physical, cognitive, and psychosocial development in early childhood. Students were then asked to discuss this topic area and identify the key issues by consulting whatever resources were available on campus. This meant that students were able to move outside of the confines of the lecture theatre to access the library for books or to use the computer databases.

While the groups were working on this task I moved from group to group to discuss the task in detail. As they had all taken the opportunity to work outside in the sun, or had gone to the library for resources this took a while to complete! This proved useful as it provided the opportunity to talk to students and hear how they felt about the task.

After a short break the groups reformed by combining the common topic groups. That is the two groups who had looked at cognitive development would team up as would those who looked at physical or psychosocial development which resulted in the formation of three larger groups. Students were asked to combine their information, identify the five or six key issues and to prepare a brief presentation to the class. Each group could negotiate among the members how to tackle the task, each person could report to the class or they could nominate one or two speakers. Again this generated much discussion and tension with the class and some students expressed their dissatisfaction with the process suggesting that this was an inappropriate activity for a lecture.

Following the presentations, a discussion with the students identified their concerns, the reasons for their dissatisfaction, and recognised their feelings. However, it was emphasised that the presentations had been most professional and students negotiated the task rather than simply refusing to engage in the process. At the end of the class a number of students, one of whom had been particularly vocal in her opposition to the task, expressed their enjoyment of the experience and felt they had learnt more than had they received the same information via the traditional lecture format.

This experience proved a personal turning point in the semester. After feeling apprehensive about utilising group activity with a large class and my response should they refuse, the temptation to resort to the familiar method of lecturing was very strong. I felt nervous, inexperienced and unsure - but it had worked! The students

were willing to engage in the process in spite of their initial reservations and by discussing their concerns any resentment was dealt with and dispelled.

In comparison the remainder of the semester was relatively easy. A range of activities and techniques were utilised including inviting guest speakers to address particular topics on the basis of their knowledge and expertise. In the early weeks the discussion in the class was between the lecturer and the students who felt able to respond or challenge. Gradually however a shift occurred and the conversations were taking place between students with me acting as a facilitator rather than initiator of discussion and debate.

The highlight of this process was to occur a few weeks later when almost the entire class was involved in a debate over parenting issues. A reticent young woman, joined the conversation by explaining what it was like for a 17 year old to be viewed as an adult in one part of her life (at work and university) but as a child in another (at home). The parents in the room saw the situation through the eyes of their children and the other young people were empowered to join a debate that they had perhaps felt was excluding them because they were not actually parents. The result of this incident was that students were able to participate in a valuable learning experience as few would leave the theatre without having learnt what it was like to view something from another perspective.

At the end of semester students were asked to complete an anonymous questionnaire which reviewed the unit. It was explained that the feedback would be used to improve the mechanics of the unit and to develop the student centred discussion format. Every student in the group completed the questionnaire, with many of them providing detailed information about their experience of the content and the process of the unit. The majority of the students expressed satisfaction with the teaching approach adopted for the class although there were a few for whom this style did not work. Whether this is a reflection of deficits in the approach or the fact that earlier learning environments train students to expect a more didactic teaching and learning experience is a topic for further research.

Reflections

One of the biggest hurdles experienced was the degree of resistance from the students in the early weeks. They were unsettled by the idea of participating in an unfamiliar format even when the benefits had been explained. In future, it would be useful to present the idea to them by developing a firmer theoretical foundation. Students could be provided with key articles to read to develop their understanding of the philosophy that underpins this mode of teaching. It might prove beneficial to introduce the ideas of authors such as Giroux and Apple (e.g. Apple, 2000; Giroux, 2001) on the topic of critical pedagogy and present the notion of the student as a partner in the learning process. Although these ideas and values influence much research and practice this was not explicitly introduced to students. Had this been done it is possible they would have been more able to understand the difference between what was being proposed and the more traditional styles of teaching.

This positive experience of adopting a student centred discussion approach has resulted in a renewed enthusiasm for teaching large classes. While recognising the

difficulties inherent in adopting this type of approach there are strategies and techniques that can prove effective. Fundamentally the worst thing we as educators can do is assume that because a task presents difficulties or challenges that these cannot be overcome. We need to learn how to relish and revel in these challenges and develop creative ways of overcoming them.

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Information Seeking: Building Effective Information Users in Tertiary Settings



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Information seeking is a key competency which any university student should acquire during undergraduate study, and which will be needed by young professionals as they embark on their careers. While the fact that we live in an information world is widely acknowledged and accepted, the impact of this setting on the ways in which students work with information in universities is largely undiscussed and unexplored. Most of the assignments that we set tertiary students assume effective information seeking skills have been well established. This appears a reasonable assumption, as most of these students have attended high schools where they were taught a range of information retrieval and interpretative skills. On entry to university, where a range of additional information sources must be accessed, and more advanced skills should be integrated, many are provided with additional library orientation and information seeking skill programs. Following this, it is expected that students will demonstrate their skills in a range of ways within their tertiary courses of study, and beyond, within the workplace. But are they effective information seekers? Probably not! While this may be due to the ways in which students are taught and guided on how to seek and use their information sources, it may also be due to the inadequate information seeking competencies of their teachers!

Information seeking in society is an increasingly critical skill which must be developed throughout the educational experience. University graduates are expected to use a range of electronic search tools as they perform their professional roles. The increasing reliance on web-based systems, electronic databases and knowledge management systems necessitates the growth of high level search competencies – particularly as more resources are electronically sourced (Debowski, 2002). This has implications for the ways in which tertiary students should be educated in the tertiary system. Not only should they develop the more generic competencies which are now being identified, but they should also be guided in building more advanced search skills from those that were introduced in primary and high school contexts. This is particularly important, given the greater complexity of search sources and systems which are to be found in the higher education sector.

A key responsibility of tertiary educators, then, is to build on the initial school bases, and to further challenge and extend the students' capacity to search effectively. Tertiary level information seeking is more complex than the skills acquired in high schools where students access a very limited range of sources on general topics, using a range of encyclopedias, reference tools and localized library resources (Gordon, 2002; Neumann, 1995). In a tertiary setting, the range of sources, and their inherent complexity, expand significantly. Tertiary students need to develop much more

sophisticated skills in the investigation of their search requests, and in the selection of suitable sources of investigation. This core graduate competency is developed across a number of learning dimensions, including the identification of appropriate keywords, the creation of Boolean search statements, and the dynamic interrogation of the search system to build the best conceivable search (Ford, Wilson, Ellis, Foster, Spink, 2000; Marchionini, 1995; Michel, 1994).

For the experienced information searcher, the process is relatively straightforward. However, studies of information seeking reveal that the process is highly complex, particularly when the topic becomes more specific and specialised (Bruce, 1998; Hartman, 2001; Marchionini, 1995). Many searches are highly complex, as they frequently include a number of related topic areas which need to be integrated. In these cases, the search requires significant coordination of a range of inputs, and the constant review and adjustment of the strategy as new information is processed. The specialized nature of many search tasks also increases the complexity because of the number of components which must be integrated into the overall investigation.

The level of support for information literacy varies greatly within, and across, universities (Bruce, 1998; Crosling & Webb, 2002; Nimon, 2001; Whitmire, 2001). Most students gain an initial introduction into this more sophisticated mode of information seeking when they receive their library orientation tour on arrival at the university. This may also be supported further by specialist instruction within tutorials in their first and subsequent years. In their initial year of tertiary study, many of the assignment tasks are highly structured, with the provision of directed sources of reading, and strong guidance by tutors. As the student progresses through the university process, the specialized nature of their field emerges, as manifested in the more sophisticated research to be conducted, and the degree of independent inquiry which is required of the student. However, the students skills in information seeking may remain rudimentary and largely underdeveloped, ill-preparing them for the more complex searching required of them (Young & Von Seggern, 2001).

As searching becomes more complex, there is a higher cognitive load on the individual. This can lead to a number of significant errors which reduce the efficacy of the search process. In the case of novice tertiary information searchers, spontaneous, informal and opportunistic strategies are often adopted, along with a reduced scope of search. In addition, students may rely strongly on their recalled, initial efforts to solve a search problem, rather than building a logical strategy (Debowski, 2001). Thus, there is a high likelihood of error and failure in novice information seeking – despite the provision of an initial orientation and ongoing guidance provided to tertiary students.

This demonstrates the need to review the mechanisms by which information seeking might be better inculcated in tertiary students. This paper therefore explores some of the issues which tertiary teachers should be considering if they wish to support students in their development of effective search strategies. Two key areas are explored: the basic competencies of tertiary teachers in information seeking; and the ways in which the tertiary teacher can model and demonstrate good strategies.

Tertiary teachers and information seeking

Academics need to be well prepared in the basic skills of information seeking if they are to successfully integrate this competency into their teaching and their curriculum design. However, the process of information seeking is gradually increasing in sophistication as more services are placed online, and the capacity of systems to provide extensive information increases. Most tertiary teachers rely on the skills they initially established as students or which they developed during their own higher degree research. While these may be adequate, they may not reflect many of the more advanced and refined methodologies which might be employed. Tertiary teachers may also demonstrate similar errors to those found by students, such as the reliance on tried and familiar search services, a reduction in search coverage, and a tendency to conduct very streamlined and simplistic searches. It is also likely that they are not as familiar as they could be with the range of information sources and the best strategies to employ in using those sources. Many academic induction programmes fail to provide a library orientation tour for staff, assuming that they will be self-motivated enough to initiate contact and familiarization themselves. Unfortunately, the pace and demand of university activities may preclude adequate time to become so orientated, thereby reducing the likelihood of effective library familiarization. For those who did make time when first associated with a new university, there remains the challenge of maintaining and updating information seeking skills.

The range of sources which may be found in subject areas, and the styles of presentation and structure evolve regularly. Academics therefore need to ensure they are conversant with the most recent techniques and sources prior to seeking to evaluate and challenge the skills employed by the tertiary students for whom they are responsible. Table 1 provides a self-analysis checklist which academics might use to explore how well equipped they are in information seeking. When answering these questions, it may become evident that there are some major gaps in both understanding and familiarity which might need to be addressed.

Table 1

A self-analysis of Information Seeking Expertise.

- | | |
|----|--|
| 1. | How long is it since you were last trained in information seeking? |
| 2. | How satisfied are you with your skills in finding suitable resources on a topic? |
| 3. | How do you know that you have captured the best resources when you search for a topic? |
| 4. | With how many databases are you familiar? |
| 5. | How do you know which databases are the best options to use when seeking resources? |
| 6. | How many databases do you normally use to conduct a literature search? |
| 7. | If you have a complex search, such as three concepts, how do you conduct your search? |
| 8. | Do you know how to use the key Boolean connectors, such as <i>and</i> and <i>or</i> ? |
| 9. | Would you feel confident in demonstrating the information seeking process to a novice? |

If your answers indicate some uncertainty or lack of knowledge about how to go about these processes, then perhaps it is time to visit the local university library service. They would be delighted to provide one on one support to any academic, and to discuss ways in which these skills might be better introduced to your students.

To resolve these knowledge gaps, it is advisable to seek expert guidance. Most university libraries would be delighted to assist in providing a refresher for staff – either in a one-one capacity, or to an entire school or department. This might be integrated into a staff meeting for all members of the community, or linked to an orientation session provided for postgraduate students in the area. While it only takes a short time to gain a better sense of current information seeking, it enables a much more effective usage of these skills in curriculum guidance and challenge to students who are being taught.

In addition, it is of value for an academic community to review their stance on information seeking and the level of competency which students should demonstrate. As with many areas of skill-building, it can be beneficial to identify the different levels of understanding which should be demonstrated by students. The collaborative review of information seeking expectations and anticipated generic outcomes would help to clarify the responsibilities of academics in relation to building these capabilities, and would also build some explicit expectations regarding the level of competence which staff themselves should demonstrate.

Thus, in terms of academic information seeking competencies, it is recommended that academic units should assess how well their staff are equipped to enable effective information seeking, and build some progressive expectations which might be structured into assessments and academic programmes. In addition, university libraries might consider how they could become more proactive in building greater capabilities in their academic community. This then enables the academic to model effective searching, and to enable more effective competency building for the students themselves.

Modeling good practice

Information seeking is best developed progressively through practice and reinforcement (Debowski, Wood and Bandura, 2001). As novice searchers, tertiary students may lack the capacity to make good judgements as to their quality of search, and the efficacy of the overall outcome (Ford et al, 2000). They need to be exposed to good models which demonstrate how to search, and the sorts of outcomes which might be achieved, and to apply these models to their own searching in controlled, guided contexts (Debowski, 2001). This is rarely evidenced in tertiary learning contexts, where the capacity of the student to search effectively is normally assumed in the design of assessments. However, the novice information seeker is often ill-prepared for this autonomy (Debowski, 2001; Marchionini, 1994). Instead, he/she will tend to be quite ineffective in selecting appropriate and sufficient keywords, and in building a suitable search sequence to explore the complex tasks typically built into university assessments (Debowski, 2001). In addition, the student, even if conversant with the broad principles of information seeking, may lack the contextual and content knowledge to make good judgements as to whether the retrieved information is representative of the available field (Ford et al, 2000). The quality of the sources may

be a further issue which is largely unconsidered by students in the press to meet assignment deadlines. Thus, there are many potential problems which need to be monitored and controlled.

To reduce the potential for erroneous searching, the tertiary teacher could provide some foundations on which the student may develop better practice and realistic expectations. A powerful source of guidance is modeling, in which an expert demonstrates the various steps and describes the reasoning which is embedded in that process (Bandura, 1986). In the case of information seeking, this modeling could provide an outline of the key search steps, and the key decisions which must be enacted. Modeling has been found to be a powerful source of guidance, as it illustrates the key principles to be followed (Debowski, 2001). These demonstrations of good practice enable the student to envisage the structure and potential outcomes, so that the same application might be replicated to other contexts. The more a student is exposed to models of good practice, the more developed the desired competencies. Thus, it is of great value to have university teachers model effective information seeking so that it may become better integrated into the practices the student applies regularly and automatically.

Models of information seeking may be embedded in various ways. For example, when introducing a new assignment topic, lecturers might recommend some key databases to search on particular assignment topics. They might also list the key search sources for the subject in the unit outline to be provided to students at the start of the unit. When discussing the assignments to be undertaken, the lecturer could provide a short outline of the best keywords to be employed when conducting the initial investigative search. Where higher levels of skill are required, an actual search might be demonstrated to illustrate the sequential reasoning and progressive search development which might be undertaken. Individual guidance on plagiarism is a rich opportunity to explore how to find and effectively use information, as the teacher can outline and model better strategies to the student, using the offending assignment as a constructive example on which to build.

The provision of modeling can be taken further. Learning theory emphasizes the value of providing effective feedback, particularly at point of need (Biggs, 1999; Ramsden, 1992; Prosser & Trigwell, 1999). For example, students might be asked to conduct a literature search on a pertinent topic in preparation for their tutorial, and then be given feedback on the suitability of their search processes. It can be very informative, for example, to compare the keywords used by each student, and the types of resources which were captured. Similarly, the students could download their search history and bring it to the tutorial to discuss their strategy and the information which was gleaned on the topic. The tutor could also explore the quality of the resources captured, and the relative merits of different databases in exploring the subject area. This activity would extend the modeling outward, by incorporating both peer and expert modeling. This is a particularly powerful learning activity when both types of modeling are incorporated (Bandura, 1986). An activity like this would require the enhancement of tutor skills prior to the session, to ensure they were sufficiently knowledgeable in relation to information search processes. After discussing and comparing the student searches, an expert search of the same topic could be demonstrated by the tutor. This form of modeled experiential process enables better student understanding of the principles and their application in the specific subject area, while also helping them to

identify areas of potential error. It also provides a more accurate picture of the information which might be obtained through the search process.

Expert searchers can offer additional support to novices. Feedback on the search process, and an outline of how the structure and methodology might be enhanced can be very useful (Goodman, 1998). There are various strategies which might be employed. The students might, for example, be required to attach their search history to their assignments, along with the reference list of resources they identified and used. Their search history could then be evaluated and feedback provided. This can be challenging, however, as novices tend to be quite erratic in their search activities. Following the tangled line of interrogation may be very demanding for the tutor or novice. While feedback on the key erroneous practices is of great value, an alternative is to encourage the student to self-evaluate, using a prepared model to match against their initial effort. This can still act as a stimulus, and lead to consideration of how the individual's own processes might be improved. However, while easier on the teacher, the overall impact may be markedly less, and may not direct the student's attention to the desired outcomes. The linkage of the process to either a tutorial activity, or an assignment process will generate increased commitment by the student toward fully participating in the review process.

While the initial modeling and review of the core strategies offers an invaluable in-depth orientation into information searching, the student then needs to practice the skills intensively. This requires the building of effective learning opportunities within course contexts, so that the student might work within a structured environment. The development of the course curriculum and outcomes becomes more critical, as it might also be used to test for information seeking competencies as well as the core knowledge relating to the content of the course.

Conclusion

Information seeking is a core competency which needs to be reflected and integrated more completely into university curricula. As an initial step, the level of expertise held by academic staff needs to be reviewed, and stronger attention needs to be paid as to the progressive development of search skills within staff, and within their student cohorts. A more active role by academic units and libraries in reviewing the competency issues and addressing curriculum design challenges would be a constructive commencement in this process.

In addition, there is continuing need for library staff to seek more active interaction with their academic colleagues. The increasing importance of information literacy needs to be recognized, and requires effective marketing of the library services and the development of instructional partnerships between academic and library colleagues. Initial meetings with whole schools or departments on an annual basis, presentations at teaching forums and the ongoing promotion of effective collaborations are all important mechanisms in encouraging academics to adopt stronger integration of information literacy into their teaching frameworks.

A key issue relates to the recognition of the importance and potential complexity of information seeking. Like many complex skills, it can appear somewhat rudimentary to those who have not examined it closely. Upon further analysis, however, it will be

found that these skills need to be further developed in both academics and students, and need to be promoted and encouraged as actively as possible. The initial use of the *Self-Analysis of Information Seeking Expertise* checklist could be an illuminating experience for many university teachers, and might result in further consideration of the complexity and challenge of creating effective information seekers.

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What do science students gain from final-year undergrad projects?



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Undergraduate students in the Human Biology and Molecular Genetics degrees at Curtin University complete a compulsory research project in their final semester. Students work individually, supervised by an academic staff member, to complete a literature review, perform a research project, and present both in written and oral formats. The literature supports the use of project work to contextualise learning, but these projects are time-intensive and costly for staff, so we investigated how effective they are in meeting the needs of graduates in the way in which they are intended.

Biomedical Science staff were interviewed to gather information on what they believe the outcomes of the research project would be for the students. Students who had successfully completed the research project were interviewed to ascertain what they believed they had achieved from the experience of the research project, and students already in work placements will reflect on whether the project has been relevant to their work. The data were compared to see if the intention was matched in any way with the outcomes. Student experiences were gathered to illustrate the range of outcomes which students believed they gained from the experience, and this paper presents the outcomes of the study and offers comments on the value and effectiveness of research projects in undergraduate courses.

Undergraduate students in the Human Biology and Molecular Genetics degrees at Curtin University complete a compulsory research project in their sixth and final semester. Students work on individual projects, supervised by an academic staff member, to complete a literature review, identify appropriate research designs and gather data to answer a particular research question. The students also identify the ethical issues within the research and then apply for the appropriate ethics approval. In addition the students are introduced to some of the philosophical issues associated with the study of science and question some of the inherent assumptions that underlie the research process. Statistical knowledge is enhanced through interpretation of output from a range of data requiring different approaches for analysis. This allows students to make informed choices about how best to statistically analyse their own

data. Students examine the limitations of the collected data and investigate how broadly the results of their research can be applied. They also have the opportunity to convey their findings to their peers and academic staff through a written research report and a formal research seminar in front of staff and invited guests.

Problem

Although there was general agreement from staff that students gained valuable benefits from doing the Research Project unit, the increased student numbers, decreased staff time and budget constraints led to questioning of the value of a unit which increased staff workload, had no equivalent flexible-delivery or distance mode and was not the source of extra publications for staff.

We wished to know what the students felt they gained, and see how it matched with what the staff felt should be the outcomes for students.

Literature

There is a paucity of reported studies of undergraduate science projects as part of the bachelor degree and not an integrated or separate honours project. However, the need for research as part of an undergraduate degree has been both the focus of reports and subsequent recommendations into higher education in both America (The Boyer Commission on Educating Undergraduates in the Research University, 1998) and Great Britain (National Committee of Inquiry into Higher Education, 1997).

Undergraduate research can take several forms and is proliferating at some research universities, where training undergraduates for research is a primary function. The Boyer Commission on Educating Undergraduates in the Research University (1998) has commented that in American research universities a research project should be a fundamental prerequisite to degree completion and is one of their recommendations to change undergraduate learning in research universities. However this has not been the case to date although there are signs of change. The Boyer Commission also makes the comment that while this is good in theory there are obstacles to the implementation- budgetary, fighting change in delivery of information (lecture vs collaborative interactive learning such as research) and redefining teaching work load (p. 14-15) to include hours involved in undergraduate research. In Australia there appears to be an emphasis on postgraduate research, a situation probably due to the associated government policy that funds universities based on these numbers, which underpins much of Australian university research culture and directs the future of all universities (Neumann & Guthrie, 2002)

Research projects in undergraduate degrees have potential to provide many benefits to undergraduate students. Apart from being designated a preferred teaching method in a survey of undergraduate students from three universities in the UK (Sander, Stevenson, King, & Coates, 2000), there is the enrichment of learning through the exposure to the research process-scientific investigation inquiry and discovery (The Boyer Commission on Educating Undergraduates in the Research University, 1998). The incorporation of original synthetic organic chemistry research into the undergraduate program on a volunteer basis was trialed by teaching staff (Lindsay & McIntosh, 2000) who hoped students would feel that they were collaborators in 'real' research. Students also experience the 'highs & lows' of the research process (Wilson,

1991) and this adds an extra dimension to student inquiry. Undergraduate research has the capacity to make science 'real' or knowing you have the potential to make a difference (Brown, 1999; Mangan, 1989) and engender enthusiasm for science (Service, 2002). Finally it should be the climax of, and culmination of all skills developed during, undergraduate degree (The Boyer Commission on Educating Undergraduates in the Research University, 1998; Van Hoven & De Boer, 2001).

Exposing students to research has benefits for their future careers, whatever direction they may take. It helps students make informed choices about the further pursuit of science research as a career option (Blenkinsop, 2003; Service, 2002). Research projects enhance skills which are transferable into later research or employment pursuits (Blenkinsop, 2003; Brown, 1999; Goodlad, 1998; The Boyer Commission on Educating Undergraduates in the Research University, 1998; Van Hoven & De Boer, 2001) and include improved oral and written communication (The Boyer Commission on Educating Undergraduates in the Research University, 1998) in the academic arena as well as those that result from interactions with professionals or the community that can be part of the research process (Van Hoven & De Boer, 2001). Skills in better information retrieval and storage through the use of improving technology (The Boyer Commission on Educating Undergraduates in the Research University, 1998) and improved 'bench top' skills associated with laboratory based research (Lindsay & McIntosh, 2000; Van Hoven & De Boer, 2001) are also possible benefits.

Undergraduate research provides research supervision experience for students continuing into postgraduate studies (González, 2001; The Boyer Commission on Educating Undergraduates in the Research University, 1998). In addition, undergraduate research can lead to increased money for the university through commercialisation of resulting products (Blumenstyk, 2002).

Whatever the benefits of undergraduate research projects, economic realities are now shaping science education more pervasively than 20 years ago. Therefore if energy is to be expended on retaining them within the undergraduate curriculum it is appropriate to investigate how closely matched are the perceived and actual outcomes and benefits for both staff and students.

Method

Staff and students were invited to participate in focus groups to discuss the Research Project over lunch. Nine of a possible eleven staff who had been involved in supervising student projects met and discussed student outcomes, facilitated by one of the authors. The session was tape-recorded and later transcribed. The transcription was then circulated to all participants for member-check comment, and any minor corrections to the transcript were made. From the subsequent transcript, themes were distilled and compiled as a list of outcomes in a table.

All 19 students enrolled in the Research Project unit were invited to participate in a focus group and given three different timeslots to attend. The first only attracted one student, the second three and the third three. Of these students, four were from the

Molecular Genetics stream and three were from the Human Biology stream. These course groups were kept separate to pick up any differences between the two streams of students. Again, the sessions were taped, transcripts circulated for member-checks, themes distilled and tabulated.

Results

Themes from the staff and student focus groups were grouped and combined into one table, Table 1. The focus groups which had expressed a particular theme are indicated by a tick in the column. The student focus group data have been kept separate according to their degree program. Those outcomes which were matched for both students and staff were isolated and are presented in Table 2. Unmatched outcomes for both students and staff were isolated into a third table, Table 3, and finally any unmatched outcomes for students from the two different degree programs were isolated into Table 4.

Table 1
Grouped data from staff and student focus groups.

Desired(staff) or achieved (student) outcome theme	Staff	MolGen students	HB students
Questioning research papers	√	√	√
Experiencing processes and pitfalls of research	√	√	√
Getting a taste for research, help decide about honours	√	√	√
Doing research activities in context of real project		√	√
Learn good experimental/scientific technique	√		
Develop good experimental design protocols	√		
Teamwork, collaboration and allocation of tasks	√	√	√
Benchtop experience	√	√	
Learning from the unpredictable, from mistakes	√	√	√
Individual responsibility for task completion	√		√
Develop feel for honesty in research	√		
Problem-solving	√	√	√
Information-retrieval, selection and synthesis	√	√	√
Gain wisdom, insight into scientific process	√		
Work “at a higher level”, culmination of the rest of the work done in the degree	√	√	√
Improved writing communication skills	√	√	√
Improved oral communication skills	√	√	√
End up with something you have achieved		√	√
Have something tangible to use in CV or a publication		√	√

Table 2
Matched outcomes for staff and students

Desired(staff) or achieved (student) outcome theme	Staff	MolGen students	HB students
Questioning research papers	√	√	√
Experiencing processes and pitfalls of research	√	√	√
Getting taste for research, help decide about honours	√	√	√
Teamwork, collaboration and allocation of tasks	√	√	√
Learning from the unpredictable, from mistakes	√	√	√
Problem-solving	√	√	√
Information-retrieval, selection and synthesis	√	√	√
Work “at a higher level”, culmination of the rest of the work done in the degree	√	√	√
Improved writing communication skills	√	√	√
Improved oral communication skills	√	√	√

Table 3
Unmatched outcomes for staff and students

Desired(staff) or achieved (student) outcome theme	Staff	MolGen students	HB students
Doing research activities in context of real project		√	√
Learn good experimental/scientific technique	√		
Develop good experimental design protocols	√		
Benchtop experience	√	√	
Individual responsibility for task completion	√		√
Develop feel for honesty in research	√		
Gain wisdom, insight into scientific process	√		
End up with something you have achieved		√	√
Have something tangible to use in CV or a publication		√	√

Table 4
Unmatched outcomes between and Human Biology and Molecular Genetics students

Desired(staff) or achieved (student) outcome theme	staff	MolGen students	HB students
Benchtop experience	√	√	
Individual responsibility for task completion	√		√

Discussion

The results show that between students and staff there was a match in just over half the outcomes (Table 2). These include some of the more generic graduate skills such as communication, problem-solving, information retrieval, and teamwork. Both staff and students thought that increased critical thought and examination of research papers through new eyes were outcomes obtained from the research project. This may be because students are reading papers in the context of their own research. Their literature review is not just an essay but a critical analysis of the published work which will influence their project. In order to be successful at this task new skills required for information retrieval, selection and synthesis are introduced, particularly the use of electronic data bases which is now considered essential to higher and further education (Armstrong et al., 2001). Books become a secondary source of information in comparison to the latest research paper. The students worked at a higher level than ever before at information integration and critical thought applied specifically to their project literature review and design.

Both students and staff believe that the research project should provide them with opportunities to learn from their mistakes. The unit provides students with more feedback than ever before on one particular subject area. Literature reviews are read and returned with feedback at least twice before final submission, improving written communication skills. Similarly, presentation of their research proposal and project improve oral communication skills.

Both students and staff felt that the research projects gave practical experience in the research process and this usually involved problem solving, collaboration with other professionals in the 'real world', and with university technical and academic staff. These can be considered some of the transferable skills for future employment (Blenkinsop, 2003; Stefani, Tariq, Heylings, & Butcher, 1997).

Finally, both groups felt the project could help the students make informed decisions about research in the future. Interestingly, both groups mentioned decisions related to honours, although for staff it meant helping to select potential students while for students it meant preparing themselves for the rigours of an honours year.

The outcomes which were not matched, where at least one of the student groups did not mention a particular outcome, are seen in Table 3. Staff believe the research project should provide opportunities for developing scientific skills, insight, benchtop experience and individual responsibilities in the process of the project. Students were more focussed on final product, for example the Literature review, the project write-up or the ability to use the project for honours or on their CV

Staff alone thought the research process should develop a feel for honesty in research. In the same vein is the staff view that students should gain wisdom and insight into scientific processes. Perhaps both these outcomes are idealistically founded in the staff's own retrospective experience gained over a much longer time span, and therefore led to hopes that the student would gain this insight in a shorter time frame. Staff wanted the students to develop good experimental techniques and research design protocols. The students themselves did not have this as a goal. This probably reflects the more realistic view of staff about good experimental technique, while the

students think they don't have time to make sure the technique is reproducible and accurate before they gather all the data. Theoermer (2002), in a study of undergraduate and graduate students and their ideas of how science develops, found that neither group understood that scientific research was a process based in theories that developed within a particular framework. Perhaps the staff-student dichotomy seen in our results merely reflects research experience.

The student only outcomes were more pragmatic. They have achieved something that they can use on their burgeoning CV or for publication. At the beginning of their careers these practical advantages, along with additional skills are important to any student wanting a career in research. Stefani (1997) comments that when doing projects students often work to vague or unidentified criteria, whereas staff had a better idea of the outcomes. Staff outcomes embody the principles that education is a journey, whereas the more pragmatic students are interested in what the outcomes can do for them.

Table 4 shows the outcomes which were not matched between the two different degree groups of students. Molecular Genetics students were more concerned with benchtop skill outcomes while Human Biology students felt they had gained skills in taking personal responsibility for their work. These differences are most likely due to the difference in the style of research project undertaken by the two undergraduate streams.

Conclusions

Staff and students share many of the same ideas about the outcomes students gain from an undergraduate research project. Staff and students agree that students in the research project are "working at higher level" and that students gain intangibles which are still not clearly identified.

Where the outcomes were not matched, this appears to reflect a difference in focus between process and product. However, students value the opportunity to experience real science that is relevant, in context and for which they can feel ownership, and they feel they gain much from the experience. Our research has shown that the school perhaps needs to address other problem areas to increase returns which staff feel they gain from the experience. The themes distilled from the focus groups need to be circulated to a wider group of the student cohort to ascertain levels of agreement and collect further open-ended comments. The authors plan to continue their investigations into this cohort as the year progresses.

Research has been seen as a learning activity where higher degree research students and academics 'advance knowledge and understanding' (Neumann & Guthrie, 2002, p. 734). Neumann (2002) comments that whereas once the process itself was more important than the actual outcome, with change in funding in Australian universities the emphasis is now on outcome. Perhaps the undergraduate research project can still reflect the more ideal educational aim that the journey is perhaps more important than the final outcome.

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Student-focused postgraduate supervision: A learning intervention process



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The supervision of research students, combining as it does a university's core functions of teaching, learning and research, provides a focus for the assessment of institutional quality performance and the teaching/research nexus. With the number of students entering postgraduate programs continuing to rise, there has been increased attention and research on the effectiveness of postgraduate supervision in recent years with a particular emphasis on completion rates and the development of generic skills. The nature of the learning partnership between postgraduate students and supervisors as well as factors affecting the learning outcomes of the supervision process has also been explored. The challenge for postgraduate supervisors is to facilitate student learning against a background of limited resources, greater supervisory loads and increasing demands for teaching quality. In this paper we propose an holistic, student-focused approach to the supervision of postgraduate research students. The learning intervention process addresses each critical stage of supervision from the establishment of clear goals, the development of the student's research and analytic skills through to the writing of the thesis and publication of research papers. The paper also provides student feedback and comment to this approach and explores the outcomes in terms of student progress and learning outcomes.

Doctoral students make a significant contribution to research in Australian universities, and their numbers have more than tripled over the last ten years (Nelson, 2001). Since the sweeping changes in the Australian higher education sector with the collapse of the binary system and the reforms of the 1980s (Lee and Green, 1995), there has been increased attention on the professional development of postgraduate supervisors and the quality of postgraduate supervision, particularly in the newer universities (Johnston, 1995). Long completion times, coupled with low completion rates for postgraduate students continue to be a concern both in Australia and overseas (Martin, et al., 2001; Wright and Cochrane, 2000; Moses, 1985), whilst the pedagogy of postgraduate supervision remains poorly understood (Grant, 1999).

A recent report on factors associated with the completion of research higher degrees in Australian universities, found there were three sets of influences on the rate at which students complete. The influences included institutional and environmental factors such as disciplinary traditions and institutional research cultures; individual

supervisory arrangements such as frequency of meetings and the quality of feedback provided; and, differences in student cohorts and student characteristics such as entry qualifications (Latona and Browne, 2001).

Others have pointed to the critical influence of the characteristics of both supervisors and students on the outcomes of postgraduate studies. Moses (1994) reported that surveys on the quality of Australian postgraduate education show that this is to a large extent determined by student characteristics. For example, student qualifications, prior experiences, motivation, expectations, as well as their approach to study will impact on how they experience postgraduate research training. With regard to the impact of supervisors Moses has also pointed out that active involvement in research and a sound knowledge of the research process are important contributors to student success (Moses, 1994). An evaluation of the desirable characteristics of supervisors found that students rated subject expertise below attributes such as the supervisor being helpful, available and caring (Fraser and Mathews, 1999). These findings then, have significance for university lecturers who seek to improve their teaching practice and their students' learning in postgraduate programs.

Facilitating postgraduate learning

Against this background we propose a student-focused approach to the effective supervision, guidance and advising of postgraduate students which addresses different aspects of learning facilitation in the context of students undertaking research degrees at Honours, Masters or PhD level. This approach is experientially based and was developed over a number of years from observations of student progress and achievement, feedback from students, reflective supervisory practices as well as an emerging postgraduate pedagogy (Green & Lee, 1995). In this regard it also draws on current knowledge and principles of effective teaching and learning in higher education (Ramsden, 1992). The approach, described below, illustrates the importance of various phases of postgraduate supervision with comments from postgraduate students.

We have found that there are three key areas during supervision where the supervisor can have a significant impact on postgraduate student learning outcomes. First, there must be good rapport, accessibility and trust established so that students are encouraged to receive advice, information and guidance as needed. Second, there should be an explicit learning intervention process so that students are challenged yet guided in an overt way during their postgraduate training. Third, the supervisor must be able to offer opportunities for students after they complete their studies. By this we mean facilitating the student to leave the confines of the supervisor/student relationship and to broaden their perspectives by engaging in the wider national and international professional/academic culture and associated industry(s).

Developing rapport and trust

The beginning stage of the supervisor/student relationship sets the scene for the latter stages of supervision and is in this regard a critical time for establishing an effective learning partnership. During this stage the supervisor should be proactive in establishing the ground rules for the supervisory process and gaining an understanding of the student's expectations and approach to learning. An awareness of the pastoral

care needs of students is also important as they become acclimatized to the demands of postgraduate research. The establishment of rapport and trust is facilitated by an open door policy for student contact and is integral to developing a good working relationship. Students need to know they can talk and negotiate with their supervisor about any aspect of their learning:

Zora took time out not only from his busy daily schedule, but also gave me his personal time to help me achieve my goals and tasks. He was available whenever I needed advice (V. Agrez, Curtin graduate 1998).

Through providing one-on-one guidance and advice on an ongoing basis as well as effective intervention at critical periods in the supervision process, the supervisor adopts the role of a learning coach and establishes a learning partnership of mutual respect and trust from the outset.

Dear Zora, ... I thank you for always making time to see me to talk through problems that may have arisen with the thesis. My knowledge on the physiology of plants, horticulture and research methodology have greatly increased due to material you gave me to read and the simple explanations you gave... (P. Bockman, Graduated Honours student, 2000).

Learning intervention approach

Following the establishment of the supervisory relationship, sustainability and maintenance of the partnership to completion is enhanced through the learning intervention approach. This approach, shown in Figure 1 involves specific assistance at regular intervals of the supervision process. Implicit in this approach is that the supervisor's input may vary during different phases of supervision and from student to student. The learning intervention process addresses each critical stage of supervision from the establishment of clear goals, the development of the student's research and analytic skills through to the writing of the thesis and publication of research papers.

The first stage involves guiding and directing the student to suitable literature sources, authors and bibliographies. It is important at this stage that the supervisor encourages and facilitates the student's critical thinking and analytical skills whilst they choose their research topic and review the relevant literature. Stage two focuses on connecting students with local, national and international scientists to glean unpublished research and development on their topics. This encourages students to establish a dialogue with key scientists in their chosen research area and introduces them to key players in the scientific community. The first two stages then, assist both the student and supervisor to determine the gaps in existing knowledge on the topic and are in this regard prerequisite to formulating a viable research project.

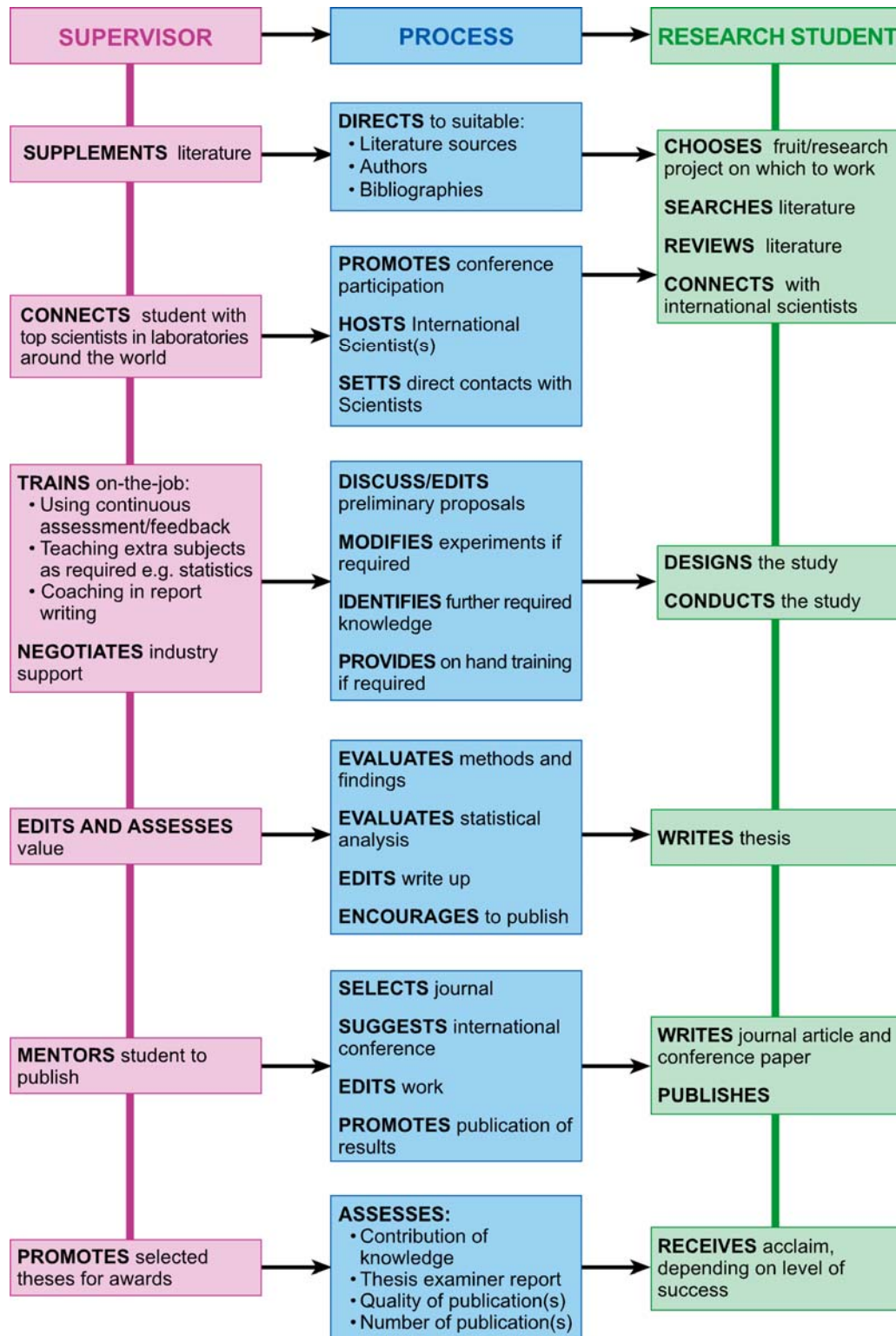


Figure 1. Learning intervention process for research supervision.

The third stage underpins training the student in appropriate research methodologies and involving them where appropriate in the negotiation of industry support. Through discussion and a continuous assessment and feedback process, the student develops the design and conduct of their research project and with the supervisor's assistance establishes the required resources and facilities for data collection and statistical analysis. Stage four then requires assisting the student to refine the plan for their thesis and involves editing student work and providing timely feedback during the writing phase.

Zora,...I thank you for always making time to see me, to talk through problems with the thesis....The feedback and encouragement I got from you were the reason I did not give up (P. Bockman, Graduated Honours student, 2000).

In the final stages of the learning intervention process, the supervisor takes on a mentoring role, for example by suggesting and selecting relevant journals for submission of articles related to the student's research or proposals for attendance at international conferences. The supervisor can also promote student achievement through the nomination of students for awards and commendations from thesis examiners, thereby assisting them to become established within their discipline.

The learning intervention process outlined in Figure 1 takes a personalised and holistic approach to postgraduate supervision. Although we have focussed in this paper on the supervisor's roles and responsibilities it should be noted that the approach is student centred and is flexible to incorporate diversity within the student cohort. Observations of student progress and attainment as well as feedback from students at all stages of their postgraduate studies shows the learning intervention approach to supervision can produce outstanding results:

Zora, your enthusiasm for my PhD research project was uplifting and infectious and your style of supervision was excellent in all aspects (S. Nair, recently completed PhD student 2002).

Zora's close participation in my Honours dissertation helped me to achieve the top mark for 1998 for which I am forever indebted (V. Agrez, Curtin graduate 1998).

Post graduation career guidance

Once students have completed their studies the supervisor can create opportunities for students through their teaching and research activities and their profile within educational, community and industry sectors. This is done by:

- Winning grants to cover the costs of infrastructure and stipends necessary for postdoctoral research.
- Examining theses for students in other Australian universities and in overseas universities. This enables the supervisor to advise postgraduate students with an up to date knowledge of national and international standards.
- Introducing students to community and industry contacts through field visits, visitors to the laboratory and by arranging for students to do research in and for industry.

We have found that student outreach, when it is coupled with good rapport and mutual trust between student and supervisor and integrated into the learning intervention process outlined above, can produce excellent learning outcomes for postgraduate students as well as good progression and completion rates.

Conclusions

Research on postgraduate supervision has begun to provide some insight into the factors that can make supervision more effective. This research has also provided a better understanding of the pedagogy associated with supervisor roles and responsibilities and has resulted in various 'how-to' manuals and 'checklist' approaches to professional development for postgraduate supervisors (Zuber-Skerritt & Ryan, 1994). However, as supervision continues to be seen as problematic in universities, and progress and completion rates of postgraduate students remain an issue, further study in this area is indicated. In this context, the approach outlined above builds on the present understanding of good supervisory practices and provides a postgraduate teaching methodology that addresses key stages of the process of supervision. Moreover, by adopting a systems-based holistic approach to all stages of the supervisory relationship, a genuine learning partnership between the student and the supervisor is established.

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The Research Higher Degree Student Professional Development Program at Flinders University



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Flinders University

As a result of changes to government funding patterns and a greater focus upon research, the Research Higher Degree Professional Development Program was introduced to Flinders University. It was designed to support candidates and equip them with knowledge and research skills of sufficient depth to complete their programs and begin professional practice. The program aimed to ensure: (a) more and faster completions; (b) higher standards of research; and (c) reduced isolation for students. Consequently, a pilot program aimed at the University's 850 research higher degree students was introduced in March 2002. The program was developed by the general staff in conjunction with an academic reference group. It was co-ordinated by the Staff Development and Training Unit, and individual courses were run by academic and general staff from within the University, or by external experts as required. Students attended workshops on topics as varied as conducting focus groups to overcoming statistics phobia, from computer literacy training and software applications to skills in personal management. Outcomes of the pilot program included: (a) increased student confidence regarding thesis completion within the required time scale; (b) collaboration between different schools and departments; and (c) improved research skills. The program was evaluated by the students as being extremely successful, and their feedback is used to fine-tune subsequent program offerings. It was concluded that this innovative program will continue to significantly improve the quality and efficacy of research at Flinders University. Further research into this exciting pedagogic area was recommended.

In 1997, Pearson and Ford (xi) recommended that "funding and other arrangements for PhD students be rethought in terms of the resources needed by candidates to carry out their research and to engage with a range of other researchers and their peers on and off-campus". In 1999, the then Education Minister, the Hon David Kemp's White Paper, *Knowledge and Innovation: A Policy Statement on Research and Research Training* flagged concerns about research programs being too narrow, specialised and theoretical, with high attrition rates and slow completion rates. This led to Government funding for research training (Research Training Scheme) being allocated to higher education institutions on a performance basis. Universities were required, for the first time, to report on arrangements for ensuring a quality research training experience for their students.

Consequently, in December 2001, the Research Higher Degree Professional Development Program was created when Flinders University committed funds to improve the research and generic capabilities skills of its students. Access to training

programs had been requested by students through the Postgraduate Student Association for a number of years, and the program was initiated through a proposal from the Staff Development and Training Unit. This paper describes the program and discusses the evaluation of the program carried out at the end of its first year of operation.

Background of the program

As part of its Research and Research Training Management Plan, Flinders University has committed to providing training and support to its research higher degree students. The Research Higher Degree Professional Development Program aims to ensure that students have the opportunity to undertake training in a number of relevant workshops and seminars. Through participation in the program, ideally the students will:

- Develop both basic and transferable skills during their candidature thus producing highly educated, well rounded individuals who will excel in their chosen profession
- Complete their candidature within the prescribed time-scale.

Thus the structure of the program was determined with three objectives in mind, namely:

- Equip students with the development of skills that may be required during their candidature (eg, information sourcing, experimental designs, computer literacy, research methodologies)
- Improve skills that students will require throughout their personal and professional lives (eg, oral and written communications skills, project management)
- Offer a number of personal management workshops to assist students to develop the necessary personal skills to ensure completion (eg, reducing procrastination, goal setting, motivation, building confidence, time management).

The program design was guided by DDOGS, the Council of Australian Deans and Directors of Graduate Studies' (1999) *Statement on Skills Development for Research Students*, which considered the following as desirable for postgraduate researchers:

- Induction
- Skills for research and thesis preparation
- Communication skills – writing, academic conventions, oral presentations etc.
- Information skills – access to information sources and searching strategies, information management, data analysis, bibliographic skills
- Project skills – project management, compliance with regulations, planning and organisational skills, time management, teamwork, negotiation skills etc.
- Cognitive skills – analysis, evaluation, synthesis and application of ideas
- Skills for professional development and career preparation.

Rationale for this particular program

The Staff Development and Training Unit at Flinders University identifies training and development needs amongst the University staff. It also provides a range of programs, seminars, workshops and other activities in the broad areas of Teaching and Learning, Research, Information Technology, Professional Development and Leadership and Management. Whilst the SDTU, prior to 2002, dealt primarily with staff members there were occasions when higher degree students attended programs offered by the Unit (ie, places on advertised staff courses were made available to postgraduate students).

Additionally, a significant number of participants at staff development activities were new academic staff and as a result the Unit has a good understanding of their training and development needs. The Unit already provided a successful Early Career Researcher program and through this has identified many of the issues faced by new researchers. The Staff Development and Training Unit has over four years experience of providing training and development activities and had successfully developed the systems, procedures, presenters and resources, including a computer training suite, to support these activities.

During 2002, research higher degree students had the same access as staff to almost all of the programs offered by the SDTU. Depending on their specific needs, the Unit also provided courses exclusively for research higher degree students or incorporated them into courses provided for staff members.

Program outline

During 2002, 41 different workshops (see table 1.) were offered (several, many times over) with a total student attendance of 1780. The program ran between March and December and was divided into four sections:

- Academic
- Professional Management
- Research Skills
- Computer Literacy Skills

Each section offered a wide variety of options, (partially in response to student demand, and guided by the experience of SDTU, the Reference Group and the DDOGS recommendations). The co-ordinators were pleased to find that Flinders staff members were also present at many events, to up-date their own skills and to gain a sense of the issues that were important to the targeted student body.

Table 1.
Workshops offered as part of the program

Academic	Professional Management
Academic Writing Skills	Career Development Strategies
Applying for a Postdoctoral Fellowship	Cross Cultural Awareness
Critical Thinking - Problem Solving	Effective Meeting Skills
Critical Thinking - Text Analysis	Emotional Roller Coaster Ride to Completion
Examination of a Thesis	Getting Started with Research
Intellectual Property Issues	Getting to the Finishing Line
PG Studies - the Legalities	Goal Setting for RHD Students
Publication Skills	Job Searching Skills for RHD students
Scientific Report Writing	Poster Presentation Skills
Student Supervisor Relationships	Project Management
Thesis Writing Workshop	Public Speaking Skills
Writing a Literature Review	Defeating Self Sabotage
Writing a Research Proposal	Time Management
Research Procedures	Computer Applications
Conducting Focus Groups	Database Skills
Applying for Ethics Approval	EndNote Skills
Geographic Information Systems	NUD*IST/ N'Vivo
Qualitative Research Methods	PowerPoint Skills
Social Research Design and Quantitative Research Methods	Spreadsheet Skills
Questionnaire Design Workshop	SPSS
Social Research Design & Qualitative Methods	Website Design and Maintenance
Academic Use of the Internet	Word Processing Skills

Program presenters

The program called upon the expertise of Flinders staff members (SDTU and from the Faculties) and both academic and general staff generously gave their time. The program co-ordinator's role was to match the training needs of the students with the skills of available presenters and some surprising outcomes occurred. For example, students from the sciences reported that they had a need to learn about the Geographic Information Systems taught in Geography, and the statistical skills of Science lecturers were enthusiastically absorbed by Social Science students. Additionally, external presenters were engaged to conduct workshops when no staff members were available.

Program management and the reference group that guided it

The program was managed by the Staff Development and Training Unit in the first instance in conjunction with a reference group consisting of the Chair of the University Research Higher Degree Committee and representatives from:

- Scholarships and Higher Degree Administration Office
- Student Learning Centre
- Careers and Employers Liaison Centre
- Postgraduate Student Association
- Two student representatives.

This group reported to the Research Higher Degree Committee, and had considered the following:

- The training and development needs of research higher degree students
- The most appropriate method and timing of delivery of services
- Strategies for disseminating information about the program.

Promotion was done by the monthly posting of a printed program of events to students and an e-mail listserver. The Project Manager also visited schools and departments to meet groups of students to promote the program and encourage attendance.

Overall, the program was warmly accepted and feedback was uniformly positive.

Evaluation strategy / response

A self-report questionnaire was administered to 850 students in November 2002, to attempt to determine the effect of program participation on research progress. Completed questionnaires were received from 214 students for a response rate of 25.18%. Responses from this survey will be used to guide and improve the program in 2003.

Program participation

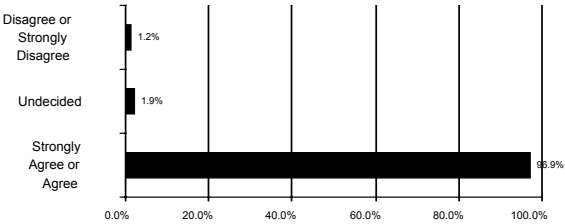
Overall, 75.2% of respondents had attended at least one event in 2002, the mean number of events attended was 3.8 (sd 2.76). One respondent reported attending 20 different events. The program was funded to make 2 places available to each student, however, not all students took up the option and as local presenters were utilized where possible at a considerable cost saving, this meant that interested students were then able to attend more than 2 events each.

Response from the students to the program

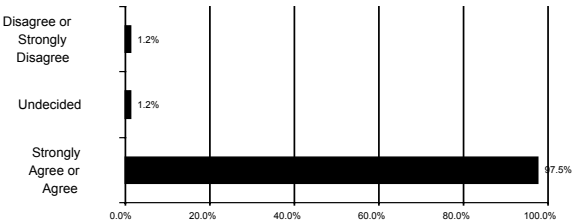
Respondents rated their attitudes on a 5-point scale ranging from 'strongly agree' to 'strongly disagree.' They were requested to consider the last event they had attended and respond to the statements listed in Table 2.

Table 2.
Evaluation results

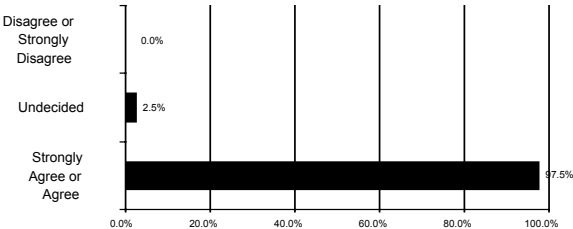
IN GENERAL, THE PRESENTER(S)
MADE THEIR SUBJECTS
INTERESTING



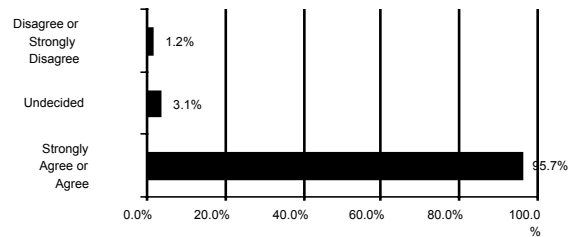
THE PRESENTER(S) EXPLAINED
THINGS CLEARLY



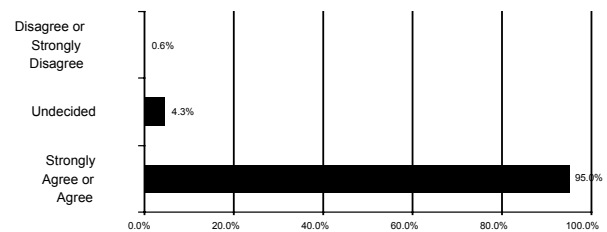
THE PRESENTER(S) HAD UP-TO-
DATE KNOWLEDGE OF THEIR
TOPIC



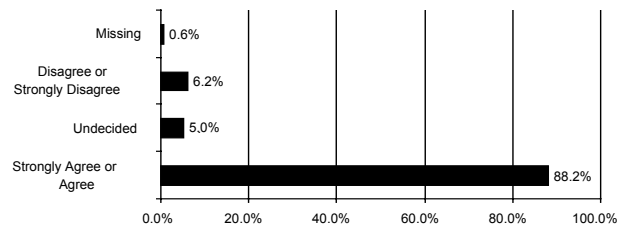
THE PRESENTER(S) WERE WELL
PREPARED



OVERALL, THE PRESENTER(S)
HAD GOOD PRESENTATION
SKILLS



GENERALLY THE EVENT WAS
WHAT I EXPECTED FROM THE
EVENT DESCRIPTION



The program co-ordinators were pleased with the high degree of satisfaction shown by the responses to this section of the survey (Table 2), and considered that only the 'event description' used in promotion and advertising needed to be improved in 2003.

Did the students think that participation was beneficial?

The students were asked to report on the benefit of the program to them personally. Of the respondents who attended at least one event, 38% reported "very beneficial" 48% reported beneficial, 9% reported "somewhat beneficial", 4% were undecided, and only 1% replied "no benefit". Thus it can be seen that 86% of all respondents found the program to be either beneficial or very beneficial. It is envisaged that in future years, this degree of benefit will be reflected in student completion rates.

Students' comments about skill development further reaffirmed the benefit of the program and included the following statements:

(the program assisted) in refining existing skills and defining what skill development needs to occur

The program was really an excellent way to commence my 1st year PhD research. Brushing up on computer skills and sorting out undergraduate bad research habits (that I never had time to do before) really made me feel prepared to get on with it

I never heard of about EndNote before. After attending the workshop, I setup my own "EndNote" library, and use it nearly every day

Participation in the program and progress with research

It was not possible to measure the tangible outcome the program had on candidates' completion rates. However, 86.3% of the respondents who had attended at least one event answered 'Yes' in response to the question "Has the Professional Development Program assisted you in making progress in your research?" Comments following this question included:

I am in the early stages and it helped me to set some goals

Session on Postdoctoral Fellowships was extremely useful for motivating me to finish my thesis and pursue a posting in the future. For me it was good timing

Better focus, more awareness of the reality of both goals and the responsibilities involved in reaching them

The self-sabotage intensive program was invaluable in making me aware of behaviour that was delaying my progress and offering practical, individualized actions to deal with this. I believe I would not have made the progress I have achieved over the past few months without this program. I would highly recommend it to any student who wants to make the best progress they can

Advantages of the Program

The evaluation of the program highlighted four additional advantages of participation beyond skill development discussed briefly below.

1. Collegiality

Social and intellectual isolation is a frequently mentioned problem for research higher degree students (Delamont, *et al.* 1997: 99). In small schools and departments, and for part-time students the effects of lack of collegiality are particularly severe (Phillips & Pugh, 2000: 122). Thus, events in which groups of students and experienced researchers are brought together offer opportunities to overcome this problem and to

set up networking channels to encourage ongoing peer support. Various students commented positively about this result. For example:

Great to have another opportunity to check in with 'how things are done' both in the course, and in conversation with other postgrads (across disciplines)

It was good to be in the company of other researchers, with similar interests

Kind of cool to see other students with similar issues - not alone and there is a solution!

Made good contacts I've followed up since

During 2002, the co-ordinators found that most of the participating students wanted to discuss the common ground they found in research methodology, techniques, thesis writing and publication, not only with presenters, but also with each other.

2. Confidence and enthusiasm

Confidence is considered to be a higher predictor of success in completing a research higher degree (Wright & Cochrane, 2000). The program co-ordinators were pleased that several respondents noted an increase in the positive way they felt about their research. For example:

Increased confidence, develop knowledge of 'behind the scenes' processes within the University

It has given me a little more confidence in myself and my abilities

Has helped me feel more confident about my abilities - from each w/shop I usually get one or two good ideas towards completing my PhD (which makes it worthwhile!)

The events also assisted in bringing students together to learn from each other about the process of completing a higher degree. If the program in anyway assists students to maintain motivation and persistence then it is a worthwhile endeavour. Hopefully, attrition rates, will decrease!

3. Personal management

The management of conceptual and practical tasks that have to be undertaken to obtain a research higher degree is an important factor when considering completion rates. Planning skills and goal setting were encouraged through a number of courses in 2002. These ranged from short presentations on the essence of time management to a series of intensive workshops that looked at self-sabotage avoidance techniques. Feedback about these events was uniformly positive, for example:

Taking Charge of Academic / PhD Career course was super! It made me re-organise my life. I reduced hours to 0.6 FTE in order to devote 2 days/wk to finishing my thesis!!

I think it has helped me to write my thesis in a more professional manner, and made me organise my time for more productive work

The program clarified the objectives for my thesis and broke the task into more manageable chunks

Time Management workshop had useful advice, I have put into practice, I am getting more done during the day

Helped me to monitor my own progress and manage my time properly

4. Complementing formal supervision

Included in the aims of the program was the fostering of good working relationships between students and their supervisors. Additionally, by equipping them with required skills, and directing them to appropriate resources, students are encouraged to work independently of their supervisors. University policies are also re-enforced by seminar presentations dealing with protocols of candidature and thesis examination. Students commented that they found participation in this program helped with contextualising generic institutional expectations. For example:

In doing research, and learning to write a thesis, there are general matters not specific to the particular area of research. Learning about these general areas is essential for doing worthwhile research and effective presentation. The Prof Dev Program trains research students in these general areas, areas which are not covered in the normal supervision process

Now have a better understanding of a thesis structure, the requirements / expectation of assessment

My faculty gives very little support to its students, so we have to go further afield for help

I think a program like this was long overdue as often postgraduates feel like they have been left on their own to produce a passable thesis at the end of a 3 year period

In Conclusion

The new Research Training Scheme in Australian universities, with its emphasis on timely completions and appropriate skill levels, forces a reconsideration of the teaching of research, computer literacy and general skills to research higher degree students. Given the funding implications, it is important that programs such as this be supported to alleviate attrition rates, facilitate completions and improve the quality and relevance of student research. The program described in this paper has extended the range of courses offered by the Staff Development and Training Unit at Flinders University to include the training needs of research higher degree students. It has made the expertise of academic and general staff members available to them in a friendly co-operative environment.

The main bonus to the Unit has been the enthusiasm that the students have shown, and their feedback that indicates that in many ways the Unit has pragmatically assisted them to completion. It was concluded that this innovative program will continue to significantly improve the quality and efficacy of research at Flinders University. Further research into this exciting pedagogic area is recommended.

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Equity issues in higher education – the Curtin initiative



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Through its Higher Education Equity Program (HEEP), Curtin University of Technology has, over a number of years, supported a large and diverse number of projects aimed at addressing key equity issues in higher education. The program is administered by the Office of Ethics, Equity and Social Justice.

This paper outlines the general thrust of the program and describes some of the successful projects in the science and technology areas.

Equity categories embraced by Curtin are consistent with the criteria set out by the Federal Government and those addressed by these projects are:

- ◇ *persons with disabilities,*
- ◇ *persons from non-English speaking background,*
- ◇ *persons from rural and isolated areas,*
- ◇ *women in non-traditional fields and*
- ◇ *persons from low socio-economic background.*

The paper explores how partnership between equity programs can increase the successful uptake of learning opportunities at universities.

Student equity programs at Curtin are developed in response to various needs or perceived needs within the student body or more accurately within a subgroup of the general population that may form a prospective and distinct equity group within the student body. These programs are influenced by university policy, and in turn, by government policy and it is the aim of this paper to provide an overview of the influence of government policy and of the development of Curtin student equity policy. Current equity statistics and the functions of current equity programs within Engineering and Science and university-wide are described. Equity policy is currently implemented in the form of devolved equity programs. The requirement that the

equity programs work together as partners is identified. Finally a modified model for equity programs is proposed in which the focus is expanded to include students' complete learning environment. Benefits of the new model and stronger partnerships between equity programs are noted.

Higher education student equity policy

Commonwealth equity and access policy

Australian Commonwealth Government public policy on Student Equity is set out in two key documents: A Fair Chance for All, DETYA 1990; and Equality, Diversity and Excellence, HEC, 1996.

The Department of Education, Science and Technology's Higher Education Equity Program (HEEP) promotes equity objectives in higher education as an integral part of institutional planning with funding determined under the Higher Education Funding Act 1998 (HEFA). The HEEP funding available to publicly funded higher education institutions, provides seed funding to encourage universities to develop strategies aimed at increasing the participation in higher education by students from designated Equity groups (<http://dest.gov.au/highered/programmes/heap.htm>).

Each institution's educational profile, on which Commonwealth funding is based, must contain an Equity Plan. In these plans, universities set out their strategies for increasing the participation of, and achieving successful outcomes for, Equity groups. Since 1995, institutions have used standard definitions and equity performance indicators to report progress in achieving targets for access, participation, success and retention for each group. Equity funding is determined by the Commonwealth on the basis of performance against equity targets (<http://dest.gov.au/highered/programmes/heap.htm>).

In 2002, total funding under the Higher Education Equity Programme (HEEP) was around \$5.9 million. Funding to institutions is determined using a performance based model which has a core grant component of \$80,000 as well as additional funding based on the number of students in Equity groups and their success and retention rates. These funds are made available to supplement rather than substitute for, the use of the operating grant in meeting general Equity responsibilities under HEFA and are made available for use at the discretion of the Vice-Chancellor. DEST considers the effective use of HEEP funds would include the seeding of innovations or strategic equity initiatives that might subsequently be funded from the operating grant. Currently improving access for rural and isolated students, low socio-economic status students and students with disabilities are priorities for HEEP initiatives (<http://dest.gov.au/highered/programmes/heap.htm>).

Continuing development of the equity policy at Curtin

Curtin University of Technology aspires to be a world-class university of technology, and places particular value on ethical behaviour and social justice. Curtin's Mission Statement contains a commitment to these values that is supported by the Ethics and Social Justice Commitment Statement endorsed by the Council in 1996. Indicators established for the Commitment Statement are as follows:

1. Evidence of increased percentage of students and staff from Equal Opportunity Groups at all levels and in all activities;
2. Evidence of increased number of plans, reports, policies, procedures, training and developmental activities that reflect the values of ethics and social justice;
3. Evidence of increased implementation of strategies to address the needs of the diversity of groups and individuals, and the care of the physical and biological environment;
4. Evidence of decreased number of complaints of discriminatory practices and procedures, and the number of breaches to Occupational Safety and Health requirements.

Curtin's Mission sets out a commitment to social justice, ethical behaviour, an international outlook, cultural diversity and an informed respect for indigenous peoples. The University's Strategic Plan provides for the development of a number of University-wide plans to support the Strategic Plan and inform the development of plans at the Divisional level and at the School/Area level.

In 2002 the Ethics, Equity and Social Justice Operational Plan was developed. Previously, a number of plans relating to the area of Ethics, Equity and Social Justice existed:

- the Abbreviated Equity Plan in the Education Profile Submission 2002-2004 Triennium;
- the Equal Opportunity Management Plan and Affirmative Action Plan 1997-2001/2;
- the Equal Opportunity Target Group Employment Plan 1998-2002;
- the Operational Plan for the Curtin Leadership Program and Curtin Women's Program (draft);
- the Aboriginal Education Strategy;
- the Rural and Isolated Plan;
- the Cultural Diversity Policy Operational Plan, 2000-2004;
- the Disability Services Plan 2000; and
- the Action Plan for Advancing Cleaner Production and Eco-Efficiency at Curtin 2002-3 (draft).

These plans have provided comprehensive coverage of specific issues captured within the Ethics and Social Justice Commitment Statement. However, no integrated plan had supported the Commitment Statement. The Ethics, Equity and Social Justice Operational Plan was developed to provide this coordination and to ensure that all aspects of the Commitment are supported. The University-wide Ethics, Equity and Social Justice Operational Plan is designed to embed Curtin's values in the University-wide plans at the organisational level, and in operational plans at Divisional/School/Area level.

The Plan was developed in accordance with the Curtin Planning Framework and with the assistance of the University Planning Office. Internal and external environmental scanning was undertaken. This involved reviewing Curtin plans, policies, and organisational and committee structures, and equivalent material from the Australian Technology Network (ATN) universities, Western Australian universities, the Western Australian Government, Ethics Centres located within Australia, private sector organisations, and the United Nations. It also included input from three distinct focus groups - students, staff, and community partners of Curtin. The staff of the Office of Ethics, Equity and Social Justice in consultation with the Ethics, Equity and Social Justice Committee and its sub-committees undertook drafting of the Plan which was disseminated widely to the Curtin community for comment prior to its endorsement by that Committee.

The objectives of the Operational Plan were developed mindful of those contained in the University Strategic Plan and of the information obtained in the environmental scanning exercise. The process of identifying the most fundamental and crucial objectives and strategies to put forward as the Key Strategic Priorities for endorsement by the Planning and Management Committee was undertaken by the Office of Ethics, Equity and Social Justice in close consultation with the Ethics, Equity and Social Justice Committee and the University Planning Office.

Through HEEP, DEST Higher Education Equity Program Funds have been made available to Curtin to promote equity objectives. DEST's continued allocation is based on the assessment of the University's performance against its objectives and also in comparison with National and State performance. Since the introduction of HEEP, Curtin has funded many initiatives designed to enhance student equity. Curtin's devolved management model and commitment to the notion that the best results are achieved through empowering specialists to address issues at the grassroots level, has resulted in HEEP funding being distributed to projects at the School/ Area level for implementation at that level. While this approach has had benefits, it has also had some drawbacks including a lack of linkages between projects and dispersal of small amounts of funding across a wide range of initiatives.

From 2003, the HEEP funding process will be aligned with the Ethics, Equity and Social Justice Plan with funds directed to supporting initiatives contained in that Plan. To acquire funding for a project in the future, the process will be for the concept to be forwarded to the Ethics, Equity and Social Justice Committee where it will be prioritised in the context of the Ethics, Equity and Social Justice Plan. Key Strategic Priority Objectives for achievement by 2004, contained in the Ethics, Equity and Social Justice Operational Plan are organised under the four areas: Curtin Culture, Core Activities, Students and Clients, and Financial Security.

For example, Objective SC2.1 in the Students and Clients area is as follows:

Objective SC2.1: Ensure a more culturally and socially diverse population by providing

academic processes which reflect the principles of Ethics, Equity and Social Justice, and by providing affirmative action initiatives to enhance diversity in the study place.

This is supported by Initiative SC2.1.4:

Initiative SC2.1.4: Provide support programs and career development programs for students from Equity Target Groups and staff from target employment groups.

The Priority Measure of Success for this objective is “Student demographics reflect DEST Reference Values and Western Australian Census Data.” The Equity Plan is currently being reviewed to identify priorities for achieving these measures.

(Ethics, Equity and Social Justice Operational Plan 2002-2006)

Student equity programs in the engineering and science disciplines

The total number of projects funded since 1992 through Curtin’s Higher Education Equity Program is 84. These break down into the various equity categories as follows:

• Disability	10
• Low socio-economic background	13
• Non-English speaking	16
• Rural and Isolated	21
• Women in non-traditional areas	20
• Other	4

Of these, more than 50 % are in the engineering and science disciplines and these range across all equity categories.

Current equity statistics for the Division of Engineering, Science and Computing

Several engineering and science disciplines continue to suffer low female participation despite the improvements made in other traditionally male-dominated areas such as Law, Medicine and Veterinary Science. In 1999 approximately 15% of engineering students in Australia were women and in 1996 7% of professional engineers in Australia were women [Lewis, Harris, Cox, 2000, pp 8, 10]. Science fares slightly better, with for example, the average participation rate of females studying physics at upper secondary school level over the last two decades being approximately 27 % [Dekkers, de Laeter, 1997; Lim, Mulder, Korczynskyj, Bailey, 1997; Jennings, de Laeter, Putt, 2003 and references therein].

Figures 1 and 2 show the female participation in Engineering, Science and Computing at Curtin from 1998 to 2002. Electrical and Computer Engineering and Mechanical Engineering experience the lowest participation of women [Curtin University Planning, 2002]. The relatively high percentage of women studying Civil and Chemical Engineering, compared with Electrical and Mechanical Engineering is typical nationally and in Britain, USA and Canada. Universities that offer

Environmental Engineering and Renewable Energy find these degrees more attractive to women than other engineering disciplines. The recent downward trend in the participation of women in computing is common to many universities in Australia and overseas.

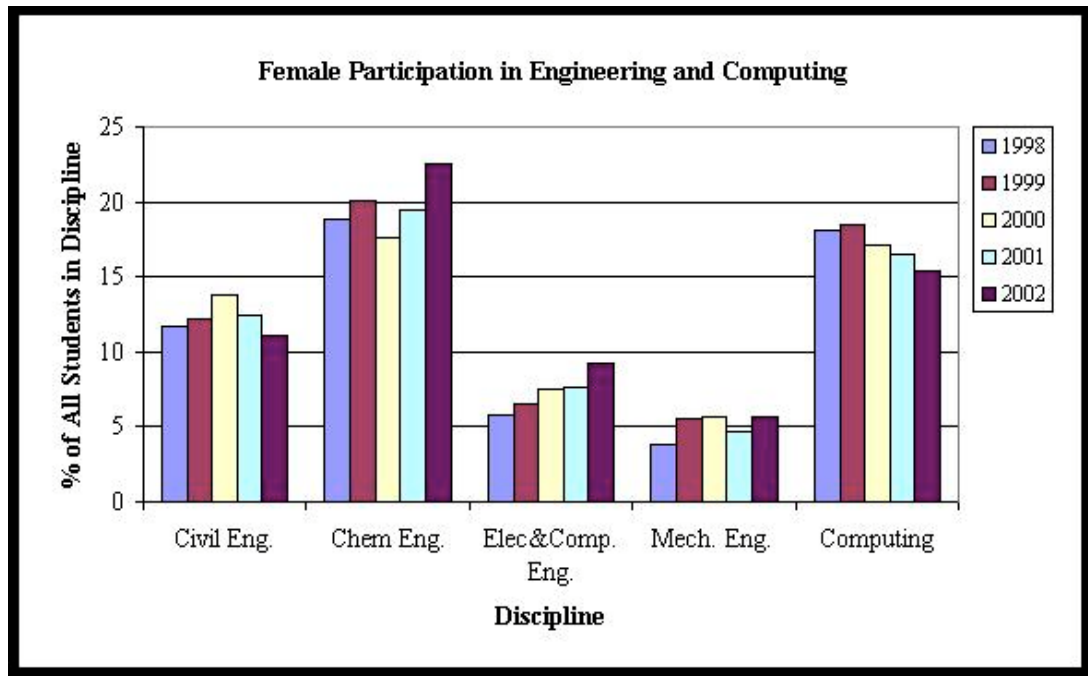


Figure 1. Female student participation in engineering and computing at Curtin

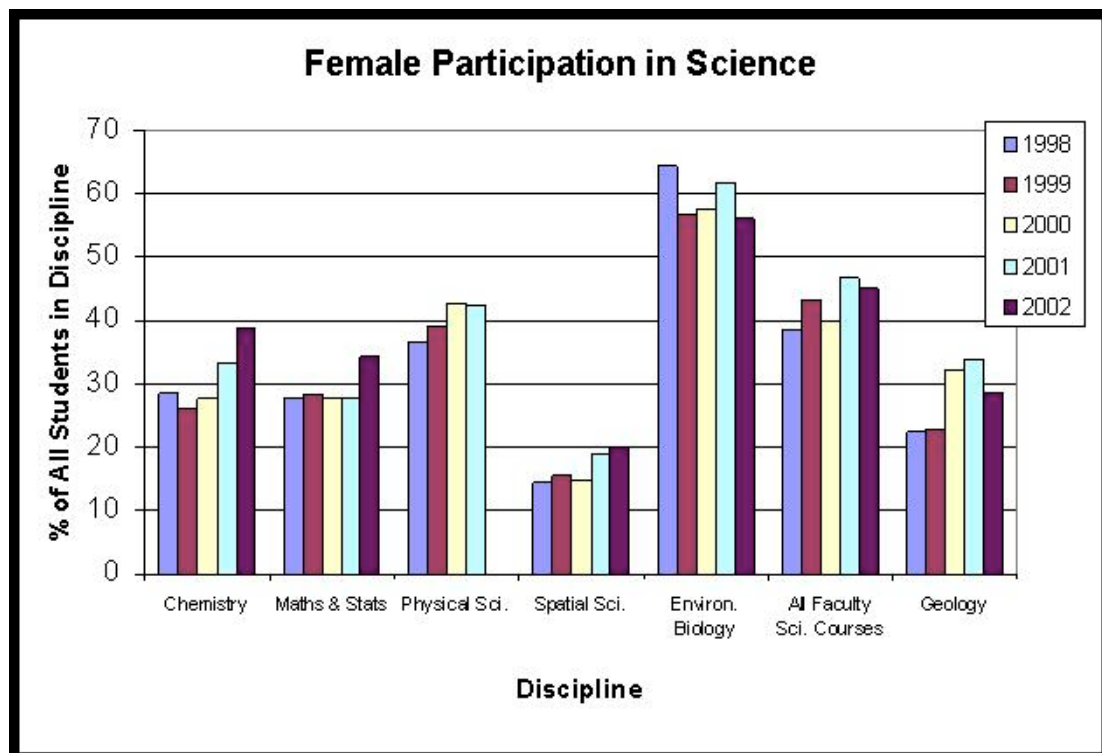


Figure 2. Female Student Participation in Physical Science at Curtin

Development of equity programs in the Division of Engineering, Science and Computing

Women in Engineering Programs and Women in Science and Engineering Programs are in place at several universities in Australia and many in the USA, Canada and Europe. In Australia their funding has been insecure, causing some programs to be diluted or intermittent. Initially programs focusing on female students included:

- outreach to increase school students' awareness of opportunities in science and engineering and counter inaccurate stereotypes
- social events, and networks to assist the students to feel that they belong
- mentoring

An evaluation of Women in Engineering (WIE) Programs in the US [Goodman et al., 2002, p 180] revealed that students withdraw from engineering courses, even if they are academically capable, if they do not sense social belonging, such as is provided by WIE Programs. The evaluation also found that after family influence, outreach activities such as provided by WIE programs inspire students to study engineering.

In addition to the original focus on prospective and current female students there has been a recognition that both the pedagogy and the culture [Roberts, Lewis, 1995] need to be addressed:

- course curricula, delivery and assessment which have been developed by men for men without accommodating or valuing diverse learning styles [Fowler, Armarego, Allen, 2001] and “soft” skills [Frize, 2002]
- marketing which focuses on the technology rather than the ways technology can help people and the environment
- marketing and media coverage which represent engineering and science as existing without women
- staff-student interactions
- inaccurate perceptions about science and engineering as a profession (macho or geeky)

According to Ramsay, Trantor, Charlton and Sumner (1998), in order to be effective, equity programs should include outreach, access and support functions. This model suits the early women in science and engineering programs but does not recognise the additional pedagogical shift and cultural change noted above.

Student equity programs in the engineering and physical science disciplines at Curtin

In the engineering and science disciplines Curtin has a number of projects supporting equity objectives, designed to provide outreach, access and support: the Women in Computing and Engineering Program (WICE), the Enabling Course in Engineering and Science, and the Physics Roadshow.

Some of the benefits of implementation at the teaching area level are common to all of these and could be termed “generic”:

- the Program Coordinator’s office is accessible to students and staff
- the Program Coordinator has a background in a relevant discipline(s) and has credibility with both students and staff
- the Program Coordinator is aware of student and departmental issues and is involved in decision making which may influence the students
- the Program Coordinator is at hand and so able to meet with academic staff providing advice on relevant issues
- local presence of the Program raises its profile within the target area

A “generic” disadvantage of program implementation at the local level lies mainly in the lack of familiarity of programs in other Divisions/ Schools and University-wide programs and services. This of course works both ways, as most of the University may well be unaware of the program’s existence.

A description of each program follows.

The Women In Computing and Engineering Program supports current female computing and engineering students at Curtin and promotes to women, their career opportunities in computing and engineering [Male, Lawrance, Dias, 2002]. Outreach and access activities include: talks at schools, attendance at Careers Nights, advice provided to prospective students who make contact through the internet, school visits to Curtin, and One-Day Year 10 Computing and Engineering Seminars including activities and industry role-model speakers. Support activities include provision of advice for female students, first-year student mentoring by senior students, sessions to increase first year students' awareness about rights and responsibilities and events to help female students meet each other and women working in the professions.

In addition to the generic benefits listed above, the benefits of implementation of Curtin's Women in Computing and Engineering Program at the Faculty level are:

- the Program Coordinator has a background in the computing and engineering disciplines and so is a role model for students
- the Program Coordinator is in an excellent position to review decision making which may influence female students and to provide advice on gender related issues in teaching, learning and assessment
- the local presence of the Program has a direct influence on the Schools' cultures

Enabling Course in Engineering and Science was initially developed in 1998 with the aid of a HEEP grant. Its main focus is in addressing the issue of under-representation of women in most technologically oriented professions. It is now “self-supporting”, though DEST, who provide funding for EFTSU in “enabling” units with administrative and mentoring support provided through the Coordinator, funded by Division of Engineering, Science and Computing. Other than ‘women in non-traditional areas’ the course is also available to students from other equity categories.

Women who have not had the opportunity to pursue studies or a career in a technological area are invited to apply. The majority of applicants are mature aged. Successful completion qualifies the student for admission to a Curtin course in science, engineering or computing. The course is one-year full time or equivalent part-time study, HECS free to the student and eligible for Austudy/Youth Allowance. Selection is made on the basis of a CV and an interview. There are no formal science or mathematics prerequisites.

The program's ambit is clearly Divisional and the generic benefits listed above, are certainly applicable here. Additionally, the coordinator's background is in science and this, coupled with implementation at the local level, allows students to be more focussed on their studies - mathematics and the "enabling sciences", chemistry and physics.

A significant disadvantage is possibility of limited exposure of the students to examples and role-models from the Faculty of Engineering.

The Physics Roadshow program commenced in 1992 and in various incarnations continued until 1999 [Korczynskyj, 1993; Korczynskyj, Swain, 2000]. The "show" consisted of a series of motivating demonstrations of various physical phenomena, tailored somewhat to class requirements, and a lecture/slide presentation providing information on tertiary education (and the desirability of continuing education beyond the compulsory age of 15 years), campus activities, careers in science, etc.

The Roadshow initially toured through the South West of the state and was aimed at the senior high school students, but was later broadened and eventually reached almost all the high schools in the state and many of the primary schools. Most recently the program focussed on schools in the metropolitan area, identified by the Department of Education as being socio-economically disadvantaged. In this latter form the Roadshow was conducted primarily by senior Curtin science students, thus providing the high school audience with a greater range of role models and enhanced accessibility.

Thus, over many years, the program addressed a host of issues for students in rural and isolated and in socio-economically disadvantaged areas.

The program was focused on physical science, in particular physics, and to this end it was very successful. There is no doubt however that a broadening of its content base and a greater range of role models would have enhanced its effectiveness in providing "something for everyone".

Equity programs and the outreach, access and support functions

The extent to which the above programs address all of the three functions varies, as shown in Table 1.

Table 1

Functions provided by Curtin's engineering and science equity programs

Functions	Outreach	Access	Support
Supporting Programs	WICE	WICE	WICE
	Physics Roadshow	Enabling Course	Enabling Course

Recognising that the effectiveness of programs increases where all three functions are present, a better outcome can be achieved by ensuring that programs designed to focus on only one or two of the functions form partnerships with other programs that address complementary functions. In addition to discipline specific programs, University-wide programs also exist. Similarly, increased effectiveness can be achieved by partnerships between complementary discipline-specific and University-wide programs.

Curtin's university-wide student equity programs

At Curtin, university-wide programs include: CurtinTrack, Student Action Research for University Access, and Learning Support For Australian Resident 'At Risk' Students.

A description of each program follows.

Curtin Track targets high achieving Year 12 students to participate in an online learning initiative which provides these students with electronic access to Curtin undergraduate courses, allowing them to commence university studies while still completing their normal Year 12 courses, and gain accreditation towards an undergraduate degree. CurtinTrack supports Curtin students, particularly those living in low socio-economic areas, by providing access to computers in local participating high schools, with electronic access to Curtin.

Student Action Research for University Access (SARUA) focuses on empowering high school students to make an informed choice about tertiary education. The SARUA program aims to increase participation of under-represented groups in higher education.

Learning Support For Australian Resident 'At Risk' Students conducts a series of seminars and workshops designed to develop international and Australian resident students' study skills.

Table 2

Functions provided by Curtin's university-wide equity programs

Functions	Outreach	Access	Support
Supporting Programs	CurtinTrack	CurtinTrack	CurtinTrack
	SARUA		Learning Support For Australian Resident 'At Risk' Students

Table 2 shows that the university-wide programs do not all support, all three functions ideally required to maximise effectiveness. Clearly, partnerships between discipline-specific and university-wide programs are capable of providing all three functions.

Partnerships between Curtin's equity programs

Existing partnership

Partnership to date has been between the Women in Computing and Engineering Program and both the Enabling Course and CurtinTrack. Outcomes of the partnerships include:

- increased number of women enrolling in engineering and computing after completion of the Enabling Course
- increased exposure of Enabling students to female role models
- increased contact between Enabling and WICE students
- mentoring scheme offered to Enabling students
- more specialised services available to students in both programs (students in either program have access to both Coordinators)
- increased efficiency in the use of resources by the university

Specific benefits of future partnership between Curtin's student equity programs

For Outreach and Access functions to be successful, a comprehensive image of Curtin needs to be portrayed to high schools and prospective students, while Support functions require the provision of a consistent and consolidated service. This would be greatly improved by stronger partnerships among the various equity programs. For example, the Women in Computing and Engineering Program and the Physics Roadshow provide school students with discipline-specific information while SARUA focuses on the ability of students to make informed, broad-based decisions about their futures, including in higher education; CurtinTrack provides scholarship access to Year 11 and 12 students and the Enabling Course the opportunity for women to gain the required prerequisites for engineering and science disciplines. CurtinTrack, the Enabling Course, the Women in Computing and Engineering Program and Learning Support For Australian Resident 'At Risk' Students could share responsibility for ongoing student support.

General possible benefits of partnership between equity programs

The general benefits of partnership between student equity programs include:

- increased number of equity groups enrolling and being retained in engineering and computing
- increased exposure of potential student and students to appropriate role models
- increased contact between students in different equity programs
- shared courses/services where appropriate

- more specialised services available to students
- increased efficiency in use of university resources
- better co-ordination among equity programs
- increased knowledge of staff across programs hence increased ability to refer students across programs
- a more coherent, consolidated and consistent image of Curtin and services provided by Curtin to high schools, prospective students and current students
- increased collegiality among staff working on projects with similar aims.

A modified equity model

While acknowledging the importance of the equity model, it is believed one function is missing: environmental analysis and pedagogical shift required before a program is commenced. A modified model is proposed with the following functions:

Environmental Analysis, Pedagogical Shift and Cultural Change	Outreach	Access	Support
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By way of example, consider the Women in Computing and Engineering Program. Environmental analysis reveals [Frize, 2002]: a course originally designed by men, taught and assessed by men with little or no value placed on “soft” skills; a “chilly climate” for women and persistence of discrimination and harassment.

It is not ethical to encourage women into a male-dominated profession such as engineering, without seeking to cause cultural change to bring about accommodation and appreciation of women within the University and the profession.

Curtin’s Women in Computing and Engineering Program encourages pedagogical shift and cultural change through:

- rights and responsibilities awareness sessions for first year students
- promotion to academic staff, of teaching and learning issues particularly those with a gender bias e.g. need for diverse assessment types, understanding of the difference in communication styles used each gender, focus on the application of technology rather than technology per se, requirement for examples to include women, requirement that courses recognise the values of "soft" skills,
- promotion of equity issues e.g. in School meetings

Conclusions

Benefits are enjoyed by partnership between university student equity programs. Stronger partnerships promise increased benefits for targeted student equity groups and for the University. It is proposed that the equity model is improved by inclusion of environmental analysis, pedagogical shift and cultural change, in addition to the original outreach, access and support functions.

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Augmentation of the assessment process by the use of an Electronic Performance Support System (EPSS).



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Can technology reduce the busy work involved in marking and the recording of comments, improve the moderation process and give more time for feedback? Until recently the application of technology to the assessment process has focused on the student learning side of assessment. This article will focus on the application of technology to the lecturing side of the assessment process, specifically the marking aspect where professional judgement is involved. The aim of the tool is to reduce the unproductive work of adding up and the manual recording of comments and marks, and to increase the time spent on feedback, reflection and moderation.

A prototype of an Electronic Performance Support System (EPSS) that supports the marking/moderation process is explained and described. This EPSS tool moves the marking/recording sheet off the desk and onto the desktop (computer screen). The aim of the tool is to combine features of the word processor, spreadsheet and database, and the paper-based marking sheet. The final version would be accessible via the web and allow anytime anyplace recording and comparison of marks.

A working example of the tool is described and discussed. The tool could be used by a single marker or multi-markers and in all stages of the marking/moderation process, for example, in the marking process, from the review of the marking sheet, to actually producing the final list of results either for the assignment or for the whole unit; and in the moderation process, from the selection of exemplars to be marked, to instantly compare marks with those of the co-ordinator's, and the discussion of marks.

Information and Communication Technologies (ICT) have tended to focus on the student side of assessment while giving little regard to the use of technology by lecturing staff. The proposed Electronic Performance Support System (EPSS) tool tries to address this imbalance by focusing on the lecturer rather than the learner in the marking/moderation process. The EPSS tool augments the marking/moderation aspect of the assessment process and is designed to reduce the busy work of marking, allow more time for quality feedback and allow collaborative marking and moderation to occur.

The literature abounds in definitions of electronic performance support systems (EPSS), however it can be simply described as any computer software program or component that improves employee performance (Miller, 2001). In the field of Performance Support (PS), a distinction is made between learning (training) or

knowledge transfer that results in people knowing what to do, but not doing it, and actual performance (Pfeffer & Sutton, 1999). Thus this tool is interested in the performance of markers, not merely their knowledge of moderation and assessment.

Learning and the learning technologies remain important to (PS), but it is clear that you cannot merely re-label training as PS simply because there is a related performance issue. Unless there is an explicit performance outcome, it's not PS. (Dickelman, 1999)

The proposed EPSS tool is called Electronic Marking and Moderation (e-MMod) tool and is under development. It is proposed that by combining features of a spreadsheet, a word processor and a database into one product, a synergy will be produced. The marking aspect of the tool gives access to the on-screen marking sheet and other views of the information, while the moderation side of the tool gives access to electronic exemplars of work and assistance, allowing markers to compare their own marks with that of the co-ordinator's instantly.

Assessment

The term 'Assessment' is not tightly defined with one widely accepted meaning, as Black (1998) discovered when he carried out a review of the literature in the area of assessment that covered 681 publications. While Miller (1998) states that "some educationists do not distinguish between assessment and evaluation" (p. 3). Miller defines assessment as any "means by which students' progress and achievement are measured, recorded and communicated to students and relevant university authorities" (p. 4).

The growing need for reliability and validity in the allocation of grades and levels places a heavy demand on the assessment process in order to satisfy learners, and university and other official bodies (Freeman & Lewis, 1998). The following reasons are typically given to justify why assessment needs to be accurate and reliable (Fry, Ketteridge, & Marshall, 1999; Preston & Shackelford, 1999):

1. It is useful and fair to students;
2. It serves internal and external quality assurance purposes; and
3. It constitutes a protection against the increasingly likely legal challenges from disaffected students.

Unreliability in the assessment process can be due to inconsistency of individual assessors (poor intra-marker reliability) or inconsistencies across assessors (poor inter-marker reliability). Thus the fewer the assessors the easier it is to control the reliability factor. However, even with one marker, strategies need to be developed to ensure reliability. Although the literature discusses a number of strategies to improve reliability, such as double marking (Brown & Knight, 1994) or using a list of criteria (A. H. Miller et al., 1998), they are often poorly implemented or not at all in higher education (Boud, 1995, 1995a; Fry et al., 1999), and until recently most of the assessment of essays has been by "academic instinct" (Fry et al., 1999, p. 63).

Computer-Assisted Assessment

ICT is changing the traditional learning paradigm and the assessment process. Educators, trainers and administrators are slowly turning their attention to e-assessment or Computer-Assisted Assessment (CAA) as computer and web access become part of the educational environment (Bull & Sharp, 2000; Preston & Shackelford, 1999). The first area of assessment that took advantage of CAA was objective-type assessments. There are now many products on the market offering this type of assessment. For example, Question Mark Computing (<http://www.qmark.com/>) and WebMCQTM (<http://www.webmcq.com/>), are at the forefront of the move towards computerisation of tests and assessments, and provide services enabling the creation and presentation of interactive questions via the Internet. They are at present ideal for objective-based assessment, such as revision quizzes, formative exams, training packages and questionnaires.

The e-MMod tool goes beyond this limited view of CAA and focuses on the lecturer using the CAA technology to aide in the assessment process rather than the learner being assessed by using the CAA technology.

This tool has been designed for high stakes assessments where:

- professional judgement is required (high level of subjectivity),
- a formal marking key is available, and
- more than one marker or a large group of students or both are involved.

Unlike most CAA that does not require any professional judgement on the part of the marker, the e-MMod tool has been designed for assessments where professional judgement is involved. The tool takes the existing marking methods where professional judgement is involved and by applying technology to the process of marking, augments the assessment process. This augmentation results in an improvement in the fairness, consistency, reliability, transparency and quality assurance of the assessment process.

e-MMod Tool Explained

The application of technology to the marking/moderation component of assessment varies widely. Spreadsheet applications are often used for collating of marks, while word processors are used for recording comments and marks and reporting back to students. At a higher level, word processors are used for recording comments, and annotation of electronic copies of assignments or portable document format (pdf) documents are used for annotation. However, usually these applications are not integrated: they are time-consuming, high maintenance, not efficient for large groups, etc.

The e-MMod tool moves the marking/recording sheet off the desk and onto the computer screen by combining and integrating the above features of spreadsheet, word process and database applications. The information from the marking/recording sheet is recorded into a database. Fields are designed to hold the marker's name, student's details, marks and other related information. Marks and even feedback

comments can be inserted by means of selecting and clicking on them with the mouse without using the keyboard. The tool adds up the marks, and if required, expresses the total as a percentage and/or grade. The information stored can be easily managed, manipulated and displayed in different formats that previously would have required a time-consuming and complex integration of a spreadsheet and a word processor applications. These management, manipulation and display features are a key component of the e-MMod tool that enhances the assessment process.

Often in the marking process a generic comment/s needs to be added to a number of assignments. The tool allows for generic comments to be easily added and selected when required. Full editing features are available within the tool and all feedback and comments fields can be updated, spell-checked and reviewed before printing, eliminating the rewriting of marks/recording sheets, and the possibility of any being miss-placed. Finally, a student version can be printed showing as much or as little detail as required.

In the moderation mode, a similar process is followed but exemplars are used that have previously been marked by the co-ordinator. Two to three exemplars are marked, after each marking the co-ordinator's marks and comments are shown below that of the marker's. After the marker has reflected on the results, the next exemplar is marked. At the end of the process, the marker will be within the coordinator's agreed range of marks and will be ready to commence marking or will know what aspects of the marking key need to be discussed and clarified with the coordinator.

A Working Example

A prototype of the e-MMod tool has been developed and used to mark a number of different types of assessments and is in the process of being evaluated. An example is used to highlight the process and features of the marking aspect of the tool. The tool allows the import of students' details from a spreadsheet, the replication of the paper-based marking sheet for printing and returning to students, and the customisation of other appropriate displays/layouts: spreadsheet view, comments and marks view, on-screen recording display, etc. The tool is password-protected and allows a number of user levels to be set.

After the relevant student and marker information is imported or recorded, the next step is the replication of the marking sheet. This can be done by copying and pasting between the word document and the student printout display. If the marking sheet does not exist in electronic format, then it must be typed into the student printout display. Figure 1 shows part of what the paper-based version looks like before it is modified for on-screen marking (this is the layout that is printed and handed back to the students).

Marking Guide for Issues Assignment

first_name_01 last_name_01 id_no_01 group A

Submission Requirements

Different perspectives on the issue and an activity that will result in the class engaging in discussion on the issue.
A one page word processed document summarising the key ideas to be uploaded to BlackBoard for all class members.

15 Minute Presentation - 10% (Same mark for each presenter)

Criteria	Possible Mark	Actual Mark	Comments
Articulation of key ideas?	6	6	
Engaging class in discussion?	2	2	
Handout with key ideas uploaded to BlackBoard?	2	2	
Total presentation mark		10 /10	

Figure 1. Copy of paper marking sheet

Figure 2 shows part of the on-screen marking layout. This layout is used only for on-screen marking and would not be printed out. A number of issues need to be considered when designing the on-screen marking layout, such as what marks will be possible (for example, only whole numbers or half marks). These decisions occur before the marking commences and are part of the pre-moderation process. Note that the marks are added by clicking on the mark radio buttons and that any change is automatically recalculated.

Marking Guide for Issues Assignment

Name first_name_01 last_name_01 id_no_01 group A

Submission Requirements

Different perspectives on the issue and an activity that will result in the class engaging in discussion on the issue.
A one page word processed document summarising the key ideas to be uploaded to BlackBoard for all class members.



15 Minute Presentation - 10% (Same mark for each presenter)

Total presentation 10 /10

<p>1. Articulation of key ideas?</p> <p><input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6</p>	
<p>2. Engaging class in discussion?</p> <p><input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 1.5 <input checked="" type="radio"/> 2</p>	
<p>3. Handout with key ideas uploaded to BlackBoard?</p> <p><input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 1.5 <input checked="" type="radio"/> 2</p>	

Figure 2. On-screen marking layout

At any time a spreadsheet view, Figure 3, can be accessed. This view can be sorted, printed out and manipulated in many ways. Other similar views could be designed showing only total marks, percentage and grade, or just marks and comments, without all the other text, thus allowing the marker to review just the comments and marks on the screen or print them on a few pages rather than one page per student.

student No		7	10	8	5	Total	%	Grade	Comments presentation
first_na	id_no_02	4	2	2	12	21	53	C	The content was well covered in the
first_na	id_no_03	4	2	2	11	20	50	C	A well presented and engaging presentation
first_na	id_no_04	4	2	2	15	25	63	Cr	The content was well covered in the
first_na	id_no_05	4	?	2	13	24.5	61	Cr	Equity and technology is a big topic and I felt
first_na	id_no_06	6	?	2	12	22.5	56	C	The main ideas were well presented by the

Figure 3. Spreadsheet view

In Figure 4 the shaded area contains generic comments that are available on every student marking display and can be copied and pasted whenever necessary into the student's comment field. These generic comments can be added or edited at any time. The figure also shows how additional text can be used; in this case the grades related to the mark out of 24 can be shown to help in the making process. When the marking is completed, the 'print marking sheet' view is selected and printed.

general comments

I strongly recommend that you see Erica, the Learning Advisor, phone 9370 6241 or email e.daymond@ecu.edu.au.

You need to develop your ideas about the issue based on your research of the literature.

* When you make a statement in an academic essay you need to back it up with a reference, otherwise it could be only what you think.

At times it is difficult to follow your argument as your sentence and paragraph structure is poor.

Essay - 30%

1,000 word essay, summarising the main points around the issue and present individual perspective on the issue.

Emailed as an attachment to tutor on day of seminar.

1. Logical presentation of key ideas: perspectives; concerns; and implications for teaching.

first_name_24 B

F

C

Cr>

D>

HD>

03 07 09 10 11 12 13 15 16 17 18 20 21 22 24

Figure 4. Generic comments and additional text

Suggested Enhancements

A number of enhancements have been suggested so far during the on-going evaluation process. They include:

1. Improved usability through the use of more automated functionalities, such as navigation buttons to move between layouts, and buttons to print, sort and find.
2. Enhanced use of the global/generic field and the ability to click on these comments and have them added automatically to the student's comment field.
3. Ability to include multiple markers.
4. Web accessibility.

Conclusion

The possibilities of the application of ICT to enhance the lecturer's side of the assessment process have only just started. The e-MMod tool is only a small aspect of this growing field of investigation into how technology might aid lecturers in the assessment process. Technologies such as wireless, personal digital assistant (PDA), laptops, are all contributing to anytime and anyplace access to the 'e-workspace'. These and other technologies will have a major effect on the assessment process for both learners and lecturers. When these technologies are combined with tools like the e-MMod, markers will be able to really focus on the students' work and feedback and minimise the time spent on the busy work of marking.

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Assessing Student Team Projects



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One of the most frequent criticisms of team projects is how to develop an assessment process which accurately reflects the contribution of individual team members. While 'fairness' is often quoted as a criteria for measuring learning outcomes (Issues of Teaching & Learning, 8:5, 2002), the challenge in team projects is how to ensure fairness. This is made more complicated by the fact that research conducted over several years with student teams in a Business School confirmed that effective management of student teams requires action at two levels: individual and team. The aim of this paper is to present some of the practical strategies which have been developed to reflect these research findings, and which have simultaneously been structured in an attempt to meet the criteria of fairness.

Assessment is an on-going process. In recognition of this, many educators pursue a continuous assessment process aimed at enhancing students' conceptual, analytical, research, written and verbal skills using techniques such as research essays, presentations, participatory tutorial marks and of course exams. While students may challenge final marks allocated to these components, they generally do not question whether this outcome has been fairly derived. Fairness in teaching can be defined as the same outcomes being applied to the same standards (*Issues of Teaching & Learning*, 8:5, 2002).

In the case of an individual assessment process, a combination of assessment methods appears to satisfy students' sense of natural justice. Not so the case where a major form of assessment is a team project. Assessment is often one of the most contentious issues confronting academic staff managing student team projects, because team projects muddy the notion of 'fairness'. *'It's not fair. I've done most of the work, but the rest will benefit from my mark'* is an oft-heard lament as team projects near completion in classroom situations where team processes are not closely managed by the academic staff. The common problems of team work such as social loafing and a lack of group cohesiveness that inhibits deeper-level learning often manifest themselves (Michaelson & Razook, 2002; Caspersz, Skene and Wu, 2002a). Although students frequently focus on the grade desired, fairness in team projects is not just

related to how much the mark reflects the quantity of work required, but also that it reflects the process and in particular the quality of input by each team member.

Drawing on other research (see Michaelson, Fink & Knight, 1997; O'Keefe, 2002), as well as research conducted with student teams in a Business School over the last three years, the aim of this paper is to present strategies which have been used to attain a fair assessment process when using a team project as a major form of assessment. The discussion is set within a context of research findings with student teams which identifies the factors affecting student team performance. The paper concludes with presenting a work-in-progress framework for assessing student team projects.

As teams become more and more popular as a teaching tool to enhance students' interpersonal skills and prepare them for a team dominated world of work, pursuit of an assessment process which reflects the principle of fairness is a responsibility which cannot be avoided. Assessment processes in student team projects should be framed in such a way as to encourage students to participate in team work. Students with a negative attitude to team work are missing effective preparation for life generally, and work life in particular. Ensuring 'fairness' in assessment is critical to achieving this aim.

Assessment in Team Projects

How does assessment in student team projects differ from assessment in non-team assignments? The first distinction is that team projects reflect a group-level form of assessment whereas non-team assignments are generally individually based. Secondly and relatedly, in assessing a team project, the focus is not just on the 'end-product' (as in a report, essay and/or presentation), but also on the process; that is, how effective was the team in organizing, pursuing and converting the process into a recognizable 'output'?

Teachers interested in the effective management of student teams are often aware of student dissatisfaction with team projects, and the related assessment outcomes. In seeking explanations for this dissatisfaction, earlier research that surveyed 190 students enrolled in undergraduate units within a Business School (see Caspersz, Skene & Wu, 2002a) confirmed a readiness in students to undertake team work. For instance, 88 per cent indicated that they had confidence in their ability to work effectively in a team and 74 per cent said that they could effectively co-ordinate team activities. Thus most students were confident in their team work skills. At the same time however, the research confirmed that individual-level factors such as an individualist orientation and interpersonal abilities in managing conflict, communication and learning styles affected student willingness to work in teams. In summary, individual-level factors as opposed to student readiness were affecting team performance.

While further research continued to confirm the salience of these individual-level factors, the need to pay equal attention to how team-level issues influence team performance was also highlighted (Caspersz, Wu & Skene, 2003). This more recent research focused on 111 undergraduate business students participating in a total of 33 teams, who were undertaking assessment tasks that included individual and team tasks similar to those described in Table 2 in this paper. It was found that concepts such as

trust, interpersonal work group processes, team-member satisfaction, workload sharing, communication and leadership were significant in affecting team performance (Caspersz, Wu & Skene, 2003). For instance, 85 per cent of respondents indicated that intra-group trust was a significant team-level factor affecting performance, and 81 per cent stated that interpersonal work group processes were significant. Table 1 provides a brief description of these and other variables identified as significant in this research.

Table 1
Significant Team-Level Factors

<i>Variable</i>	<i>Explanation</i>
Intragroup trust	Confidence within individuals about others
Team member satisfaction	Satisfaction with team process and outcome
Workload sharing	Perception of equal attribution of team work
Communication and Cooperation	Understanding expectations and requirements for completion of team project
Shared leadership	Equal responsibility for facilitating team process.
Interpersonal Work Group Processes	Operates with other variables and relates to level of satisfaction with the team process

In summary, the research confirms that effective management of student teams requires focusing on both individual and team-level factors. Addressing both levels is also important when managing cultural diversity in student teams. While research confirms that work team productivity can improve if cross cultural teams are effectively managed (Cox and Blake: 1991; Adler: 1997; Richard: 2000; DiStefano & Maznevski: 2000), research also highlights a number of negative consequences arising from multicultural work teams. These include 'process loss' from problems including inability to communicate clearly, frequent disagreements on expectations, and attitudinal problems such as dislike, mistrust and lack of cohesion (Adler: 1997; Watson & Kumar: 1992). Thus Watson, Johnson and Merritt (1998) and Earley and Gibson (2002) highlight that effective management of cultural diversity in work teams demands addressing both individual and team level behaviours.

It is suggested that the assessment process can be a key component in managing how these twin levels affect team performance. That is, if the assessment process operates at both levels it can act to facilitate better management of individual- and team-level factors and, in fact, provide a circuit for the integration of these factors. In addition, if targeted at both individual and team level, the assessment process will also meet the criteria of fairness, where there are individual components being assessed, as well as team components.

However, some unique features of tertiary-level student teams can complicate an assessment process designed to meet these aims. These may culminate in student

teams experiencing a different process of team work as opposed to work teams. That is, teams generally follow a number of stages usually described in terms of behaviours (Tuckman: 1965). Stage one is generally referred to as the forming stage which involves the transformation of individuals into team members, Stage 2 is entitled the 'storming' stage in which team members vie for control over the group. Stage 3 is described as the 'norming' stage where team members have resolved their differences and start to work together, while stage 4 is titled the performing stage because team members no longer have disputes over power, control or status but rather work together to complete their task. Finally in stage 5 teams 'adjourn', let go and move on with their individual lives (McGourty & De Meuse: 2001).

While not disagreeing with this framework, the fact that student teams will usually only run for a 12 week (or semester) period may result in a compression of these stages, where some teams may not even go through some of these stages (Gersick:1988). Additionally, unlike a work organization setting, the team project is only one of many learning activities in which students have to engage during the semester. Thus the time available to devote to the team project is generally restricted to class time. The transformation from individual learning to functioning as a cohesive team has to develop within this limited time frame. Furthermore, teams are generally composed of students from a diverse range of disciplines. Thus there may not be a common knowledge base in student teams which extends any further than the parameters of the unit of learning framing the team project. As a result of these and other factors, the effect of differences in learning styles on the ability of an individual team to complete their project team is likely to be accentuated.

Given these issues, the question thus becomes: *what strategies can educators use in an assessment process which recognizes this combination of individual and team level issues, unique characteristics of tertiary-level student teams, but which nonetheless strives to meet the criterion of fairness as well as other goals of assessment (such as enhancing analytical, conceptual and other skills)?*

Meeting Individual Needs

While aiming to stimulate a more collectivist orientation in students may be a worthy aim, there is no point ignoring the evidence of research confirming a strong individualist orientation that often dominates a student group (see Caspersz, Wu & Skene, 2002b). Therefore, even though the team project may form a major component of overall assessment, it is worthwhile ensuring that individual tasks are at least equal if not greater in sum than the team assessment component. Thus an assessment of 100 per cent may be divided as follows:

Nonetheless, the importance of the team project may be reinforced in other individual assessment components. For instance, a compulsory question related to team processes may be included in the exam. In addition, a team journal in which students record their response to team work issues such as managing conflict, or processes such as planning a team project, may also be included as an individual level component of the assessment process.

Table 2
Individual plus Team-level Assessment Structure

Assessment Component	Percentage Mark
Team Project and Presentation	40
Individual Tutorial (Small Group) Participation	10
Individual Preliminary Assignment	10
Exam (seen or unseen)	40

Harnessing Team Level Processes

Harnessing the team level processes described in Table 1 towards generating a positive effect on team performance is both difficult and complex. In response, it is suggested that a key component of harnessing team level processes for the betterment of the team, is generating understanding *about* team members' diversity *between* team members. Diversity here not only refers to cultural diversity, but also diversity in learning styles, that is, the way a student learns (Busato et al: 1998).

There are many approaches to understanding and assessing learning styles (see Busato et al, 1998; Felder, 1996). However, the intent here in exposing students to the concept of learning styles is not so much to generate a prescriptive understanding (as in what my learning style is or what someone else's learning style is), but more to raise students' awareness of the diversity in learning styles that they may encounter, and develop responses to managing these for completion of a team project. Thus current work-in-progress with 33 undergraduate teams completing a business unit is focused on exposing students to different activities aimed at raising their awareness and skills to better manage various aspects of diversity amongst students in teams. These include exercises on understanding the concept of learning styles, as well as inclusive curricula aimed at improving students' understanding of cultural and other aspects of diversity. Outcomes from this research will be reported in later publications.

However, while raising student awareness of learning styles is one strategy which may result in better management of diversity in teams, another strategy is the incorporation of a pre-team work phase with separate assessment requirements.

Incorporation of this phase follows the work of Michaelson (2002) who has developed a *Readiness Assurance Process* for team work. The readiness assurance process aims to enhance students' understanding of content pre-team work, as well as provide an opportunity for students to gain an appreciation of each others' diversity of input by facilitating small group work on course content.

Similarly, a major focus of the pre-team work phase, which runs for approximately 3-4 weeks of a semester programme, is to ensure that students have a solid exposure to the content of a unit. However, this conceptual individual-based learning is

consolidated in group discussions with others, thus providing an opportunity for students to get to know each other and develop an appreciation of each others' capabilities and learning styles.

Work-in-progress with 33 undergraduate teams completing a business unit in International Management has a pre-team work phase incorporated into the team project programme. In the first 4 weeks of the teaching programme, students study readings and complete case studies sourced from supporting texts on issues such as cross cultural communication, in preparation for small group discussions. These activities earn individual assessment points for students via the tutorial participation mark. In addition, students have to complete a preliminary assignment on a foundational-level concept. This is also an activity earning individual assessment points and provides the opportunity to provide timely feedback to students early in the course of the unit. Outcomes from surveys and focus groups with staff and students about this pre-team work phase will be presented in later publications.

Managing Fairness

To meet the criteria of fairness, a number of monitoring strategies have been developed and incorporated into the tutorial programme as specific activities. These include a team meeting checklist, as well as a mid-term evaluation of the team process. The latter is usually held by the staff member managing the team project overall, who uses it as an opportunity to discuss any problems which teams may be experiencing. In addition, a team contract incorporating a grievance procedure is signed by team members in weeks 4 or 5. The grievance procedure outlines the steps, as well as a deadline for team members to follow, in managing a grievance against another team member. Again, this is usually held by the staff member managing the team project overall. Finally, a formal attempt is made to ensure that students understand the availability of these strategies and why they have been incorporated into the team project.

Experience has shown that formally incorporating these strategies has been important in satisfying students that an effort is being made to meet the criteria of fairness. Explicit communication about their availability and intent is also important in satisfying students' sense of fairness. In summary, feeling re-assured that there are processes to ensure fairness as much as possible is a critical component of satisfying students that fairness is a serious issue that is being taken into account by academic staff managing team projects.

Assessing Tertiary-Level Student Teams: A Work-in-Progress Framework

The following principles emerge from research and evaluations of strategies developed thus far to manage individual and team level factors that impact on team performance and meet the criteria of fairness in assessment:

1. The assessment process has to focus as much on the process of team work as it does on the output.
2. Assessment must be targeted at both the individual and team level.
3. Given the dominance of an individualist orientation prior to team work, it is recommended that the flow of assessment should begin at the individual-level before progressing to the team-level.
4. While the team project should attract significant marks, the bulk of assessment marks should be assigned at an individual level. Nonetheless, effective performance in the team project may contribute to a higher grade.
5. Including team project content in individual based assessment components is one way of integrating the team project into individual assessment. For instance, a compulsory question on the team project can be included for students to answer in the exam.

Thus, an assessment process incorporating a team project may be depicted as follows:

Table 3
Team Work Assessment Process

Week	Assessment Component	Individual or Team Assessment	Percentage of Mark
1 - 4	Small group work based on evidence of reading, preparation and discussion of case studies.	Individual	10%
4	Completion of preliminary assignment based on a foundational concept in course content.	Individual	10%
Week 10	Completion of team project presentation exercise	Team	10%
Week 11	Completion of written team report	Team	30%
Exam Week	Completion of exam incorporating question on aspect of learning in team project	Individual	40% (compulsory team based question worth 10%)

In conclusion, while the paper is based on work still in progress, it is nonetheless steeped in both research on specific aspects of student teams' performance and development, and practical experience gained in managing student teams over a three year period. It argues that students' perception of fairness in assessment of team projects is enhanced by implementing strategies that manage the process of team formation and development. Careful preparation in the pre-team phase also assists the evolution of team cohesiveness where individual-based learning of course concepts is translated into a more complex understanding through group discussions. The assessment tasks and timeframe must also be appropriate to ensure that students are satisfied that assessment of teamwork is fair. These suggestions go some way to providing a framework for assessment in team projects, but they are not meant to be conclusive or prescriptive. This would be foolhardy because, even as assessment is an on-going process, so too are the attempts to improve assessment as a vehicle for student learning.

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Developing an Objective Structured Clinical Examination for Ambulance Paramedic Education



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The assessment of clinical skills is challenging for both examiners and students. Students on the whole find practical assessments to be very stressful and examiner expectations vary from person to person making the process subjective to say the least.

The aim of the project reported here was to develop an Objective Structured Clinical Examination (OSCE) for ambulance paramedic education that was valid as well as practical. The skill to be assessed was manual defibrillation and cardiopulmonary resuscitation (CPR). A brief literature review examining the use of human simulation manikins and OSCE's was conducted to provide a foundation for the project. The assessment tool was developed after peer and expert review. A video was taken to assist examiners in their preparation of the new format examination and a seminar was organized for examiners to discuss the various issues. The importance of real life environments and time sequences was stressed. Finally, the effectiveness of the OSCE was assessed from both the students and the examiners perspective. The findings support the use of OSCE's as a valid, practical, student centered assessment tool.

Ambulance paramedic education has only recently moved to the tertiary sector in Victoria. The entire curriculum including all assessment items was reviewed to meet university requirements. Clinical assessments in particular were problematic. Previously, students were examined performing a clinical skill such as manual defibrillation by one of a variety of examiners. These examiners were primarily clinicians with an educative role within the workplace. The educational level and expectations of the examiners varied. The examination itself took the format of a skill stand with oral questions related to the skill. This was problematic in itself as this format merely tested the students' mechanical skill level. Clinical application and problem solving, which requires synthesis of knowledge, was not examined at all.

Students on the whole found these practical assessments to be very stressful and this was evidenced by frequent comments in course evaluations undertaken by Monash University Center for Ambulance and Paramedic Studies (MUCAPS). Examiner subjectivity, variables within the examination format and varying standards were oft-cited criticisms of the practical assessment process.

The aim of this project was to develop a clinical examination for ambulance paramedic education that was objective, valid, comprehensive and practical. The emphasis of this paper is the development of the assessment tool rather than an

evaluation of its effectiveness. A brief literature review on the topic was undertaken to provide a foundation for the project and a variety of assessment seminars were attended to enhance the authors' knowledge base on the subject. The assessment tool was developed after further peer and expert review. A video was made to assist examiners in their preparation of the new examination format and a seminar was organized for examiners to discuss the various issues and develop a list of accredited examiners for the future. Finally, the effectiveness of the OSCE was assessed from both the students and the examiners perspective.

Literature Review

A limited literature search was conducted utilizing CINHALL, MEDLINE, EMEDICINE, and EMBASE. The use of a manikin to assess students' clinical skills was the first area to be investigated and was found to be well supported in the literature (5, 7, 8). According to Issenberg (6) simulation training and assessment have many benefits. These include:

1. Predictable behaviour
2. Simulators do not get stressed or embarrassed
3. Findings can be recorded accurately
4. Can be used repeatedly with fidelity and reproducibility
5. Can be used without risk to humans in case of error
6. Some procedures would cause risk to the patient if an actual life-threatening event were not in place. (For example, manual defibrillation).

The chief advantage in regards to this project is that students can practice and be assessed in a core clinical skill before treating humans.

Simulators have been used for some time now to assess clinical performance and decision-making in medical education. Prior to this, simulation based assessments were widely used by Defense Forces and within the aviation industry. Medical researchers (3,2) found that human patient simulation as a training and assessment tool were well accepted by both pre-hospital and hospital based health professionals. This research supports the use of a patient simulator manikin as a foundation tool for an Objective Structured Clinical Examination (OSCE).

Dailly (4) defines an OSCE as "...a clinical encounter with a standardized patient that lasts approximately 5 minutes. In many cases there is a corresponding 5-minute station dealing with the examination or history gathered by the student. A trained assessor marks the performance."

Rogers (9) investigated three methods of assessment currently utilized by educators within the health profession. Written examinations, Objective Structured Clinical Examination (OSCE) and patient simulation were researched to evaluate student learning. The findings concluded that written exams measure acquisition of knowledge but fail to predict if students can apply this knowledge in a clinical

situation. The OSCE and patient simulation were both found to be effective performance evaluation tools that assessed student's clinical problem solving skills as well as manual dexterity. This finding further supports the use of a patient simulator and an OSCE to assess clinical skills for student ambulance paramedics.

The OSCE is seen as a reliable measure of clinical competence (1,9). The objectivity associated with the tool is related to its ability to evaluate student performance by direct observation using preset checklists and rating forms. The idea is that when recorded differences in scores occur, they should be reflective of differences in students' abilities, nothing more (4).

A dearth of literature exists in relation to the examining principles in relation to simulation. This is an area that obviously requires further research and validation. As a consequence, the underpinning principles for the OSCE devised for this project was based on models for clinical teaching and simulations as documented by White and Evan (12) and Van Sickle (11). This is the current foundation for all scenario teaching at Monash University Center for Ambulance and Paramedic Studies.

Project Description

The project involved developing an OSCE using a human simulator manikin to assess second year ambulance paramedic students in their manual defibrillation skills. After completing the workshops / seminars on assessment, and the literature review, some time was spent with peers from other schools within the university to discuss and observe a variety of clinical assessment techniques. This provided a foundation on which to develop the assessment tool. Once this was completed and had been reviewed by peers within the faculty, the next task was to prepare the examiners. A one-day seminar was organized to educate potential examiners on the principles and processes for the conduct of OSCE's. The importance of following the prescribed format, using appropriate body language and not using the session to educate students was stressed. It was also explained to examiners that they were not to inform students of whether they had passed or not at the time of the examination as this was to be determined as a team decision at the examination debrief. This is to decrease subjectivity in the decision making process. The OSCE was trialled with seconded staff acting as students to eliminate any problems with the assessment tool. Finally the students were acquainted with the new format and were given practice scenarios utilizing the new format prior to being assessed.

A team debriefing was held after the exam and all issues / students were discussed as a group. Results were then posted using students identification numbers to maintain confidentiality.

On the examination day the manikins were prepared to mimic the given scenario as much as possible. For example, the scenario states that the patient collapsed after being in the shower. The manikin was naked on a towel and wet down with water for each student. The manikin was also made up with moulage to have a large laceration on his forehead and blood was obvious for students to see. Students were told that

everything was to happen in real time, for example, if they wanted to insert an oropharyngeal airway they would have to do it exactly as they would in real life, not just verbalize it. Standard precautions (gloves and eye protection) were worn throughout the scenario by students, as is the practice in the field.

Project Evaluation

An evaluation form was sent via post to all examiners and students who participated in the trial OSCE's one week after the examination to allow both groups to reflect on the experience and comment away from the university environment. The evaluation form was returned by a total of 36 students and 4 examiners. Twelve students did not return the evaluation forms.

Results

The majority of students (83%) felt adequately prepared for the change in assessment format. Students that felt unprepared cited class absence, ill health and a preference for the previous method. The examiners found the seminar successfully prepared them for the new format OSCE but were concerned about the waiting time for students. The OSCE format accurately related to ambulance paramedic practice according to 94% of students. Two suggestions were made by students that could be utilized in the future to assist in this area. These were:

1. Students to work in pairs within the examination process as this was reflective of real life working situations
2. Students to complete a patient care record at the completion of the scenario to assess documentation skills

All students and examiners felt that the OSCE accurately assessed knowledge base on the subject

The most positive aspects of the new format were listed as:

1. More realistic
2. The same for everyone
3. Examiners better prepared

Suggestions for improvement included:

1. More stations to decrease waiting time
2. Students wished to work in teams as this mimics real life more accurately include more skills into the scenario such as documentation and history taking to mimic real cases more accurately

Discussion

For future scenarios, the viability of having the student that has just done their exam, work with the next student that is being assessed is under discussion. Students in their evaluation made this suggestion as ambulance paramedics normally work in pairs and it was felt that this would be more realistic. The evaluation supported the concept of

the OSCE as a more learner centred tool than the previous examination modality. The OSCE format is quite labour and time intensive so in order to decrease student waiting times, the following strategies have been implemented:

1. More seminars to train more examiners
2. Have more stations available for students
3. Organize students on a timetable system so that they don't have to wait for long periods at the university before doing their OSCE as this increases students' stress

The viability of having students complete documentation relating to the examination scenario is another issue being discussed by the examiners board. This will assess students' history taking and documentation accuracy, which is a vital aspect of ambulance paramedic practice. Time limitations factor into this consideration. The examiners board is considering imposing a time limit for each scenario to expedite the process. In reality, these patients are considered time critical and speedy stabilization and transport to definitive care is the aim. The imposition of a time limit for each OSCE will heighten students' awareness of time criticality.

Implications for education and research

Further research, utilizing both quantitative and qualitative methodologies, is necessary to determine the validity of the OSCE and students perceptions of the assessment tool. Initial project findings support the continued use and investigation of the OSCE at this stage.

Conclusion

This paper reflects the process of developing an OSCE for ambulance paramedic education and provides the foundation for a research study into the effectiveness of the tool in assessing clinical problem solving skills in students. The development of the tool is still in the embryonic phase and is continually being refined. In the initial findings the OSCE process has been found to be more objective, realistic and comprehensive than the previous skill stand evaluation. The OSCE has also proved to be labour and time intensive and strategies are being discussed to address these issues.

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Student Perceptions of Peer Learning in the English Unit 'Romanticism and Revolution'



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This paper discusses results based upon a questionnaire presented to forty second and third year students studying an English course called 'Romanticism and Revolution'. The questionnaire aimed to gain an insight into students' perceptions regarding the usefulness of different formal and informal partners integral to their learning in this unit. The results showed unexpected trends in students' perceptions as to the usefulness of peers in tutorials for their learning. This paper outlines the nature of the study, discusses the major results and offers four reasons as to why peer learning in tutorials may not be as useful as teachers might assume. Additionally, four possible solutions to these problems are proposed, which include changes to teaching methodologies and assessment structures in courses that employ peer learning strategies.

How do students perceive peer learning? From their perspective, who are the most important learning partners in the classroom? And to what extent do their views direct what we might aim for in our approaches to teaching and learning? This paper discusses results based upon one small but telling sample of what students think, gleaned from a questionnaire presented to forty students studying a second/third year English course called 'Romanticism and Revolution'.

The questionnaire asked students to evaluate how "useful" they found various partners integral to their learning in this particular English unit. The aim of the study was to ascertain student's perceptions of their learning methods as opposed to focusing on student perceptions of teaching.

The questionnaire on 'Partners in Learning' consisted of four questions (see Appendix A). Question (1) required students to rate from 1-4 the usefulness of the major formal kinds of learning partners integral to the course. This included lecturers, tutors, tutorial peers and secondary reading material. Question (2) asked students what, if any, informal mediums, such as mass media or informal discussions with friends, contributed to their learning for that unit. Question (3) asked whether, in general, students felt they learnt more from individual research or group work in tutorials. Question (4) invited students to specify any other teaching methods (eg. creative tasks) or assessment structures (eg. group projects) that they would like to see introduced into English courses. This paper focuses upon the results to question (1), which reveal significant and, in the context of current teaching and learning literature, unexpected trends in students' perceptions as to the efficacy of peer learning in tutorials.

Peer learning refers here to students learning with and from each other. The process refers to a two-way, reciprocal learning activity in which knowledge, ideas and experiences are shared between participants (Boud, 2001).

Context for the Study

‘Romanticism and Revolution’ is a second and third year unit. The course studies Romantic literature and key British political and social tracts from 1790 to 1830. The course requires students to attend one forty-five minute lecture (also available on the web) and a one and a half hour tutorial in which they discuss set primary and secondary readings. Lectures introduce students to the primary texts and the historical or theoretical contexts that are of central import to an understanding of the primary text. The same texts and issues are then discussed at length between students in tutorials later that week. Student assessment is based upon two essays worth a total of 90% of their overall grade, and a tutorial mark worth 10% of the final mark. Students who attend less than half of their tutorials receive a fail grade for that component of the course. Each student is required to present a fifteen-minute tutorial paper to the group on one of the weekly tutorial topics. This process introduces other students to the topic and initiates questions and discussion. Thus, for this course the distribution of learning time emphasises peer learning (1.5 hours in tutorials as compared to 45 minute lecture) whilst the assessment structure emphasises private research (90% of overall grade).

Results

The results are based on the responses of forty students from three different tutorial groups each with a different tutor. The following two pie charts represent student responses to question (1). Of the forty responses, twenty-six students used the complete 1-4 scaling system. The responses of the other fourteen students will be discussed later.

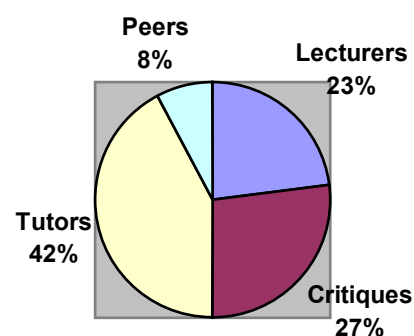


Figure 1. Most useful resource as identified by students

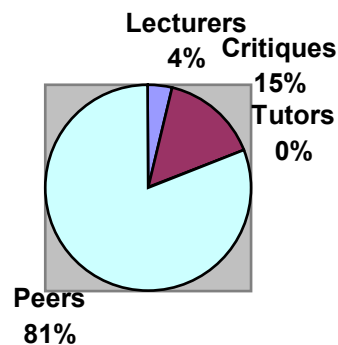


Figure 2. Least useful resource as identified by students

Figure 1 shows the breakdown of student's perceptions as to what was the most useful learning resource for them in the course. Tutors were rated as the most useful source of learning by the majority of students (42%), followed by secondary critiques (27%), lectures (23%), and peers in tutorials (8%). Figure 2 reveals that the vast majority of students (81%) voted other students in tutorials as the least useful source of learning, the second highest rating going to critiques (15%; 4% lecturers, none selecting tutors).

The fourteen other students elected to use their own rating system (see Appendix B). Four students used only two scales, seven students used three scales and three students used only one scale, thereby rating all resources to be of equal value. These results still show a strong trend against the value of peer learning. Students who rated peers the lowest are marked with an asterisk.

Interpretation of Results

What the results suggest is that while the majority of students found tutorials the most effective learning forum, students rely on tutors as their primary source of learning and view their fellow students as peripheral to their learning. Responses to question (3), which asked students whether, in general, they learnt more from private research or group activities in the course, complicate this picture somewhat. Whilst the majority of students (47%) found private research to be more useful, a third of the students (33%) said both sources were equally valuable to their learning and 19% of students said that group work was more useful.

Second and third year English students are familiar with tutorial formats and are aware of their responsibility to contribute to group discussion. The above results regarding student perceptions of peer learning are surprising and slightly troubling. In the School of English, Communication and Cultural Studies at the University of Western Australia the teaching structure emphasises the importance of group work and views the tutor as the facilitator, not dominator of, tutorial discussions. My teaching philosophy strongly emphasises the importance of group work and peer learning in conceptually driven courses. However, these results indicate that I and other teachers may be misjudging how effective students are at fulfilling their role in

peer learning activities. The remainder of this paper suggests four reasons why peer learning forums might not be as effective as they could be in this course and offers suggestions as to how these issues might be managed. Although these issues stem from my own teaching experience they are basic considerations for anyone attempting to implement peer learning practises into a course (Sampson & Cohen, 2001).

Expectations and students

This is a reflexive issue referring both to what students might expect of themselves in a tutorial and what teachers and assessors expect from them. Students may not have a clear sense as to what is required of them in tutorials. For example, they may be expected to generate questions, offer opinions and ideas, debate those ideas and contribute information garnered from private research. This could be particularly challenging and confusing for first year students who may not have experienced such peer learning environments in high-school where teaching methods tend to be more dogmatic rather than dialectical. If students feel uncertain as to what is required of them they might withdraw from participation or become cynical as to the value of the process.

What sort of solutions might present themselves? This issue may require activity at a departmental level, whereby teachers establish a clearer sense as to what they expect of students in peer learning environments. This requires all the teachers in a course and across a department if common assessment and teaching structures are employed, to recognise how the peer learning strategies employed relate to the general goals and learning outcomes of the courses offered by that department. Although such criteria cannot be too formalised, there may be insufficient dialogue between teachers as to their expectations of students in peer learning contexts. For example whilst a general guide to essay marking is available to teachers in my department, no such guides in assessing tutorial participation are available. Once identified, these objectives and expectations need to be explicitly stated to students in their first tutorial session, so both students and facilitators have a clear sense of the task at hand. This avoids students feeling confused, uncertain or sceptical about the value of what they are doing (Sampson & Cohen, 2001).

Dealing with 'Difference'

Difference here refers not only to ethnic, cultural, age and gender difference, but differences between students' capabilities, personalities and interests. It is a common situation in tutorials that some students are not prepared for class, whilst others might be indifferent, shy, or confront language barriers and so forth. The onus is therefore placed on a few active students to contribute whilst others are passive in class discussions.

With a more structured view as to how students are expected to participate in peer learning, we can in turn have more structured ways of interpreting student performance. Any assessment relating to peer learning has to be motivating rather than intimidating and allow for different aptitudes and personalities. For issues of equity, assessors in a department need to have a shared approach to common peer based learning issues such as how to assess a student who attends class regularly but does not participate; and to distinguish between shyness and laziness or lack of preparation. Dialogues between tutors and facilitators may provide basic approaches

in evaluating such scenarios, thereby ensuring equitable assessment systems across a course and throughout a department.

Such problems may also relate to issues of class size, which determine patterns of interaction between students. Large tutorials make it difficult for a balanced discussion to be possible and patterns of interaction might be established in a group after the first few weeks and stay the same if left unchallenged. Ensuring there is variety in the tasks set to students and diverse kinds of small group or partnership work used, inhibits students from assuming set 'roles' within a group dynamic.

Peer Learning and Assessment: Students who do not take tutorials 'seriously'.

The relationship between assessment and peer learning is complex (Sampson & Cohen, 2001). However, students may recognise an implicit contradiction in a course that emphasises the importance of peer learning in its teaching structure, but subsequently undermines its significance in the assessment structure. The presence of formal assessment is often regarded as an indicator of importance (Boud, Cohen & Sampson, 2001). A tutorial participation mark worth only 10% of a student's overall grade can be ignored without this seriously affecting their final grade. If the peer assessment grade is not negligible (say 20%), students are required to take that component of their learning more seriously and, as a consequence, their role in that learning forum more seriously. However, in the present study, students were ambivalent about introducing group research projects as part of their learning and assessment structure suggesting most students still prefer to be individually assessed.

The Tutor's Role in Peer Learning

Tutors have different conceptions as to their role in a tutorial setting that informs their teaching style and this affects the dynamics of peer learning. A tutor can teach, facilitate or prefer to view him or herself as more a peer than a teacher. As a result, tutors exhibit different degrees of patience for student responses and assume various levels of activity in group discussions. How can a tutor ascertain if they are assuming the right role for each particular group?

One solution is to conduct a mid-semester feedback session (see Appendix C). This process enables tutors and facilitators to ascertain how students are feeling about their tutorial environment. I conducted such feedback sessions in my tutorials last year and found the students very keen to express their opinions and many of their responses directed my teaching and facilitating methods in specific ways. These sessions also drew attention to students who felt they had insufficient opportunity to talk or found discussions dominated by other members. Confidential feedback sessions force students to become self-conscious about their own learning early in the semester and give tutors the opportunity to make the appropriate changes in their teaching style and confront other issues early on.

The possible solutions to the issues explored in this paper are many and varied and subject to trial and error. Further studies conducted across other disciplines would be necessary in order to develop upon the issues raised here. This project revealed that even a small intervention within one unit suggests the need to think critically about practical ways of achieving the outcomes we are seeking, and also, the danger of assuming that we know what students think and feel.

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Appendix A: Questionnaire distributed to students

- (1) Rate the following according to how *useful* they are for you as an English Literature student from 1-4 (1 being the **most** useful):

_____ lecturers

_____ secondary critiques (books, journals etc)

_____ tutors

_____ other students in tutorials

- (2) Which of the following have you used as a resource in your research for *Romanticism and Revolution* (please tick one or more)

_____ coffee shop discussions with other students

_____ internet

_____ television documentaries

_____ friends outside of university

_____ print mass media (magazines/newspapers)

_____ other (please specify _____)

- (3) In general, as an English student, do you think you learn more from your own private research or from group discussions and activities?

- (4) What other teaching or learning practises would you like to see integrated into English courses? Eg. group research projects, creative projects, research skills workshops, etc.

Appendix B: Additional Results

The table below shows the responses of fourteen students who did not use the 1-4 rating system but instead employed their own scale. These students either employed one, two or three scales, as opposed to four. Asterisks indicate those students who ranked peers as the least useful learning resource.

Students Using an Alternative Rating System (other than 1-4)

Lecturers	Critiques	Tutors	Peers
3	4	4	3
2	2	1	1
1	2	3	3*
2	2	1	2
1	2	1	2
2	1	2	3*
2	1	2	4*
3	2	1	2
2	1	3	3*
2	1	2	3*
3	2	1	3*
1	1	1	1
3	3	3	3
1	1	1	1

Appendix C: Informal mid-semester feedback form

What aspect/s of the tutorials do you find most useful?

Is there any aspect of tutorials with which you are unhappy, or, do you have any suggestions for ways in which they might be more useful for you?

Circle the word that best describes your feelings about the tutorials:

unsatisfied

indifferent

satisfied

happy

Thank you for your feedback!

Log-books: A strategy for reflective practice in nursing



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The concept of reflection is not new. Much has been written and researched regarding reflection and the teaching and learning process. In 1999 the School of Nursing and Midwifery at Curtin University of Technology underwent a major revision of the Bachelor of Science Degree in Nursing. The curriculum was reconstructed to encompass the 'clinical learning spiral' (Stockhausen, 1994). The spiral was developed to enable nursing students to develop the competency of reflective practice. The philosophy underpinning this competency was that reflection leads to change and positive outcomes for clients in terms of nursing care. This paper will discuss briefly reflective practice as endorsed by the Australian Nursing Council. It will also explain the implementation of the learning-log as a strategy to assist nursing students to reflect on learning in the first year of their nursing program. Scenarios from student's log-books will be presented.

Much has been written and researched regarding reflection and the teaching and learning process (Boyd and Fales 1983; Schon 1983; Boud et al, 1985; Street, 1991 & Mezirow, 1991; Taylor (2000). It is not a new concept, but it is only in recent times that nursing has adopted the notion as a core competency in nursing and midwifery at all levels of clinical practice. Reflection can be defined as:

the throwing back of thoughts and memories in cognitive acts such as thinking, contemplation, meditation and any other form of attentive consideration in order to make sense of them, and to make contextually appropriate changes if they are required (Taylor 2000, p.3).

The Australian Nursing Council (ANC) has classified core competencies into four domains. These are Professional and Ethical Practice; Management; Enabling; Critical Thinking and Analysis. The domain of critical thinking and analysis relates to reflective practice. Schools of nursing in Australia have a mandate to teach and assess students in each core competency. Successful students are recommended to the appropriate Nurses Boards in each State to be entered on the role as registered nurses. The philosophy underpinning critical thinking and analysis is that reflection on practice can lead to change and positive outcomes for clients in terms of nursing care. In 1999 the Curtin School of Nursing and Midwifery revised the Bachelor of Science Degree in Nursing, to encompass the 'Clinical Learning Spiral' (Stockhausen, 1994). This framework was designed to enable nursing students to learn the competency of reflective practice at the commencement of their clinical learning journey. This paper will explain briefly reflective practice and the 'Clinical learning Spiral'. It will also discuss the implementation of the learning-log as a strategy to assist nursing students to reflect on their learning in the first year of the nursing program. Student's reflections will be included as examples of issues arising from this teaching strategy.

Reflective nursing practice

The work of Schon (1983) has firmly positioned critical reflection in professional nursing practice. Schon (1983) described two types of reflection: reflection-in-action and reflection-on-action. It could be argued that nurse practitioners use both types of reflection. Nurses reflect on their practice by critically analysing situations and the outcomes of their actions. This contributes to the development of competencies in nursing practice. In the context of nurse education reflective practice contains opportunities for the student nurse to develop as a competent, self-aware and confident clinical nurse practitioner. Although reflection is not the panacea for the often confronting and complex learning environment that the student will face, reflection can be used as a strategy for thinking nursing and to knowledge development.

The clinical learning spiral

The experiential learning model proposed by Stockhausen (1994) was developed to consolidate features of clinical experience and capture the balance, transference and significance of theory and practice. The framework encompassed other models of experiential learning and action research, such as Boud (1985) and Carr and Kemmis (1985).

The clinical learning spiral is represented as four phases. These phases are flexible and dynamic and not necessarily followed sequentially. The clinical teacher guides the student in preparation for their clinical experience in the initial *preparative* phase of the spiral. The *constructive* phase is the clinical experience. The experience is viewed from the perspective of completeness with a beginning, middle and end. The third phase is *reflection*. Students during this stage reflect and share their clinical experience with their clinical teacher. It is during this phase that learners receive constructive feedback on their nursing practice development. The fourth and final phase of the clinical learning spiral is *reconstruction* of the learning experience. This phase promotes planned change. The change can either be in the students' behaviour or in nursing strategies. It is the students' responsibility to act on their experience. Not all experiences will result in change, but Stockhausen (1994) suggests that students should make a commitment to action as a consequence of reflection. This is to ensure that students' learning goals are carried forward to the next spiral.

Curriculum

Experiential learning in a practice profession such as nursing is highly valued. In 1999, the School of Nursing and Midwifery at Curtin University of Technology undertook a major revision of the Bachelor of Science Degree in Nursing. The aim was to focus on experiential learning and increase the time students spent in clinical practice. In undertaking this revision the school was cognizant of its responsibility to recommend students for registration on completion of the program. Recommendations were dependent on the student being able to demonstrate attainment of the required competency standards as stipulated by the ANC.

The revised curriculum focused upon competence and the development of reflection throughout the clinical journey. The first year clinical units incorporated the use of a learning-log. This was to facilitate experiential learning in the clinical practicum and to enable nursing students to develop the competency of reflective practice. Students were expected to commence their learning journey with 112 hours in supervised clinical practice. Underpinning the curriculum was the 'Clinical Learning Spiral' (Stockhausen, 1994), which emphasized the importance of reflective practice for professional growth.

Log-book entries

Reflection on practice has gained popularity within nursing as a means of refining theory and enhancing practice (Thorne, 1997). It is argued that implementing reflection into the nursing curriculum in the form of journal writing can provide students an effective means to reflect on learning in the clinical setting (Paterson, 1994). It is also a strategy to learn the dynamics of praxis. Specifically, students can learn the uniqueness of each case in context and have the potential to realize the dialectical relationship between reflection, action theory and practice. This model of praxis provides direction in decision making. The new curriculum at the Curtin School of Nursing and Midwifery introduced the students to reflective journal writing at the commencement of their professional journey, in the first year of the program.

Students selected and wrote about their experiences on a weekly basis. Not all entries, however, were associated with clinical experiences. In the first semester students were allocated to a health care agency for six full days. The remainder of the time was focused on theoretical information. The students were expected to write about their learning experiences in the classroom and the clinical area. They were discouraged from typing their entries as some admitted to rephrasing their entries in order to present an academic piece of work. The international students found journal writing a difficult task and often viewed it as an academic exercise rather than a learning experience. Grammar, spelling and other academic concerns were not considered relevant. This allowed freedom to write a meaningful narrative. Freedom to express feelings and ideas were enhanced by a work-book, which provided space for students to write long hand. The work-book stated the learning objectives for the lectures and the clinical laboratories. This information guided the students when making entries in their log-books.

Students' ideas were not assessed as right or wrong. How well a student reflected was dependent on their skill and motivation. Marks were not given for log-book entries, but feedback from the teacher enabled all students to reflect, reconstruct and make new learning goals. The students submitted their log-book twice in the semester, so they could view their progress and receive feed-back from the tutor. Submitting the log-book to the tutor, enabled insights into problems or concerns the student may have encountered. At the end of the semester, time was made available in the classroom for students to share their experiences.

At the commencement of the semester instructions were provided on the type of entries expected in the log-book. It was not unusual for students at this time to use the log as a personal diary. For example one student said they were:

still loving every minute of the course. I wake up every morning looking forward to coming to uni.

Much of what students wrote was about the difficulty in making the transition to university and the amount of unexpected studying that was required for nursing. A male student made the following comment:

I am now starting to realize that I had some misconceptions of what uni life was going to be like. I expected to be able to go to all the classes, follow up with a bit of study and revision as well as joining a couple of sports groups, the gym, and even competing in some intervarsity football. I now realize that I'm going to have just enough time in the day to keep up with my schooling.

In the first semester clinical unit, an orientation to the nursing program was conducted. The orientation was designed to assist students with strategies to help create and maintain a safe and stable community environment. This was important in the learning milieu of university and in clinical practice. The strategies were in the form of activities that the students performed in teams or with a partner. For example the blind obstacle course was designed to enable students to use their common sense and intuition. An overview of the concept of critical reflection was presented in the second week of semester. At this time students were encouraged to reflect on the orientation program and write in their learning log. The following is an example of a typical entry:

To begin with the whole idea of an orientation with people I didn't know and group games didn't appeal to me. However, when the day was over I thought it was great idea. It gave me a chance to get to know some people before going to Curtin and getting lost on my own and not knowing one face in the crowd.

The learning log revealed thought processes and feelings as well as significant events. One student wrote about her experience in the clinical area, which portrayed her thought processes:

Human Bioscience has been a real eye opener this week. I was so afraid before the session when we toured the wet lab for the first time that my stomach would just not be able to handle the cadavers. Thinking about that now I'm not sure if that is a good thing but I guess that in future weeks I will find out if it is or not. The experience though, of actually being able to see first hand what others and mine bodies are like inside was incredible. To feel what a lung feels like compared to a liver is so much more insightful than just reading from a textbook. I also now believe that this will enable me to have a better understanding of the human body and help when working with patients/clients.

Exploring feelings could have been difficult and may have left the student feeling vulnerable. In such cases the tutor was available to provide direction and to act as a sounding board for goal planning. Many students told their story, which described their feelings. For example one student wrote:

I know it must be one of the hardest things for nurses and patients to do trying to communicate needs and feelings when their speech is hard to understand. I remember last year before my pop passed away how frustrating it was for him because of his poor speech. Because of that I think some of the nurses treated him differently much like a child assuming he had something wrong with his mind... This made our family so annoyed, as his mind was great. Every case is different, but from my experience with my pop, I'm making sure and know how important it is to treat these elderly patients with respect.

Sometimes the tutor was able to gain insight into how well a student was coping and could see how the student was adjusting to nursing. In this way valuable information was obtained about the student and the health care agency. The tutor was able to act on this information and provide appropriate feedback. The following student wrote about her experience in the clinical area:

On Tuesday I worked with an enrolled nurse and did not really enjoy the day. The nurse I was with never explained what she was doing and did not answer any of my questions very well. I was not really impressed by her as a nurse and she seemed to do a lot of things we have been advised not to do since our first lesson in introduction to nursing practice. She referred to almost every patient as either 'love' or 'sweetie' occasionally she did try and pronounce a surname but never got very far.

Students who were hesitant to openly discuss embarrassing matters used the log-book as a less confronting avenue of communication with the tutor. They also found that writing was a therapeutic form of stress relief. Students commented on their progress and how they interpreted different units. For example:

What I am finding really quite amazing is how much each of the units overlap. I find concepts we cover in psychology we look at in human bioscience. This is quite surprising because at first I wondered how all of these different units could combine to form a program that interlocked, but it does.

Finally, there was evidence to suggest that students were developing a higher level of cognitive skill by making links between theory and practice. One student wrote:

What I found quite incredible was when one of the patients blood pressure dropped and all the symptoms went along with it. I had just the day before been reading about blood pressure in that big purple book and being able to observe the symptoms made it all make a lot more sense. This is what I found most valuable in my first clinical experience, being able to see first hand some of the theory's that we have learnt about.

Structure for dialogue

First year students generally have a limited frame of reference regarding nursing. Most have difficulty starting a reflective journal and although direction is provided in a lecture format, initially most students flounder. Reflective journals can be used as teaching strategy to assist students to make meaning and place nursing in context. It could also provide a means for tracking through practice issues to arrive at new insights and have the potential to provide new knowledge (Taylor, 2000).

Up until recent times the objective scientific ways of knowing have dominated nurse education. This has produced rigid doctrines and inhibited emancipatory learning. Praxis comes from the whole of knowing and knowledge in nursing practice (Chinn, 1999). Carper (1978) argued that the fundamental patterns of knowing in nursing include empirics, aesthetics, ethics and personal. It is intended that future first year students will be asked to structure their log entries using these four domains of nursing knowledge as a guide. This structure may produce hitherto unknown aspects of students learning experiences and have the potential of producing new forms of nursing knowledge.

Since nursing involves the interweaving of skills, values and norms (Perry, 1985), it is important to lay a solid foundation in the fundamentals of nursing early in the students' career. Providing experience in the clinical field allows students time to develop their competencies. Generally, professional activity is based on integrating knowledge-in-action approach, much of which is spontaneous and tacit (Bines, 1992).

By writing a reflective learning-log and planning learning goals students can begin to understand the norms and values of professional nursing practice and learn self-awareness. As students progress through the curriculum they continue to increase their level of sophistication in clinical practice and the competencies required for nurse registration.

Conclusion

Reflection has become a 'buzz' word in education. In nursing, however, the concept has been incorporated into the ANC Standards for nursing practice. If nurse educators are to facilitate critical thinking, then curricula must incorporate strategies to assist students in this competency. These strategies are best placed in the foundation studies, so that reflective practice skills can be taught and further developed throughout the program. Use of a learning-log is one method that can be utilized to facilitate this process. This strategy may also lead to new forms of nursing knowledge.

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The development of an Educational Belief Inventory for university students and teachers: Construing each others' beliefs



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The processes of teaching and learning at university are influenced directly and indirectly by the educational beliefs of teachers and students. The identification of these two groups' beliefs presents a challenge to the researcher. This paper outlines the process undertaken to develop an Educational Belief Inventory (EBI), designed to investigate the beliefs of both university students and university teachers. This process began with an extensive review of the literature and an analysis of the instruments that had been previously developed to measure and identify teachers' and students' educational beliefs. This review indicated a need for an instrument which takes into account the beliefs of both groups while also identifying how each group construes the others' beliefs. The review also provided the theoretical basis of the current EBI design and identified a group of researchers whose work was incorporated into the instrument described in this paper, thus directing much of the EBI development process. Finally, the paper reports on the results of a pilot study in which the instrument was trialled for reliability and validity and, subsequently, modified and improved to reflect the results of this trial.

Background to teachers' and students' educational beliefs

The fundamental partnership that exists between teachers and learners within educational settings has been the focus of much recent educational research, a minor subset of which has intentionally explored the interplay between the beliefs, expectations and intentions of both teachers and students. The link between teachers' and students' conceptions of, or beliefs about, learning and teaching has been researched in a variety of contexts (Chan, 2000; Trigwell & Prosser, 1996; Wilss, Boulton-Lewis, Marton & Lewis, 1999). Insights have emerged from these and other previous studies about the direct impact of teachers' and students' beliefs on teaching and learning practices. A number of investigations have specifically addressed the nature of teachers' teaching practices, or teaching *approaches* (Kember & Kwan, 2000; Martin, Prosser, Trigwell, Ramsden & Benjamin, 2000; Prosser & Trigwell, 1997; Trigwell, Prosser & Taylor, 1994) and students' study practices, or learning *approaches* (Chalmers & Fuller, 1999; Eklund-Myrskog, 1997; Entwistle & Tait, 1990; Meyer & Muller, 1990; Ramsden, Martin & Bowden, 1989; Trigwell & Prosser, 1991). Noticeably fewer studies have investigated the link between teachers' approaches to teaching and students' approaches to learning (Gow & Kember, 1993; Trigwell, Prosser & Waterhouse, 1999). The consequences of such research has no doubt intended to influence educational practices and improving learning outcomes by increasing the quality of learning and teaching. This is also the case within tertiary

educational contexts – the quality and outcomes of teaching and learning in universities are influenced by the educational beliefs of university teachers and university students (Hativa, 2000) and these beliefs are subsequently influenced by teachers' and students' practices.

Several research studies have examined certain aspects of teachers' and students' beliefs, with some particularly focusing on either teachers' beliefs about teaching (Dunkin & Precians, 1992; Hativa, Barak & Simhi, 1999; Kember, Kwan & Ledesma, 2001) or students' beliefs about learning (Chapple, 1999; Cliff, 1998; Johnston, 2001). In fact, the widespread nature of the belief literature has seen the emergence of a number of articles have been purposely written to summarise the research findings (Entwistle, 1998; Fang, 1996; Pajares, 1992; Roche, 2000). Nevertheless, much of the research that has concentrated on educational beliefs has typically been conducted with either a specialised range of participants (such as teachers *or* students) or a limited type of beliefs (such as teaching *or* learning beliefs). A small proportion of these belief studies have investigated the overlap between teaching and learning beliefs (Andrews, Garrison & Magnusson, 1996; Baker & Moroz, 1996), or the overlap between students' and teachers' beliefs (Peterson, 1988; Tavares, Brzezinski & Silva, 2000). The proportions of the various types of studies reflected in the belief literature indicate a lack of research into the two areas of overlap – teaching *and* learning beliefs, or teachers' *and* learners' beliefs.

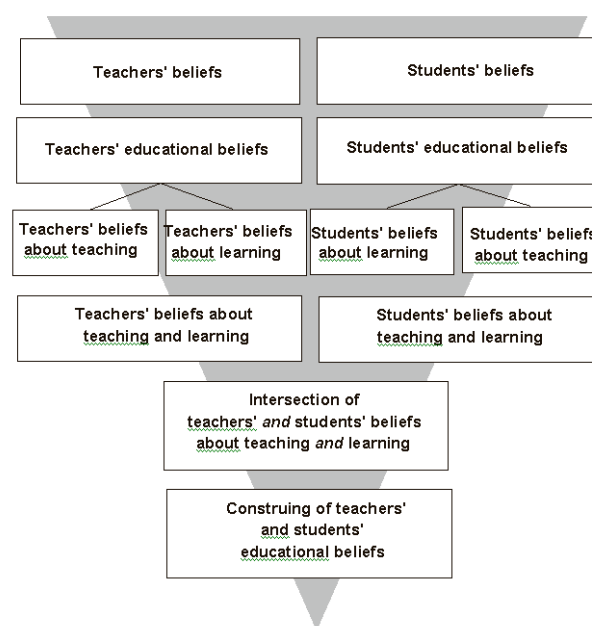


Figure 1. Scope and Nature of Educational Belief Literature

From this recent review of the excesses and deficiencies of the belief literature (illustrated in Figure 1) emerged a call for further research into the point of intersection between teachers' and students' beliefs. The interdependency between the concepts of teaching and learning also requires further exploration: "The teaching/learning partners in the classroom need to be more aware of each others' differing perspectives of the teaching/learning environment they experience" (Baker & Moroz, 1996, p. 9). Such recommendations indicate clear guidelines for future research – to investigate educational beliefs by taking into account both of the two

main groups of stakeholders in education (the teachers *and* the learners) and both types of beliefs (beliefs about teaching *and* learning). This joint awareness that these two groups and these two types of beliefs have frequently been treated separately coincides with the increased tendency of researchers to recognise the similarities in the conceptual structures of the nature of teaching and learning (Andrews et al., 1996; Bruce and Gerber, 1995; Johnston, 2001; McCoombs, 2000).

Learning environments typically involve a complex interplay of a range of factors, including the relationship between students and teachers, the dependence of teaching and learning processes, and the links between beliefs and practice. The investigation of such factors provides a number of challenges to the researcher in terms of topic scope, participant selection and choice of methodology. The dependencies and relationships that exist between teachers, learners, their beliefs and approaches to teaching and learning, are represented in Figure 2. This characteristic complexity demonstrates the interplay of abstract and observable factors within a broader institutional educational context. Such a collection of factors must be acknowledged when designing an instrument to identify the abstract belief elements of an institutional educational setting.

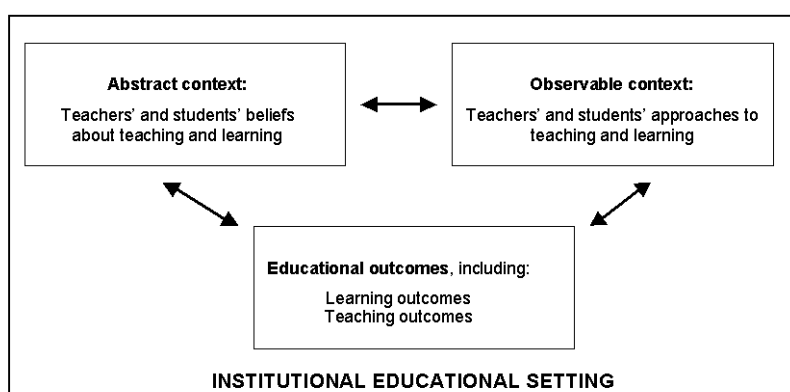


Figure 2. Theoretical framework: Teaching and Learning in Higher Education Contexts

The research instruments that have been used in the belief studies to date have primarily been designed with the intention to investigate and measure either teachers' *or* students' beliefs about teaching *or* learning. Some inventories and questionnaires overlap in these areas to a minor degree. Many of the instruments used in such studies are well-designed tools, characterised by robust theoretical bases and offer the benefit of having been trialled, tested and improved through previous use. They include, for example, Schommer's Epistemological Belief Questionnaire (Schommer, 1998) and Prosser and Trigwell's Perceptions of the Teaching Environment Inventory (Prosser & Trigwell, 1997). However, since the purpose of the current study, which is the subject of this paper, was to investigate teaching and learning beliefs in the broader context, the study required an instrument that was constructed for this specific purpose – one that both teachers *and* students could use and one that incorporated items about both teaching *and* learning beliefs. A select number of researchers who had designed a range existing tools used in previous belief studies gave their permission for elements of these instruments to be incorporated into the Educational Belief Inventory (EBI), the trial of which is outlined in the following section of this paper.

Purpose and context of the Educational Belief Inventory (EBI)

The Educational Belief Inventory (EBI) was designed to be one component of a set of data collection techniques used in the broader study that investigated the educational beliefs of university teachers and students. The study aimed specifically to investigate the way in which students' and teachers' beliefs overlap, how these beliefs change, and how teachers and students construe each others' educational beliefs. The data gathering period of the study was completed during the second semester of 2002 at a large metropolitan university. Since the study's scope was fundamentally exploratory in nature, a number of data collection techniques were employed in the study, including the collection of responses to the EBI, semi-structured interviews, written reflective journal entries and researcher observations. The data from these multiple data gathering methods are now being analysed concurrently, with each set of data supporting and triangulating each other, in order to gain a multi-faceted understanding of the partnership between students' and teachers' educational beliefs within a university setting.

The Pilot Educational Belief Inventory (EBI)

Construction of the pilot EBI

To reflect the purposes and structure of the study, a quantitative data collection tool was required that enabled a collection of beliefs from two types of participants from within the same educational setting. The tool's functionality necessitated not only the collection of attitudes from the participants' own point of view but also from each others' construed point of view. From this dual perspective, teachers were requested to construe their students' beliefs and students were requested to construe their teachers' beliefs. This requirement determined the dual-repetitive layout of the inventory.

A pilot version of the EBI was created, incorporating newly created items and items from existing belief inventories. The construction of the trial EBI was undertaken according to a seven step process: (1) the study's domain was clarified and target participants were identified; (2) a literature review was undertaken that identified both under- and over-researched areas in the educational belief field; (3) a pilot EBI was constructed incorporating items from previous studies and statements from the belief literature; (4) the pilot EBI was implemented with trial teacher and student participants; (5) feedback was collected from trial participants; (6) feedback was incorporated from pilot EBI into the final EBI construction; and (7) the final version of the EBI was implemented.

The pilot version of the EBI consisted of 54 items including 52 Likert-style items and two open-ended items across a three page format. An additional front page of instructions was attached to the pilot EBI which included a completed sample item. Participants were given the option of completing the EBI in one of three formats: as a paper-based document, as an electronic Word document or as an online form. The Likert-style items were presented as belief statements, beginning with the words, "I believe ..." and participants were requested to record their agreement with each item using a 5-point scale. Items included statements such as: I believe that university students learn by participating; I believe effective university teachers are able to motivate their students; and I believe that truth is unchanging. Some items were

created specifically for the instrument whereas a number of researchers gave permission for the use of items from their own previously constructed instruments (Evans, Ellett, Culross & Loup, 1993; Gow & Kember, 1993; Kember & Gow, 1994; Nottis, Feuerstein, Murray & Adams, 2000; Prosser & Trigwell, 1997; Schommer, 1998; Young & Shaw, 1999). The open-ended items were placed at the end of the EBI and requested participants to complete two unfinished statements: "I believe effective teaching is ..." and "I believe effective learning is ...". Due to the exploratory nature of the study, the EBI items were not categorised into subscales but all items were based on concepts associated with educational and epistemological beliefs, and especially focused on the nature of teaching and learning.

Administration of the Pilot EBI

A total of 19 trial participants volunteered to complete the pilot instrument, including seven university teachers and 12 university students. Each volunteer took an average of 10 minutes to complete the EBI. To increase the validity of the administration of the instrument, the researcher directly observed many of the participants' behaviour as they recorded their responses on the EBI (Burns, 2000). The Kuder-Richardson reliability coefficient was employed to measure the reliability of the pilot EBI for a number of reasons: the items on the scale intended to measure a common factor; the items were based on a Likert-style rating scale; and this reliability coefficient ascertains the consistency of participants' performances on each item (Burns, 2000; Creswell, 2002).

Using feedback from the Pilot EBI

The feedback from participants' written and verbal responses to the pilot EBI enabled both the validity and the reliability of the instrument to be improved. Participants noted some ambiguity about certain terms used in the belief statements and these terms were modified or deleted. For example, the phrase "personal life" was changed to "everyday life" to suggest general application of a belief to a person's life rather than the application of a belief to a person's family life or personal relationships. Trial participants found the paper-based format of the EBI to be the most convenient and for this reason, the electronic and web-based versions of the EBI were only used as secondary options during the final administration of the EBI. Based on the responses of the trial participants, the 52 Likert-style items on the pilot EBI had a Kuder-Richardson reliability coefficient of .85, which is above the .8 coefficient level recommended for indicating reasonable reliability (Bryman & Cramer, 1990). Items that recorded the lowest reliability levels were either deleted or modified in the final version of the EBI.

From this appraisal of the reliability calculations, validity considerations and feedback from the trial participants, eight items were deleted from the pilot EBI and a further eight items were modified, resulting in a reviewed reliability coefficient of .90 of the remaining 44 Likert-style items. Consideration of the validity of responses to the pilot EBI uncovered a tendency for participants to use the terms from the EBI belief statements in their own responses to the open-ended items at the end of the pilot version of the EBI. To prevent this transference of participants' terminology from the EBI statements into their responses to the open-ended items on the instrument, these items were shifted to the beginning of the final EBI. The format of the final EBI was

reduced from three to two pages, specifically in consideration of the fact that the structure of the final EBI would include a repeated format of the final 46 items to enable participants to respond to the inventory items both from their own perspective and then from the construed perspective of their students or their teacher.

Construction and implementation of final Educational Belief Inventory (EBI)

The final EBI consisted of a total of 46 items – 44 Likert-style items and two open-ended items across a four page format. A single instruction page was attached to the front of the EBI. The EBI was administered to the students and teachers of five university classes at the beginning and the end of Semester 2, 2002. Based on the responses of the participants who took part in the study (100 participants completed 176 EBIs in total), the reliability coefficient was .85 overall. The Kuder-Richardson reliability coefficient of the responses given by participants about their own beliefs was .82 and .87 for the responses given by participants about each others' beliefs. The time taken by participants to complete the inventory was approximately 20 minutes and most participants opted to complete the EBI in its paper format, with only three participants preferring to use the electronic copy of the EBI. No requests were made by participants to complete the EBI online.

Reflection on the development of the Educational Belief Inventory (EBI)

The manner in which participants completed both the trial and the final EBI indicated that the process of personal reflection about one's own educational beliefs is a challenging, and sometimes confronting, experience. Furthermore, the process of construing the educational beliefs held by others appeared to be even more demanding for most participants in the study. The course of action adopted from the initial construction and trial of the pilot EBI through to the construction and implementation of the final EBI was a process which was primarily driven by the overall intention of the research study – that is, to investigate the links between university teachers' and students' educational beliefs. At times, adoption of the traditional use of subscales within the EBI was considered but consistently decided against in preference for a less deterministic layout that was in tune with a more exploratory investigation. In retrospect, the emerging structure of the instrument and the manner in which the items were refined and modified during the development process was underpinned by a consistent consideration of the paucities and surpluses of the belief literature. Lastly, the inclusion of both open-ended and Likert-style items in the EBI allowed for the collection of data which incorporated participants' original belief statements with their opinions on existing beliefs.

Conclusion

Currently, the research study outlined in this paper is in the final stages of analysis and the final report is being written using an integrated approach to qualitative and quantitative data interpretation methods. Results of this analysis are providing answers to three overall research questions which focus on: the identification of participants' beliefs; the level of congruence between teachers' and students' beliefs; and the ability of each group to construe the beliefs of each other. Since the EBI did

not adopt a predetermined structure of subscales, the analysis of the participants' responses to the EBI items is currently being conducted on an item-by-item basis. The results the EBI have supplemented and triangulated the qualitative data collected from the study which was designed according to a mixed methodological model (Tashakkori & Teddlie, 1998) and employed various data gathering techniques: "The combination of multiple methods, empirical materials, perspectives and observers in a single study is best understood, then, as a strategy that adds rigour, breadth and depth to any investigation" (Denzin & Lincoln, 1994, p. 2). It is anticipated that results of the study will enhance our understanding of the close partnership that exists between university teachers' and students' educational beliefs.

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Revisiting Adult Education theories: Can emancipatory learning begin to redress the shortfall in achieving learning organisations?



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The concept of the learning organisation has been vigorously debated over the past ten to fifteen years, and the role and value of workplace learning even longer. We know the models and have the checklists, but we are yet to see this ideal realised to any significant degree in many organisations, including Australian workplace settings.

In recent years, the discipline of Adult Education appears to have been subsumed in the broader debate over the learning organisation, but perhaps current trends in this discipline can provide some direction for seeking solutions to the increasingly apparent shortfall in achieving the learning organisation in Australian workplace settings.

In an attempt to reinvigorate discussion on how learning can be more effectively fostered in the workplace, this paper reviews some approaches to adult learning with emphasis on critical reflection and emancipatory learning to more clearly understand and begin to remedy the gap between the ideal and the reality of the learning organisation.

Adult Education is not a new concept, having been considered by Dewey (1925) and Lindeman, (1926) and received renewed attention in the 1970s, in particular through the work of Freire (1974; 1976) and Knowles (1970; 1978). In recent years however, this discipline and its literature appear to have been subsumed, even lost, in the broader literature and associated discourse of *organisational learning*, *the learning organisation*, *transformation theory* and *action learning*. Amongst this broader literature and discourse there is increasing evidence which shows that the *learning organisation* is, for many organisations, an elusive goal; an ideal rather than reality (Daft, 2001; Dennis, 1998; Dixon, 1999; Garavan, 1997; Marsick, 1997).

Organisations aim for increased productivity, with learning recognised as a significant factor in achieving higher productivity goals, however, there is emerging evidence which shows that training and related activities are in decline in the Australian workplace (Kramar 2001; Voicey, Baty & Delaney 2003). With such a decline evident, it is the premise of this paper that much more can, and will need to be done, to support workplace learning to ensure it is fully utilised as a key intervention strategy in maximising productivity goals. Therefore, putting aside the complex infrastructure, management support and resourcing requirements necessary to support a learning organisation, this paper focuses on *learning* rather than the *organisation* itself.

First, this paper briefly reviews definitions of adult learning and focuses on key concepts of the andragogical model. It then examines the work of Jack Mezirow and his theory of performance transformation (now more commonly referred to as transformation theory), including his emphasis on emancipatory learning. From there the paper refers to more recent work which provides links to more clearly understand learning requirements, transformative learning and the learning organisation.

Adult education

According to Lindeman (1926) adult education is “a process through which learners become aware of significant experience. Recognition of significance leads to evaluation. Meanings accompany experience when we know what is happening and what importance the event includes for our personalities” (p. 169). This definition includes inference to self-direction and critical reflection, both of which have since become substantial aspects of adult learning theory. The definition was reinforced by Knowles (1978), but the greater emphasis of his work lay in promoting the concept of andragogy, which he describes as the focus of learning of adults as opposed to children (pedagogy). He suggests that “andragogy assumes that the point at which an individual achieves a self-concept of essential self-direction is the point at which he psychologically becomes an adult” (p. 56), thus taking responsibility for his/her own learning, and capable of becoming a self-directed learner. It is this aspect of self-direction which underpins much of the work of Knowles (1970; 1978) and is reinforced through the work of Freire (1974; 1976) who promoted ongoing education as a means of conscientisation, empowerment and self-direction.

More recent research which reviewed the andragogical approach promoted by several researchers in the field of adult education eg: Freire, Dewey, Bruner, Rogers and Knowles suggests that rather than a being a theory, andragogy is more “a philosophy of education which provides useful guidelines to the teaching of adults” (Burns, 1995, p.251).

Drawing on the theories of these researchers, Burns (1995) suggest that the consensus of key concepts of the andragogical model include:

- Adults need to know why they are required to learn something before being motivated to learn it.
- In any group of adults, there will be a greater range of individual differences than among a school group.
- In contrast to subject-centred learning in childhood, adults are task and problem centred in their approach, particularly to those problems which they face in everyday life in work, home and leisure.
- Adult motivation appears to be based on intrinsic factors such as quality of life, self-esteem and job satisfaction, thus adult education should make optimal provision for differences in style, time, place and pace of learning
- Adults are responsible for their own learning decisions and their own lives (summary, Burns, 1995: 333-336).

Even through trainer/educator awareness of knowing about these key concepts however, it is not enough to ensure that all adult learners will learn.

The emergence of transformation theory

Acknowledging and building on the work of Freire, Dewey, Bruner, Rogers and Knowles, Mezirow, (1978; 1981; 1990; 1996; 1999) expanded the idea of self-direction in adult learning by taking into account the psycho-cultural and psycho-social contexts in which the adult learner has been socialised. He argues that in learning situations, the current attitudes, values and perceptions of the adult learner may not always be appropriate in the light of new information or with new situations and change. Mezirow (1978) further argues that the ability to unlearn, update, or reframe previously acquired attitudes, knowledge, skills and behaviour to accommodate “new” information or new situations as a pre-requisite to a new frame of reference will be an increasingly common life event, and particularly in relation to becoming a self-directed learner.

The research by Mezirow (1978) was based on studies investigating re-entry programs designed for middle class women who were resuming their education, or considering future employment after a break of some years. The major thrust of the study was “to identify factors that characteristically impede or facilitate the re-entry programs” (p: 6). A significant finding from this research was the identification of a phenomenon which Mezirow (1981) named *performance transformation*, and defined it as “the process by which adults come to recognise culturally induced dependency roles and relationships and take action to overcome them” (p: 16-17).

Performance transformation encompasses the notion of meaning perspectives which Mezirow describes as being the psychological structures within which individuals locate and define themselves and their relationships. By recognising the conditioned assumptions which shape these structures, the individual can confront and shed inappropriate or outdated structures. From there, individuals can re-construct their personal frame of reference and re-define their personal goals and criteria for evaluating change, thus enhancing their self concept and self esteem. This continual critical reflection between previously held beliefs and new life priorities facilitates the enlightenment of individuals, and the progressive development of new meaning perspectives for interpreting their life and coping with new experiences.

Further, Mezirow (1978) argued that through critical reflection, psychological and cultural events which may limit the natural path to perspective transformation can be recognised. He claimed that this relates to understanding reasons why individuals attach the meanings they do to reality, especially in the roles they fulfil and to the relationships in which they are involved. He also noted that there are varying levels of reflectivity, all vital to the transformation process, which ultimately lead towards greater autonomy and self determination.

In his studies, re-entry programs provided the catalytic function of confronting currently held assumptions through the provision of information and options which heighten consciousness and raise awareness about issues relating to those assumptions. In this context, Mezirow (1978; 1981) suggested that a person becomes a transformational learner when they recognise that the culture in which they have

been socialised impedes their capacity to exceed the limitations of [currently held] unquestioned roles, attitudes and beliefs. In identifying this process Mezirow (1978) believed that an “important dimension of adult development and a significant derivative function of continuing education had been identified” (p: 18).

The attitudes and behaviours identified by Mezirow in his research in relation to learner uncertainty and resistance when re-entering the structured learning environment parallel the attitudes and behaviours which manifest as employee uncertainty and resistance in proposed and actual changes and associated training in the workplace (Dennis 1996; 1997). The psychological adjustment identified by Mezirow as performance transformation equates to the psychological adjustment employees encounter in unlearning and shedding an obsolete “end state” in readiness for change, with the end state referring to the desired outcome of any proposed change.

Three learning domains

Further research by Mezirow (1981: 1990), incorporating his own findings of 1978 as outlined above, and incorporating the work of Habermas (1970; 1971) has been fundamental in promoting the concept of performance transformation and transformational learning in the field of critical theory in adult learning. Mezirow (1981) noted that Habermas (1970; 1971) identified three general areas, or domains in which learning occurs. Each interrelated, but each has a precise method and focus of objective enquiry. The first is *technical learning* which relates to instrumental action based on empirical knowledge and technical rules. The second is *practical learning* for effective interaction with others through communication, and the third is *emancipatory learning* through introspection and self awareness, allowing recognition of socialised and environmental constraints which may inhibit a learner’s life chances.

It was this third domain with which Mezirow (1981) was most concerned. He suggested that if there are three distinct areas in which learning occurs, then “these imply three different functions for adult education concerned with such learning” (p: 4). He argues that adult educators have failed to identify the distinction between the three areas of learning, having focused their attention primarily on the technical and practical domains. As part of this criticism Mezirow (1981) added that he viewed the concept of “emancipatory action as synonymous with perspective transformation (p: 6). He believed that it should be an inclusive and conscious part of the teaching strategies employed in adult education programs, such as those developed for workplace learning with the aim of providing greater opportunity for critical reflection by learners.

More recent articles by Mezirow (1996; 1999) have given greater focus to emancipatory learning highlighting communication and critical reflection as key aspects of transformation theory.

The transformation theory of adult learning is based upon an emancipatory paradigm, and constitutes a dialectical synthesis of objectivist and interpretive paradigms. Transformational Theory grounds its claims pertaining to learning in the distinction between instrumental and communicative learning, particularly the roles of critical reflection and discourse in human communication, and the transformative potential of our interpretive frames of reference
(Mezirow 1996 p: 158).

Whilst Mezirow acknowledges criticism of his work, including Cunningham (1991) and Taylor (1997), he continues his research and to lead debate relating to transformation theory. Notwithstanding the criticisms, transformation theory is held in high regard and continues to underpin substantial research in the field of adult learning (Cranton, 1996; Marsick, 1997; Dixon, 1999). Its value lies not only in providing a plausible and well regarded explanation of the complex nature of adult learning, but also in raising the parallel issues of the need for adult educators/trainers to be cognisant of this complexity, and their ability to incorporate methodology which will more effectively promote transformational learning in adult learning programs.

Workplace learning in the learning organisation

It is noted by Argyris and Schon (1996) that “there is virtual consensus that we are all subject to a ‘learning imperative’, and in the academic as well as the practical world, organisational learning has become an idea in good currency” (p: xvii). This point is reinforced by Waugh (1996) who states that “recurrent, lifelong education and training . . . are implicit requirements of the modern workplace” (p: 15).

With this imperative in mind, more recent literature by Dixon (1999) reinforces the idea of recurrent, lifelong education and training as an essential activity in the workplace. She notes that

Organisations are collections of individuals, each of whom has developed and stored meaning structures, is capable of creating new meaning from interfacing with the environment and each other, can test that meaning against their current meaning structures, and can alter or reconstruct their meaning structures. . . an organisation learns through this capability of its members
(Dixon, 1999: 43).

The complexity of learning in the workplace is also highlighted by Dixon (1999) when she argues that learning is achieved through critical reflection of meaning constructs based on shared information, thus reinforcing the belief of Mezirow (1996) that critical reflection and information sharing play a substantial role in adult learning. According to Dixon (1999) this is achieved through a range of meaning structures which equate to meaning perspectives or interpretive frames of reference as described by Mezirow (1981;1996). The meaning structures listed by Dixon (1999) include private (personal) meaning structures; accessible meaning structures (those made available to others in the organisation); and collective meaning structures (those which organisational members hold in common). She cautions however, that for organisational learning to occur, it is not enough to simply encourage organisational members to exchange meaning constructs, rather, “. . . the organisation must act to facilitate collective learning” (p: 63), hence reinforcing the need for effective

communication within the organisation as a significant component of adult learning. Therefore if “emancipatory action is synonymous with perspective transformation” (Mezirow, 1981: 6), then it is likely that only through the ongoing learner review and reappraisal of their meaning constructs as new information becomes available, that significant learning will occur, whatever the adult education setting.

Conclusion

Literature relating to the learning organisation is vast and ever increasing, and although Rowden (1997) proposes that a “literate, educated, inquisitive, problem-solving workforce is essential to the survival and competitiveness of business and industry”(p. 3), the reality of the learning organisation still appears in many instances, to be illusive (Daft, 2001; Dennis, 1998; Dixon, 1999; Garavan, 1997; Marsick, 1997).

By investigating the learning aspect of the learning organisation in this paper, it can be seen that developing opportunity for effective workplace learning is no simple matter. Closer scrutiny and comprehension of the current research in adult education and transformative theory has provided a starting point to recognise why *the learning organisation* remains, to a great extent, elusive. Such scrutiny also assists in recognising the composite (holistic) nature of issues which need to be addressed in generating effective and ongoing learning opportunities in the workplace, and it is anticipated that if these issues are more thoroughly pursued, learning will ensue and likely become a more routine part of work, readily underpinning productivity goals and advancing the reality of a learning organisation.

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Teaching and learning online for the first time: Student and coordinator perspectives



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In recent years the higher education sector has moved towards the flexible delivery of individual units and entire courses. As a result, online delivery methods are becoming increasingly common. In this paper we describe students' and unit-coordinators' views concerning teaching and learning online for the first time in an introductory psychology unit. Using an action learning approach, views were ascertained through a focus group, messages posted on the online discussion boards, a survey, and coordinator reflections. The results indicate that the current online design of the unit does little to actively engage students in the learning process. We argue that transformation rather than adaptation of unit material to better suit the online environment is required. Facilitating the transformation of unit materials requires greater institutional support and ongoing professional development for teaching staff. In addition, it is recommended that a combined approach (online and face-to-face learning) may be more beneficial than online delivery only, especially for large undergraduate classes and during the transition year.

We teach in a time of greater need for flexible delivery methods (Kezar, 2000; Siragusa, 2002) such as the provision of the online mode of delivery. Uses for online delivery are varied and include providing all material online, pre-lab exercises to ensure students are prepared for their classes, integrating internal and external students (e.g., through online group projects), providing case studies to aid learning, and encouraging the development of learning communities and student connectedness through the use of bulletin boards and chat room facilities (Chittleborough, Mocerino, & Treagust, 2002; Oliver, 2002; Proctor, Knapton, Aldridge, & Fraser, 2002; Wood, 2002). However, the technology for online delivery is not sufficient by itself – educators need to build experiences and expertise as well as address learning theories and instructional design principles in order to be successful in web-based teaching and learning (Siragusa, 2002).

Advantages of online delivery include being able to provide students with immediate feedback on submitted work, access to other resources (e.g., Internet sites, music, pictures), encouraging the pre-reading of material, facilitating the development of computer and Internet skills, and greater flexibility than traditional delivery methods as students may study at a time and venue convenient to them (Chittleborough et al., 2002; Gaynor & Kessell, 2002; Proctor et al., 2002; Siragusa, 2002). A major challenge to the provision of online learning is the geographical isolation between students and coordinators, which can impede a more 'natural' style of communication (Gibbs, 1998; Ho 2002; Oliver, 2002; Siragusa, 2002; Wood, 2002).

Recent research in Western Australia suggests that students are generally satisfied with online delivery but there are some concerns such as peculiarities with online programs and platforms, knowing whether or not submitted assignments have reached the unit coordinator, and the students' computer or Internet literacy levels (Chittleborough et al., 2002; Gaynor & Kessell, 2002; Oliver, 2002; Siragusa, 2002). In addition, access to the sites and staying connected (especially in remote areas) may be problematic (Chittleborough et al., 2002; Gaynor & Kessell, 2002; Siragusa, 2002). Finally, the teaching institution may not always adequately support and encourage innovation for successful online teaching and learning (Murray, Combs, Aldridge, & Fraser, 2002; Proctor et al., 2002).

When we consider the current growth in online learning course enrolments, there is a significant number of students and coordinators who use online technology for the first time. Thus, in evaluating the success of the online delivery of units, there is a need to examine the perspectives of both the instructors and the learners (Siragusa, 2002). This paper describes the evaluation of an online unit where the unit coordinators and the students participated in online teaching and learning for the first time.

Preparation

Early in 2002, we completed professional development courses relating to online teaching and learning. These courses were provided by our university. Two of the courses were concerned with teaching and learning using the online platform used at the university. In addition, we completed a 6-week e-moderating course which required approximately 30 hours.

Implementation

The knowledge and practical skills obtained in these courses were used to develop and implement an introductory unit in psychology, delivered entirely online with Blackboard as the online platform. The unit was transferred from the external print-based mode to the online environment by us in conjunction with an Instructional Designer.

The unit is the first psychology unit in the psychology degree and was the first unit within the School of Psychology to run solely online. The decision to offer the unit in the online mode was made as part of the institutional push towards online learning. The student cohort is typically diverse and the unit may be completed by students majoring in psychology or by others who have an interest in the area. Psychology majors usually complete the unit in addition to a research methods unit in their first semester.

One hundred students enrolled in the introductory psychology unit in the second semester of 2002. Many of these students were commencing their first semester with the university as part of a mid-year intake of students. In addition, 25 of the students studying the unit were also enrolled on campus in the first year research methods unit. The first author coordinated the research unit, facilitating face-to-face contact with the 25 students also enrolled online in the introductory unit.

Evaluation

An action learning approach (McGill & Beaty, 2001; Weinstein, 1999) was used to evaluate the implementation of the introductory unit in the online mode.

Upon completion of the semester, student retention rates and grades were examined.

In addition, student views were ascertained through three main methods. First, comments on the discussion boards were thematically analysed. Second, the views of the students who were also enrolled internally in the research methods unit were canvassed in a focus group. The focus group occurred five weeks into the semester and 20 of the students volunteered. Third, the students completed a survey which asked for their views concerning the online learning format.

Results and discussion

Grades

The examination of grades provides a useful tool to aid the evaluation of online units (Siragusa, 2002). The overall marks for the unit were examined and compared to that of the previous semester where the unit was run both internally and externally in a print-based format. The assignments were of the same format and contained similar questions, allowing for direct comparison. The table indicates that the number of students scoring High Distinctions and Distinctions were comparable across the three modes of delivery. However, fewer students earned Credits and Passes in the online mode than the previous semester's on-campus and print-based external modes. In addition, significantly more online students failed the unit. Many of the Fail grades resulted from non-submission of assessments and/or failure to sit the exam, rather than poor assessment grades, suggesting that the unit failed to engage the students rather than the unit being too difficult.

A comparison of grades between semester 1 and semester 2, 2002

Grade	Semester 1, 2002		Semester 2, 2002	Results of the online mode
	Internal n (%)	External n (%)	Online n (%)	
HD (80% and above)	18 (6.3%)	9 (8%)	6 (6%)	No change
D (70 – 79%)	61 (21.4%)	27 (23.9%)	23 (23%)	No change
CR (60 – 69%)	109 (38.2%)	37 (32.7%)	20 (20%)	Decrease
C (50 – 59%)	61 (21.4%)	22 (19.5%)	11 (11%)	Decrease
N (less than 50%)	35 (12.3%)	18 (15.9%)	40 (40%)	Increase
Total	285 (100%)	113 (100%)	100 (100%)	

Note: n = number of students.

Communication on discussion boards

By the end of the teaching period of 14 weeks there were a total of 141 messages posted by 29 students. Only 12 students posted more than one message. The majority of the students who posted messages lived in the north metropolitan area of Perth and six lived in regional areas. Four students who posted messages were also studying the research methods unit on campus. We believe that the small number of students posting messages may be attributed to the unit's lack of online activities, as accessing Blackboard was not necessary to complete the unit. To minimise the transition to online learning, all students received the Blackboard material in a print-based format upon the commencement of the unit. The decision to do so inadvertently led to Blackboard being underused, as the students received all the required materials.

Those that used the discussion boards introduced themselves, provided encouragement, and shared study tips with other students. Students also replied to other students, welcoming them to the unit and offering to support each other through their studies. The boards assisted initially in the formation of study groups, as students used the facility to locate peers in their geographical area. Not all students appreciated the online format. For example, a student commented that *"communication via computers really is not very personal"*. For non-local students, the boards reduced the isolation of studying. For example, *"I am really happy to find that I will not be so isolated after all. I look forward to getting to know all of you during the course of our studies"*. The opportunity to meet other students was seen as important. For instance, another student commented *"I think it will certainly make a difference doing an external unit where you can interact with the other students. This way we get the best of both worlds!"*

Focus group

The focus group highlighted a number of student concerns related to feelings of resentment. Students wanted personal contact with fellow students and staff but instead they felt the unit was impersonal. They felt the need to be connected was especially important as they were in their first semester of university study. Further, the students were angry that as the unit was offered only in the online mode. Many students reported that they would have preferred to study the unit on campus, had they choice been available to them. They felt as though they were in an *"experiment"* as they were aware that this was the first time the School of Psychology had used online delivery.

Survey

A questionnaire and a reply-paid envelope were sent to every student in week 12 of the semester. Only 21 questionnaires were returned, yielding a low response rate (21%). Seventeen of the respondents accessed the unit's online materials during the semester. All but one of these posted a message and all but two replied to a message. The student who did not post a message still benefited from the online medium; *"although I did not post a message, I did enjoy reading about other people's questions, which helped me throughout the semester"*. Eleven students reported they would like to do another unit online in the future. Those who did not use the online

facility cited reasons such as a lack of computer access and a knowing that accessing the online environment was not a requirement of the unit.

The students who preferred to study externally reported that they benefited from the online environment as it allowed 24-hour access to unit materials and timely feedback from the coordinators and other students. Those students who would have preferred to study on campus, had the option been available, described the unit as “*lonely*” and “*isolating*”. Almost all of the respondents students suggested ways to improve their online learning experience, such as the provision of some face-to-face contact for those students who are able to attend the campus to aid the development of study groups, consolidate their understanding of content and assessment, and to “*put a face to the name*” of the unit coordinators.

Retention

A preliminary retention rate was calculated based on the number of students initially enrolled in the unit and the number of students that who sat the exam. The retention rate for the unit was 62%, which is higher than most external units where retention rates are typically as low as 50% (Phipps & Merisotis, 1999). However, the retention rate was lower than usual for the unit when delivered externally in the print-based mode (around 70%). Although there are many reasons for non-completion of units, the low retention rate may be a result of the online mode of delivery. Although 25 of the unit’s students were enrolled internally for the research methods unit, it appears that the contact was not sufficient to facilitate feelings of connectedness to other students and the coordinator of the online unit.

Coordinators’ reflections

The online and e-moderating preparation courses were useful in terms of the coordination of an online unit, however, the online medium was not utilised to its capacity. Barriers to doing so included a lack of additional support in and understanding of online pedagogy to facilitate the successful transformation of the unit and the large number of students enrolled in the unit. There is a need to not only provide support in the training of academics before they embark on online teaching but also to aid their ongoing development and expertise in teaching online to ensure maximum learning opportunities are provided within the online environment. This is particularly so as the online environment is vastly different to the norm of face-to face teaching and the skills required for the online environment are different. Thus, there is a need to further develop an institutional culture that supports online teaching and learning (Kulski, Boase-Jelinkek, Quinton, & Pedalina, 2002).

The optimal class size for delivery of activities such as online tutorials, group discussions, and collaborative assignments is estimated to be between 10 and 20 students (Salmon, 2000). As a result of the unit’s large enrolment, activities and group assignments were not provided due to the anticipated difficulty in moderating such activities. From a pedagogical perspective, the decision not to utilise such activities further resulted in the under-usage of the online platform and is likely to have negatively impacted on student learning. For example, the individual assessment meant that the students were not encouraged to engage or collaborate meaningfully with one another.

Conclusion

Whilst all attempts were made to canvas the opinions of all students enrolled in the introductory unit, the attempts were not successful. The views of the 'silent majority' remain uncertain. The experiences of the student cohort as a whole are thus difficult to determine. Despite this, we feel that some tentative conclusions can be made.

The current online design of the introductory psychology unit does little to actively engage students in the learning process. Merely transposing the print-based materials into the online environment failed to maximise the benefits of the online medium. A design that incorporates experiential and collaborative learning processes is essential as these processes contribute to learning outcomes (Kezar, 2000). In addition, it has been suggested that to achieve optimal outcomes, information must be redesigned rather than adapted to meet the specific requirements of the online environment (Campbell & Ben-Zvi, 1998; McLoughlin & Luca, 2001; Wolfe, Crider, Mayer, McBride, Sherman, & Vogel, 1998). The transformation of the unit to better suit online delivery will be challenging considering that approximately 500 students enrol in the unit in first semester and another 100 or more in second semester as part of the mid-year intake. The online environment is better suited to units with smaller enrolments than the unit it was trialled with in the School of Psychology.

Finally, the transition to university studies presents a potentially difficult adjustment for students (Pargetter, 2000). The online mode appeared to exacerbate the stresses associated with this transition. A combination of online activities with face-to-face components would enable students to participate in online activities suitable for larger classes which would offer opportunities for the revision of material, master classes, and idea generation (Salmon, 2000) while allowing students to feel connected to students, staff, and the university. Such a combination is especially useful for large classes (e.g., Coall, 2002; McKenzie, 2002) especially during the transition year, and is a recommendation from this paper.

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Is there a fit between pedagogy and technology in online learning?



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The study followed a group of online lecturers from different disciplines who were engaged in different levels of online teaching. The researchers' experiences with e-learning have indicated there are a variety of ways by which teaching staff approach e-learning. As new technologies provide a challenge to make learning an interactive and collaborative experience that is guided by social constructivist approach to teaching and learning, some academic staff embrace the technology to enhance their pedagogy and others are reluctant to use the technology.

We conducted qualitative research in an attempt to answer the research questions of what pedagogies are used by teaching staff to facilitate e-learning, and how lecturers change their use and understanding of e-learning techniques. The study suggests that there is a continuum in the way the constructivist pedagogy has been implemented by the different lecturers and also a continuum in the way the technology has been embraced by them. From our observations, we categorised the university lecturers in relation to their pedagogies (level of social constructivist approach) and to the level at which they used the technology, in order to explore how the relationship between these two elements changed.

The study helps us to understand how the technology enabled some of the lecturers to develop their pedagogies and change their perspectives on social learning online. In addition, for others who used social features of the technology to an optimal level the technology helped them accommodate and reinforce the notion of a social constructivist approach to teaching and learning. Finally, the interchange between the ability to use the technology and the adoption of social constructivist approach to teaching raised new questions in relation to implementation of online learning.

Developing quality online teaching environments

Technology is becoming an increasingly important part of teaching in higher education. Universities are shifting more and more from traditional lecture-based courses to online teaching in order to remain competitive and to provide more flexible learning opportunities for students. However, although advanced technology appears to offer enormous scope for developing engaging and interactive environments, the

traditional lecturer-centred knowledge transmission models still prevail (Taylor & Maor, 2000). In spite of the trend towards online teaching, many higher education faculty members are not using this technology and they are unsure of what to do with it if they did (Conard, 2002). On the other hand, technology may be used but the pedagogy may remain traditional.

Developing and providing university courses online is complex and challenging and its success depends not only on the use and availability of appropriate technology, but also on an underlying pedagogy that ensures high quality learning experiences. Although there is a growing body of research in the field of online learning and examples of good practice can be found (Salmon, 2000; 2002), universities still have some way to go in developing highly interactive and collaborative online courses. Therefore, whilst attention is given to developing online technologies, more attention needs to be given to the pedagogy that will enhance quality online learning (Hendriks & Maor, in press). To this end, this paper examines the fit between online pedagogy and technology. We argue that a social constructivist approach to teaching and learning will enable lecturers to create high quality, interactive online learning environments (Hara, Bonk & Angli, 2000; Garrison, et al., 2000). This, however, requires an integration of relevant technology and constructivist pedagogy.

Social constructivism

In the context of e-learning, recent studies have also revealed that the teaching and learning environment can foster interaction, collaboration and negotiation of meaning among participants using particular protocols and a variety of delivery techniques (Maor, 1999, Maor & Hendriks, 2001; Bonk & Cunningham, 1998; Von Glasersfeld, 1995). Key elements in successful e-learning include: affective support, the creation of a community of learners, peer learning, reflective discourse, and student-centred learning with the instructor taking the role of facilitator (Maor, 2003; Jonassen, 2000). This type of learning is underpinned by a social constructivist approach to teaching and learning (Tobin, 1993, Von Glasersfeld, 1995), which involves creating a student-centered approach where the teaching staff assume the role of facilitators and the students engage in learning that is interactive, collaborative and shared among the community of learners.

Our experience with online learning has indicated that teaching staff approach online learning in different ways. There is an emerging group of lecturers who are enthusiastically adopting online learning to match their social constructivist approach to teaching. There is a second group who are using the technology but do not extend their pedagogies to take advantage of the interactive potential of the technology. A third group of lecturers use a constructivist approach in their face to face teaching but they lack technological knowledge and therefore do not use online technology for the same pedagogical goals. Finally, a fourth group still do not acknowledge the potential of using e-learning as an interactive tool for teaching and learning and therefore deliberately do not use the technology in their teaching.

Research methodology

The focus of this research was to investigate lecturers' understanding and use of social constructivism in an online environment. The aim was to examine the experiences of a group of lecturers in order to understand what *pedagogies and technologies* they use in their online courses, and what changes occurred as a result of engagement in this research. A qualitative methodology was undertaken with a view to gain in depth understanding about the fit between technology and pedagogy in online teaching.

Participants

University staff who were engaged in online learning, or who were planning to go online, were invited to participate. Initially the research involved a group of 10 (volunteer) lecturers from different academic disciplines. No incentives were provided, except for the monthly workshops, an addition to their normal workload. The university provides some technical support to the academic staff, however, there is no forum for them to deal with pedagogical issues or other online teaching experiences. At the end of the first year, 6 lecturers were still highly committed to the study. They were from the Environmental Science, Veterinary Science, Law, Education, Information Technology and Humanities.

Data collection

Our two primary methods of data collection for this study were interviews and workshops. At the beginning of the project, participants were requested to complete a questionnaire which gathered data on what online courses the lecturers were engaged in, the kinds of technologies being used and how they perceived online learning. During the project, the lecturers took part in series of interactive workshops that dealt with various aspects of online teaching and learning. The workshops addressed topics such as the principles of social constructivism, technology, collaborative learning, social learning and reflective discourse, WebCT tools, online assessment and action research. Sessions were recorded and later transcribed.

The interviews were conducted towards the end of the academic year and were recorded and transcribed. A number of participants also conducted action research projects, however, these are not reported here.

Data analysis

Results from the questionnaire were analysed using Nud*ist. During the year, data collection and analysis from the workshop discussions were a simultaneous, ongoing activity conducted through a process of category construction (Merriam, 1998).

Participants' profiles and engagement with online teaching

The questionnaire provided an initial profile of the participants and their online activity. The units being taught online were mostly undergraduate, both internal and external. There were undergraduate units, a small number of graduate units, honours or clinical teaching. Most of the internal units had a face-to-face component and the

online component mainly took the shape of discussion forums. Most of the participants therefore started to see the value of using online technologies as a complement to face-to-face internal mode of teaching and to overcome isolation and promote communication in external units.

Among participants, all but one lecturer used the Web. The tools they were using ranged from WebCT, (the official e-learning platform for Murdoch University), and E-mails, assignment submissions, providing feedback and grades, MP3 lectures, to discussion forums, CD of images for image identification, Dreamweaver, story-lab, play-role simulation and online conflict resolution.

The reasons given for why the lecturers used online technologies varied but were classified according to three factors: technology, pedagogy and student learning. Technological reasons included having contact with external students, providing flexible delivery, having less paper flow, speeding up communication with students, making use of interesting media other than books, and providing study material online. Only a few of the reasons stated by the lecturers dealt explicitly with pedagogical issues. These related to stimulating more collaboration and interactivity amongst students, and between students and lecturers, providing more opportunity for discussion and feedback, and enhancing students' learning outcomes.

Using a social constructivist framework to teach online

During this project, participants engaged in a number of workshops aimed at initially exploring their understanding of the meaning of a social constructivist approach to teaching and learning, then establishing a better understanding of the theory, followed by the question of how to adopt this framework in the online environment. Data from the workshop discussions and interviews of individual lecturers are presented in this section in order to describe the main themes emerging from this study. Major pedagogical issues identified included participation, collaboration, interactivity, and the role of the lecturer. These concepts were further analysed in the interview data to investigate the implementation of these aspects in the online courses.

Participation

A major goal of the lecturers was to have students actively participate in the online learning environment. There was an overall concern that students were not participating enough in online activities, and strategies to encourage participation was one of the workshop discussion topics.

Alex, an experienced online lecturer, expressed his concern about students' participation.

... the only thing that concerns me is that there wasn't good participation from some students. So I am looking for a way to encourage all students to become more active. I might consider the idea of setting quotas for postings (A. Interview, Nov 02).

Rose, a new online tutor, questioned the quality of the participation:

I initially expected more participation and more well thought out postings. After altering my approach, by intervening more often and making clear what was expected of students, I found that the commitment improved (R. Interview, Dec 02).

Participation increased and there were more well thought out postings after Rose changed her approach and was very explicit about her expectations of the students.

In several cases online activities were voluntary and this did not encourage participation. Jane, who is not currently teaching online but plans to do so, did not want to introduce another assessment tool. Her goal is to achieve participation without the necessity of assessment. She was seeking her colleagues' advice:

My dilemma is how to actually get people to engage with each other. I don't want to make it another assessment component. But I do want a free flow of information and I'm still working out how I am going to work this... (J. Interview, Jan 03).

The erratic, low level of online participation is also reflected in the following comment by Bob.

First we had a little hello thing, happy to have you on site etc, then I immediately put up a question, that particular question was answered by two or three students straight away, then I gave a sort of composited answer, a summary from a different view, and a few different links, I was hoping would go somewhere, they all died with it. So I put up another question. It sat there for three weeks. Sure, there were other discussions going on, but they didn't even test the question, so I finally put up another thread to that question...But I'm participating more than I need. (Bob – May 6)

Bob's comment suggests that an ad hoc approach to teaching online would not guarantee successful participation. The need for careful planning and use of technology proved to be essential to successful student participation.

All four examples suggest that although the lecturers have different perspectives on teaching they were looking for strategies to increase participation. The above data emphasises firstly, that structuring the course will influence how well students participate and secondly, the importance of having clear guidelines, clear expectations of the course, a clear set of structures and rules of engagement. These are part of successful online teaching.

Degree of collaboration

A second theme that emerged from the data indicates the varying levels of collaboration between lecturer and students, and between students themselves as well as initiatives to promote collaboration. In an interview, when asked about the social presence of others and how it influenced students' activities, Alex felt that collaboration could be enhanced through the effective use of public and private online spaces:

This one aspect of the online environment that is valuable is that you can set aside private spaces...students can collaborate in that private space ...usually agree on the tack to take and display that publicly (A. Interview Nov 02).

Group-based activities that required students to work together were viewed as an effective way to promote a high level of collaboration. Jane described her way of getting students to work together, by empowering them to decide their goals:

I usually get people to do a number of different activities in groups. ... They have to work together ... its usually based on interest so they join together in groups based on what they want to work on and they decide what the goals are going to be (J. Interview, Jan 03).

However, participants generally felt that the level of collaboration in their classes needed to be improved and that not all students experienced effective collaboration. For instance, Frances stated that:

One of the students said to me that perhaps her group is one of the groups that didn't work so well [together] and she was the only one that did push it ... She thought it was very difficult to work because you send out an email message and you've just got to wait (F. Interview 15 October, 02)

The pitfall of lack of equitable contribution amongst group members and also the passivity of "waiting" for interaction to occur causally reduces collaboration between members and reduces the enthusiasm to work online.

As well, without clear direction on how to work with the medium students can't go far and therefore could not collaborate. Another lecturer had high expectations of students' ability to work in groups. However, it would appear that the relatively simple tasks of uploading a file and sharing a document were not easy tasks for students:

I thought the WebCT presentation space could be used for this because it effectively allows for file sharing. So I thought students could get together on-line, share a document, revise it, amend it, discuss it and produce a group project, so to speak.

Alex attempted to increase collaboration by assigning collaborative group writing projects for students to write together. However, to his surprise this didn't work. The students were unable to use file management system properly:

most of the students just couldn't grasp what to me was fairly straightforward, the file management system. They just couldn't get the idea of how you put a document up, how you change it, how you rename it, download it, put it back (A. – May 6)

In addition the study provided an opportunity for the lecturers to collaborate among themselves and to learn from one another. They learnt useful tips from one another, avoided pitfalls, encouraged and supported one another.

Promoting interaction

Interactivity implies dialectical relationships in which people engage in a purposeful and meaningful way to bring about new knowledge and understandings. One of the challenges in creating quality online learning environments is to create opportunities for students to engage in activities that require them to interact with each other. The lecturers used a range of activities with varying degrees of success.

Rose used role-play simulation to encourage interaction. She divided her class into groups and assigned them roles in order to have an authentic discussion on real life problems. Most of the time she was satisfied with the active role of the students, but not always; therefore Rose set a goal for herself to do action research focussed on actively engaging students through role play simulation.

In Asian studies on-line we've done a role play simulation of a development studies scenario. Sometimes it's worked brilliantly, with all the students involved in the discussion and taking part actively. Other times, and I don't know why this is, and this is actually part of the action research project that I'm doing with Dorit. Other times the discussion doesn't take off and I can't get students involved. (R. – May 6)

Bob indicated that he had little knowledge and understanding of social constructivism and that he was aware that he did not promote interaction and left it to the students to use the online discussion:

I put up the topics or questions and the students discussed these without any constraints. *After* certain amount of discussion I or the other course coordinator step in and puts up the answers. However, whenever I did this the discussion stop dead (B. Interview, Nov 02).

Kevin also expressed concern about the limited interaction between students and the material online

...they are not interacting much with staff in this. There is more interaction between themselves to some extent (K. Interview, Nov 02).

Alex used dispute resolution as a major activity.

The negotiation process is like a bargaining process online with groups of students playing different roles and then negotiating a solution to the problem, ...the mediation is similar except that you have a third role which is the mediator. (A. Interview, Nov 02).

These examples suggests that most of the lecturers in this group adopted a problem-based and activity-based teaching/learning approach and sought innovative ways to use technology as a way of providing students with opportunities to interact. However, they realised that the technology provided more innovative teaching methods that were only partly adopted by them.

Lecturers' role/attitude

As facilitator, the lecturer's role is to structure stimulating learning opportunities and provide pedagogical and technical support. In this regard, the participants perceived themselves as facilitators or mediators, who exercised less control over students' learning and relied more on student input and independent learning. For instance Alex saw his role as

try[ing] to encourage discussion among students and participation. So I see myself as creating an environment for the students rather than telling them all they want to know (A. Interview, Nov 02).

Likewise, Rose found that it was important to make clear to the students that her role would not be to answer every posting, "rather my role is that of mediator" (R. Interview, Dec 02). Jane saw her role as one of designing an online environment for students that promotes interactive learning:

So my task then is to think about how am I going to do the same sorts of things [as in face-to-face teaching] in an online environment or using technology of some description" (J. Interview, Jan 03)

It is clear that the lecturers are facing some dilemmas. They had to find the right mix between facilitation and intervention.

Use and understanding of technology

Constructivist online learning activities presuppose the purposeful and appropriate use of technology that enables online lecturers to design quality learning environments.

In our study the lecturers revealed different levels of understanding and use of collaborative technology. A few lecturers who were knowledgeable about technology made use of a wide variety of collaborative, communicative tools such as discussion boards, e-mail, chat-rooms and student presentations, while others were limited to the use of e-mails and online discussions.

Rose and Frances, for instance, demonstrated a high degree of technology use. Frances in particular works in an IT area that enables her to make optimal use of technology. Even she, however, needed to be creative in using the available technology:

...[L]earning a new language virtually. You have to learn abbreviations, the emoticons, learn the different way of communication. You have to be more proactive, a lot more humour (F. Interview, Oct 02).

Rose's technical ability improved over time:

I have added to and diversified the website. For example, changes to the software in the chat-room, added a slide show to accompany academic reports and I've altered the look and feel of the site (R interview, Dec 02).

Bob on the other hand does not perceive himself as an online lecturer and therefore uses the web and collaborative tools in a limited way. He sees online learning as a way of varying the delivery of learning material and noted that "I have very little use of e-learning techniques so far" but notes that he would "like to use modelling and 3D" (B interview, Nov 19). Furthermore, he did not appear optimistic about the benefits of technology but by the end of the study he was more open to the potential of using technology to enhance learning.

Discussion

Although online technology provides opportunities for developing quality online learning, the use of advanced technology will not necessarily lead to quality learning if it is not matched with appropriate pedagogies. Therefore, the pedagogy associated with online learning is crucial. To this end, this paper suggests that the integration of collaborative technology tools and teaching/learning principles rooted in social constructivism can result in a quality online learning environment.

However, our study suggests this may require a shift in the way lecturers perceive and approach their online teaching. The key elements of constructivist learning include collaboration, interaction and co-construction of knowledge (Maor & Hendriks, 2001). The challenge is to translate these theoretical principles into the online environment so that there is a fit or congruence between the technology and pedagogy used by the lecturers.

As with the use of technology, the interview data suggested that the lecturers' understanding and application of social constructivist principles varied, which also seemed to impact on the quality of student interaction and participation. Participants used a variety of interactive and collaborative learning activities such as role-play and synchronous discussion and the technology used ranged from email and discussion boards to virtual synchronous tutorials. However, linking of learning activities and

online tools seemed to be sometime a hit and miss affair. It also depended on lecturers' technological knowledge and skills. Only a small number of participants were fully competent in the use of online technology while others lacked the knowledge to use the technology in an effective way.

Those lecturers who had neither an advanced pedagogical framework nor advanced technological skills faced a steep learning curve in both areas. Those with more knowledge or experience in one or both of these aspects nevertheless found it challenging to integrate pedagogy and technology. For some, technical problems simply made it too time consuming to continue experimentation. For others, adapting face-to-face collaborative and interactive methods into the new technology proved daunting without outside support. One participant suggested that the development of an effective e-learning environment incorporating constructivist principles might take an unassisted lecturer several years of experimentation and adjustment.

Constructivist pedagogy and online technology are clearly compatible and may be mutually reinforcing. However, implementing both to provide high quality e-learning environments requires instructors with appropriate knowledge and skills. Lecturers who rate highly on both the pedagogic and technology continua we have identified will be best placed to take advantage of the synergy between online tools and constructivist teaching methods. Those who are not as well versed in either the technology or the constructivist method will struggle and be unable to realise the benefits of combining them. For all lecturers trying to realise effective e-learning time, support and encouragement will be essential.

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How does the quality debate relate to the nature of the student experience online?



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One perspective in the current quality debate is that the increasing numbers of virtual learners reflects the search for individualisation and personal satisfaction in learning. This accords with principles of quality management which are person-centred and concerned with client satisfaction. While there may be many questions about the effectiveness and learning gains achieved through online learning, there is also well-founded research evidence that it achieves higher student satisfaction and levels of engagement. In addition, there is a growing understanding of the factors that affect learner success in online learning and a realisation that good design must be learner-centered. Increasingly the design process begins with a partnership with, and recognition of student needs and interests.

This paper addresses current definitions of quality in online design and examines emerging expectations of what constitutes a good online experience. As the dynamics of quality assurance in online distance education continue to evolve, there will remain a need to consider delivery options for students. This paper presents an overview of current thinking on quality in online learning, and offers a framework for rich online experiences based on evolving student needs and learner-centered, constructivist principles.

Multiple perspectives on quality

There can be little doubt that the issue of quality is at the forefront of educational planning, evaluation, student satisfaction and institutional change. Despite the centrality of concerns about quality, there is no unified vision of what constitutes quality in online delivery, no agreed criteria and few frameworks to guide the practitioner in adopting best practice strategies (Littler & Mahyuddin, 2001). In addition, myths abound as to how technology can be integrated successfully in schools and universities without incurring enormous costs. Technology may be seen as revolutionising education, but at a cost:

No single classroom teacher could now be a sufficient resource for a class of today's demanding net students. It will take teams of professionals to replace all the old customs (such as the one size fits all lecture) and tools, like study guides/textbooks (cited in Ramsey, 2000).

More and more, quality is being equated with cost-effectiveness and the need to maintain a competitive edge. Few people in the educational world believe that it is possible to increase quality while reducing costs. Another mistaken assumption is that the integration of information and communications technologies may even undermine

quality by replacing or supplanting the social and personal experience of learning. Many critics of ICT speak of its capacity to undermine social presence, signalling that the human element is primary and a fundamental condition of student satisfaction (Gunawardena & Zittle, 1997; Swan, 2003).

Guidelines and benchmarks for online quality

In response to calls for greater accountability and quality online, a number of reports and documents provide design guidelines and benchmarks for distance education environments. For example, the Institute for Higher Education Policy (National Education Association, 2000) provide 24 benchmarks for course design, delivery and learning outcomes. In their report no specific recommendations are made except to suggest that intended learning outcomes are regularly reviewed to ensure clarity, consistency and appropriateness. Penn State University in association with Lincoln University (Innovations in Distance Education, 1999) have taken this a step further and promote that “where possible provide assessment and measurement techniques and options that capitalise on the unique characteristics and situations of the distance learner”. Recommendations on assessment processes are as follows:

- Enable students to self-monitor progress
- Give regular feedback to students
- Support peer learning and assessment
- Design self-assessment practices.

These recommendations are in line with those of Berge et al. (2000) who also suggest, with respect to online learning, that “wisdom might be served by using alternative forms of assessment of student understanding”. One example they cite is the use of a series of sequential exercises building upon one another throughout a semester, so that issues of security are less of a problem. However, in all the reports cited here, there is a dearth of pedagogical guidelines for practitioners. The Quality Assurance Agency for Higher Education (1999), acknowledges that there are differences in the way assessment is conducted on campus that may not be appropriate for students studying in the off-campus mode, who have little contact with academic staff. In another study, Warren & Rada (1999) address the issue of quality learning via computer-mediated communication. They define quality learning as going beyond the acquisition of facts to achieving a cognitive outcome, and fostering higher order thinking at the level of synthesis and evaluation of concepts. A range of pedagogical and psychological frameworks now show that there is an emerging consensus about what constitutes a sound instructional design framework for online learning. An overview is provided from the viewpoint of student needs and perceptions.

Surveying the literature on student perceptions

Despite the fact that controversies abound about the impact of media on learning, institutions are increasingly placing their courses and units of study online, and there is also concern about how best to facilitate online learning and increase learner support (McLoughlin, 2002). An examination of the views and perceptions of students from a broad range of institutions, and in different countries who have had an online experience reveals striking similarities with regard to learning online. They reveal

negative and positive attributes of Web-based learning, support offered and the kinds of frustrations experienced in the learning process. Most often reported were feelings of anxiety and insecurity with regard to commencing online study, uncertainty about expectations and frustrations with technological failure (Goh & Tobin, 1999; Sturgill, Martin & Gaye, 1999; Hara & Kling, 2003). Frequently, the online communication is perceived to have a socially isolating effect, to lack warmth and support, and to be more intimidating (Gunawardena & Duphorne, 2000; Mason & Weller, 2000). Time taken to learning the new skills and to engage in online conferencing is yet another point of contention for students, and seems to engender negativity when tutors do not explaining g the prerequisite skills and expectations adequately (Hong, Lai & Holton, 2003; Porras-Hernandez, 2000).

Balancing these concerns, the literature seems to indicate that students feel challenged by technology, but that they experience greater feelings of self-direction and efficacy once they have developed the necessary skills (Table 1). From this brief review of literature on student perceptions of online learning, certain features emerge as significant in influencing student perceptions of the environment:

- (i) Readiness. This refers to the personal and environmental factors that influence students' study experience, such as confidence and competence in learning online.
- (ii) E-learning attributes. These are the unique elements that make up the conferencing environment, such as the degree of support and structure offered.
- (iii) Learning strategies. These refer to the specific strategies use by students as they engage online.

Choice of strategies is often influenced by the design of tasks and by the forms of assessment used. Other research has shown that the institution can positively impact each of these features and that learners can improve their skills iteratively (Murgatroyd, 1996; Bonk & Cummings, 1998; Anderson, 1999; Somekh, 2001; McNaught, 2002).

Relating these findings to the literature on quality learning, the evidence is that students are aware of the nature and expectations of e-learning, of the need for support, structure and or meaningful tasks that match their learning preferences. The onus is therefore on instructional designers and educators to create quality learning experiences online that meet learner needs.

Table 1
Summary of research on student perceptions of e-learning

Author & date of article	Negative concerns/issues	Positive aspects
Sturgill, Martin & Gaye, 1999	<ul style="list-style-type: none"> • Communication felt distant and dehumanizing • Frustration with lack of troubleshooting skills 	<ul style="list-style-type: none"> • Social equalization • Different forms of communication • More autonomy
Gunawardena & Duphorne, 2000	<ul style="list-style-type: none"> • Level of readiness often inadequate • Lack of social presence 	<ul style="list-style-type: none"> • Increased self-efficacy • Comfort level increases with experience
Goh & Tobin, 1999	<ul style="list-style-type: none"> • Frustration and tedium when resources lacked interest and quality • Mismatch with learning styles • Time consuming • Need for feedback 	<ul style="list-style-type: none"> • Autonomy with regard to learning • Enriched forms of interaction and engagement • Personal growth and professionalism
Porras-Hernandez, 2000	<ul style="list-style-type: none"> • E-learning is more demanding • Anxiety concerning new approaches to study • Lacks immediate feedback 	<ul style="list-style-type: none"> • Increased sense of self-efficacy • Generates new skills and attitudes • Interaction with other students
Hara & Kling, 2003	<ul style="list-style-type: none"> • Anxiety about communication norms • Insufficient feedback • Poor online skills • Lack of feedback 	<ul style="list-style-type: none"> • Greater self-direction
Mason & Weller, 2000	<ul style="list-style-type: none"> • Time demands to develop new skills • Need to ensure that expectations and learning styles are met 	<ul style="list-style-type: none"> • Expanded experiences • Sense of accomplishment
Hong, Lai & Holton, 2003	<ul style="list-style-type: none"> • Feelings of isolation 	<ul style="list-style-type: none"> • Motivated by anytime, anyplace opportunities • Increased self-reliance • New forms of group learning

We may conclude from this overview of student perceptions of online education that the notion of quality defined in terms of student satisfaction with the online experience is important, yet few guidelines have been provided by academics on what practices to adopt when designing educative, authentic or valid assessment processes that are suited to distance education and online environments. Most often, quality issues are tied up with implementation, infrastructure and delivery of services to students and they provide a big picture view of the systems that need to be in place to enable online education to be managed at an institutional level.

Learner-centered principles for online design

The argument so far has shown that student perceptions of online learning are consistent and reliable and attest to the need for a set of guiding principles so that instructional design is truly learner-centered. During the early 1990s, the American

Psychological Association (APA) announced a set of 14 Learner-Centered Psychological Principles (LCPs) shown in Table 2. These were based on research from the fields of learning and instruction, motivation, and development since the emergence of cognitive psychology in the 1970s and 1980s (APA, 1993). Intended to help with school reform and redesign, the LCPs address cognitive skills such as fostering curiosity and intrinsic motivation, linking new information to old in meaningful ways, providing learner choice and personal control, nurturing social interaction and interpersonal relations, promoting thinking and reasoning strategies, constructing meaning from information and experience, and taking into account learner social and cultural background. These fourteen principles have significant promise for Web-based instruction. In support of this claim, Bonk and Cummings (1998) advocate the adoption of a dozen principles for designing Web-based instruction from a learner-centered perspective. These guidelines describe the need for creating a psychologically safe environment, facilitating learning, mentoring students, and providing prompt feedback. In a nutshell, the learner-centered principles provide a focal point for thinking about the design of student-centered online instruction. In Table 2, each of the factors listed under the headings of cognitive and motivational, affective, social, developmental and individual need to be considered in order to achieve a balanced design.

Table 2

Summary of design issues in the learner-centered psychological principles

Cognitive and Metacognitive Factors to be considered

1. Nature of the learning process
2. Goals of the learning process
3. Processes for construction of knowledge
4. Support for strategic thinking
5. Fostering thinking about thinking.
6. Providing a context for learning

Motivational and Affective Factors to be considered

7. Motivational and emotional influences on learning
8. Intrinsic motivation to learn
9. Effects of motivation on effort

Developmental and Social Factors to be considered

10. Developmental influences on learning
11. Social influences on learning.

Individual Differences to be considered

12. Individual differences in learning
 13. Learning and diversity
 14. Standards and assessment
-

Applying the principles to design of online environments

Since the introduction of the LCP's, many educational technologists are advocating the need to shift from instructor-centered to student-centered approaches (Bracewell et al., 1998; Hannafin & Land, 1997; Harasim, 1990). Learner-centered pedagogy asks what students need to learn, what their learning preferences are, and what is meaningful to them (Wagner & McCombs, 1995). Web-based instruction provides opportunities for learning materials, tasks, and activities to fit individual learning styles and preferences. Networks of learning information, such as digital libraries, virtual teams and online discussion groups, are available to meet student interests and ideas. Such environments also provide access to more authentic learning experiences than are typically found in conventional educational environments.

In accordance with the learner-centered movement, online tools should provide opportunities to construct knowledge, actively share and seek information, generate a diverse array of ideas, appreciate multiple perspectives, take ownership in the learning process, engage in social interaction and dialogue, develop multiple modes of representation, and become more self-aware (Chong, 1998; Harasim, 1990; Oliver & McLoughlin, 1999; McLoughlin & Oliver, 1999). Simply stated, technology-rich environments can support learner engagement in meaningful contexts, thereby increasing learner ownership over their own learning (Bonk & Cummings, 1998). A detailed perusal of examples, functions, and supporting research for learner-centered environments can be found in Hannafin and Land (1997).

The emergence of hypermedia technology combined with asynchronous learning networks provides greater opportunity for learners to take control (Doherty, 1998). Other researchers agree that learner control and self-regulation is and will continue to be the most dominant characteristic of this form of instruction. Clearly, the "learn anytime, anywhere," manner of thinking does foster additional expectations for greater learner autonomy and learner options. With the increasing expectations that a learner will be guiding his or her own learning, instructors need to develop pedagogical strategies and employ technological tools that foster self-directed student inquiry and investigation. In such an environment, tools and strategies for student manipulation of information, discovery, generation or artefacts, and sharing or knowledge are highlighted (Hannafin & Land, 1997). With appropriate task design, students can examine problems at multiple levels of complexity, thereby deepening understanding.

As an example, Hannafin, Hill, and Land (1997) focus on the student-centered benefits of open-ended learning environments (OELEs). In OELEs, knowledge evolves as understanding is modified and tested, while learners begin to evaluate their own learning needs. Basically, the focus is on relevant and meaningful problems linked to everyday experiences. In accordance with the vision of student-centered environments, OELEs support self-regulated learning, enable novices to negotiate through complex problems, showcase knowledge interrelationships, anchor concepts in real world events, and nurture various problem solving processes.

Web-based learning models

Most Web courseware is embedded with devices for tracking, managing, and controlling student learning, rather than innovative ways to nurture student control and responsibility for learning. This situation is not really surprising since such courseware tools emanate from a behavioural learning model (Firdyiwek, 1999). At the same time, there is a proliferation of ideas related to creative approaches for teaching on the Web (Bonk & Dennen, 1999). Levin and Waugh (1998) detail approaches such as online collaborative teaming, online questioning and answering, Web resource searching and evaluation, project generation and coordination, and student publication of work. Moreover, Collis & Moonen (2001) point to new instructional opportunities to locate information, conduct research, analyse data, take part in virtual tours, exchange and publish information, and solve problems. The possibilities exist, therefore, for rich forms of e-learning, but, for the most part, pedagogically sound and exciting Web tools have yet to be developed to take advantage of such opportunities.

Some designers are responding to the lack of sound Web tools by creating interactive tools for online portfolio feedback, teamwork, collaboration and mentoring, while others are building tools for online debates, reflection, concept mapping, and e-mentoring and discussion (McLoughlin & Luca, 2002; Herrington, Oliver & Reeves, 2002).

Conclusion

Trends in pedagogy are converging with the emergence of e-learning technologies that allow for greater learner control, personal responsibility, and collaboration. Advances in interactive technology are forcing instructional designers and technology users to confront and envision learner-centered instruction as well as their role in it. Fortunately, the Web is emerging as a viable teaching and learning platform for learner-centered instruction at the same time that there is a call for quality and client-centered approaches in education. Increasingly the design process begins with a partnership with, and recognition of student needs and interests. Furthermore, as e-learning provides a unique context where students become the center of the learning environment, designs are predicted to become increasingly learner-centered. In fact, in successful online courses, students might assume significant and leading roles such as offering instructional tips and constructing new knowledge that were once the domain of the instructor. Summarising the evidence from the thrust to apply learner-centered principles and from the analysis of student perceptions of the online experience, there is a need for design to take into account student experience with online learning and perceptions of support, while offering creative tasks for learning engagement, self-direction and motivation.

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Using Multimedia Elements on the Web to Change Student Mental Models of Colour Vision Deficiency



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The online environment offers many opportunities for students to interact with each other, unit materials and resources, and for lecturers to inform students of issues regarding their main course of study. One of the weaknesses of teaching and learning in the online mode, however, is that lecturers have difficulty in identifying misconceptions and imperfect mental models in their students.

This paper reports on a study being conducted by a West Australian university in the use of small e-learning modules developed in Quicktime video to change or strengthen students' mental models – in this case their mental model of Colour Vision Deficiency (CVD), or colour blindness. It is hoped that one of the outcomes of the research will enable academic staff to create their own Quicktime based e-learning modules, using very simple technology, to inform and modify student perceptions on any given topic.

As courses move towards the online environment, many issues become apparent. One of these is how can teachers identify their students' mental models and, even more importantly, how can erroneous mental models be corrected.

The impetus for this study came from the fact that one of the authors taught her students about the effects of colour blindness on web site accessibility and software design. It was found that, although students had access to a colour blind person (in the form of a fellow student), many did not understand the concept of colour blindness and the effects on perception of text and images in web sites.

An informal review of the students found that many of them felt that blindness to colour resulted in a blindness to objects. This misconception was particularly prevalent among Asian students. A review of the literature highlights the fact that colour blindness is most prevalent among Caucasian males (8%), and very few Caucasian females (0.4%) (Jacobs, 1981; Marcus, 1992). It is an increasingly important area of website design, with the World Wide Web Consortium (W3C) guidelines containing 833 references to colour blindness.

For the e-commerce students, many of whom would be destined to be managing e-commerce projects, colour blindness was considered to be an increasingly important aspect of accessibility. Colour blindness (or Colour Vision Deficiency – CVD) was also chosen as a topic for the experimental module because of the interesting and diverse mental models students displayed on the issue.

An exhaustive literature review has found a paucity of research into e-learning and mental models, and the use of e-learning modules in tertiary education. This paper will look at some of the issues surrounding mental models and online teaching, as well as outlining a proposed solution for helping to overcome incorrect student mental models in a university online teaching environment.

Mental Models

When Johnson-Laird, (1990) states that a "primary source of mental representations is perception" (p 1), he is using "mental representations" as a synonym for "mental models", but, as outlined by Johnson-Laird and Byrne (2000), the term has a narrower referent in terms of thinking and reasoning. Mental models can be constructed from, not only perception, but also imagination or comprehension of discourse, and they can be abstract or visualised (Johnson-Laird & Byrne, 2000).

Mental models may also be constructed from real, imaginary or hypothetical situations, and the mind builds small scale models of reality that it uses to anticipate events, to reason and to underlie explanation (Craik, 1943). In constructing a mental model a mental simulation may be 'run' in order to draw conclusions. This is distinct from the notion of the mental model as an image, which is considered to be a one-off representation, such as reconstructing a scene (Preece, 1994). Barker et al (1998) examine the development of mental models through appropriately designed teaching and learning activities whereby it is possible to adapt a mental model through reflection, remediation and reconstruction processes. Mental models are described as dynamic and adaptable. A mental model can change during the course of a conversational situation as new knowledge is acquired (Barker et al, 1998). Learners progress from having a naïve mental model through to an expert mental model as their understanding of a concept deepens, particularly when supported with open-ended learning situations and suitable scaffolding (Oliver & Hannafin, 2001).

Every teacher should have an understanding of effective and ineffective mental models so that the correct kinds of scaffolding, modelling and coaching can be included in learning environments. Solving situated, ill-structured problems in different settings requires the solver to use complex and diverse mental representations (Jonassen, 1997). The possession of correct mental models provides a natural way of inferring probabilities and allows students to fulfill decision making tasks as well as providing a means of meta reasoning (Johnson-Laird, 1998). Johnson-Laird et al (1998), conclude that reasoning is easier from one model than from multiple models, and become semipermanent tacit 'maps' which students are able to hold in their long-term memory.

The Problem

One of the authors is responsible for a web usability class, whereby Electronic Commerce students have to design web interfaces that are usable and accommodate people with disabilities. It is therefore essential that they have a correct mental model of all the issues (in this case colour blindness) and an understanding of their effects on Web users.

Many of the students had no concept of the implications of being a colour blind Web user. Even the opportunity to interview and observe a colour blind peer did not seem to have an impact on their understanding. Several students (14 of the total 103) believed that colour blindness was "object blindness", in other words, a colour blind person would not see traffic lights at all. Other students believed that a colour deficient person only saw in black, white and shades of grey. A demonstration of the problem of knowing when a mobile phone was recharged (was the recharging light red or green?) helped the majority of students to gain an insight into the problem, but many students still used blue text or red and green elements (with no secondary cues) in their interface designs.

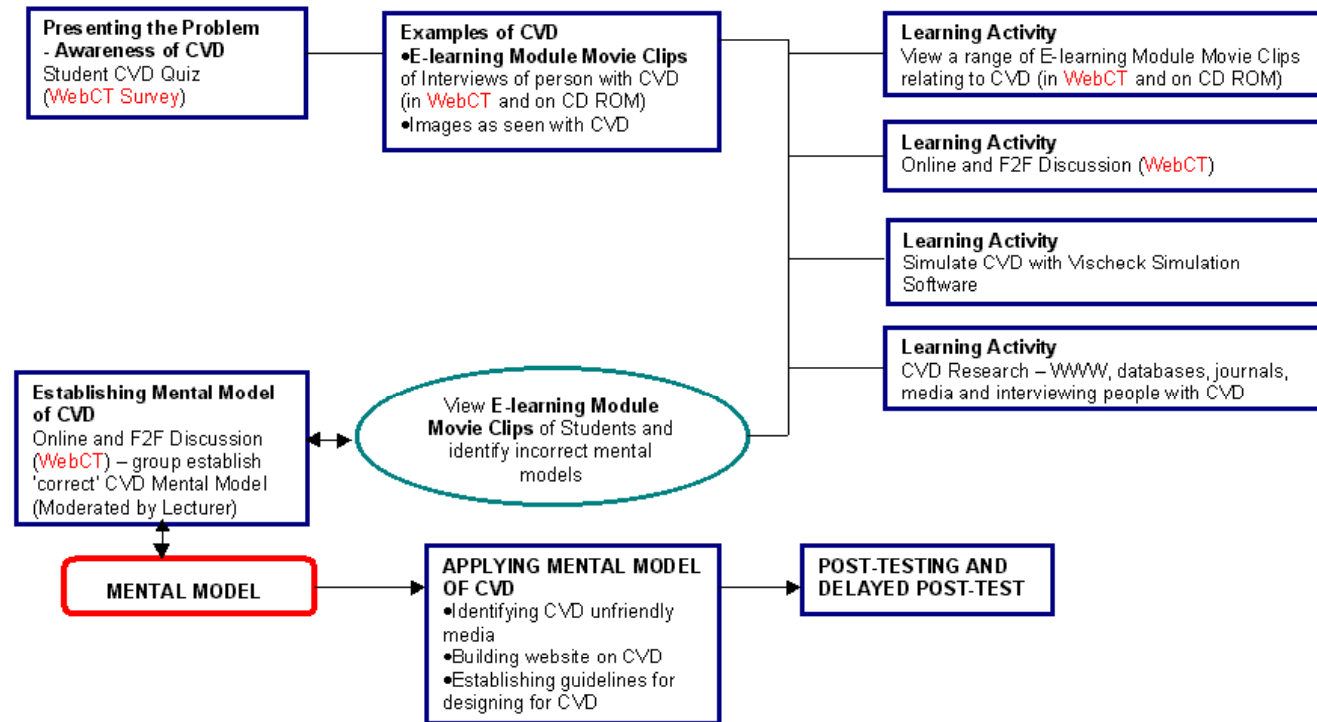
For an in depth explanation of the issues of CVD readers of this paper are directed to a discussion on colour blindness in the mail archives of the W3C Web Content Accessibility Guidelines Working Group found at <http://lists.w3.org/Archives/Public/w3c-wai-gl/1998JulSep/0160.html>. W3C, the World Wide Web Consortium (<http://www.w3.org/>), develops common protocols that promote evolution and interoperability of the WWW, and sets standards for Web accessibility.

The proposed solution

In an offline learning environment students are able to discuss issues with lecturers and peers, and in the case of the CVD issue, were able to interview a colour blind student. However, these options are not available to online students studying in remote or rural areas. To offer online and external students a similar learning experience the authors set out to develop a series of learning modules that could be used in conjunction with a WebCT or Blackboard learning environment, or to delivered on CD ROM for students without internet access.

Supporting the project was a Teaching and Learning Grant received by the authors in 2001 to work on the development of reusable interactive e-learning modules to support students' learning of new applications, mastery of difficult concepts and modification of mental models, such as the colour-blindness issue as described earlier. The project included designing prototype modules with interactive elements from a variety of sources implemented in Quicktime with audio and text annotations. One of the key aspects of this Teaching and Learning Grant project was the requirement that the e-learning modules be easily developed by faculty staff without any multimedia programming skills or high tech equipment. This introduced an additional challenge of having to think in terms of what is 'easy to create, effective and accessible' for most staff venturing into online teaching, rather than considering state of the art high tech options that can not be easily modified or replicated with minimal cost to a faculty.

Figure 1: Colour Vision Deficiency (CVD) Awareness Problem



Three prototype e-learning modules were designed and developed using the example topic of ‘Awareness of Colour Vision Deficiency’ which was known to be a problematic topic for students studying Web design and results in a range of student misconceptions. Figure 1: ‘Colour Vision Deficiency (CVD) Awareness Problem’ illustrates the application of e-learning modules designed for this topic in combination with a range of learning activities.

E-learning Module 1 – The CVD Experience

The first e-learning module was designed using video clips of an interview with a person with CVD. The module identifies the type of CVD (red/green) and displays a range of images which are then described by the person with CVD with their perceptions of the colours that they anticipate are in the picture. The e-learning modules allow the images to be displayed to the user in both their actual colours and in a format simulating the colours actually seen by the person with CVD. Students are presented with examples illustrating cases where CVD may not pose a problem (ie ‘grass is always green’) and cases where CVD results in quite a different interpretation of the colours and their meaning (ie Blue waves in an image represent water to a person with CVD. But what if the waves are actually red? What do they symbolise then, and do they actually symbolise anything at all?). The students are also able to observe the effects of surrounding colours and the fact that a “haptic illusion” can occur where the senses are tricked.

E-learning Module 2 – Student Perceptions of CVD

The second e-learning module comprises a series of student interviews whereby students in pairs were asked to interview each other to find out what they know about CVD. The resulting student interview video clips illustrate a range of responses ranging from knowledge of aspects of CVD to total misconceptions and clearly erroneous mental models of CVD. Figure 2 lists the series of questions used in the student interviews.

1. What do you think colour blindness is?
2. How do you think it affects people?
3. What are the problems associated with colour blindness?
4. Do you know the different types of colour blindness?
5. What do Red & Green colour blind people see?
6. What do Blue and Yellow colour blind people see?
7. What is your major/ double major?
8. Do you think you need to be aware of colour blindness in your proposed field of work?

Figure 2. Student Interview Questions

E-learning Module 3 – CVD and Web usability

The third prototype e-learning module presented the students with examples and issues showing the importance of an awareness of CVD in the field of designing for web usability. In this module they saw examples of webpages and how these are viewed by a person with CVD.

As stated earlier, Figure 1 shows potential applications of the modules with an introductory Web design class. Students were initially asked to participate in a pre-test survey which, in the form of an online quiz, collected answers to questions designed to establish their level of awareness of CVD and a snapshot of their current mental model of CVD. The results of this survey were anonymous, but students were asked to identify themselves with a 'nickname' which was used both in this pre-test survey and then in the subsequent post-test surveys and allowed the researchers to match all responses relating to the same student and establish whether a change of mental model took place.

Following the pre-test students were presented with the first e-learning module featuring interviews with the person with CVD and images as viewed with and without CVD. Students were then given the opportunity to discuss their own views of CVD face-to-face in the on campus group, or online for both the on campus and external groups. They were also given the opportunity to further research the topic of CVD, and CVD issues relating to webpage design through a series of web links and were offered opportunities to conduct their own research via a range of sources both online and print-based. Students who were keen to further explore the way images appear to a person with CVD were directed to the Vischeck website to download or use the online CVD simulation software. It was hoped that they would thus become alerted to the issues of CVD and interested in finding out more about it, particularly in relation to their chosen field of study which included in most cases website design and marketing.

Students were then presented with the second e-learning module which featured student interviews on the topic of CVD as described above, and asked to identify the incorrect mental models of CVD that become evident through the student interviews. At this point students were also encouraged to try to establish what the 'correct' mental model of CVD is. For example, what does a person with red and green colour blindness see when presented with items that are red and green? They were given the opportunity to discuss this face-to-face or online and collectively agree on what the correct mental model should be. The lecturer moderated the discussion and identified any areas of difficulty and misconceptions that may lead to the development of an erroneous mental model.

The third e-learning module was used to alert students to some of the pitfalls of designing websites without considering CVD and to give them some guidelines to follow. From this point onwards students were expected to start applying their knowledge of CVD in webdesign. A range of learning activities that could be undertaken by the students were considered, starting with an exercise in critiquing websites from the point of view of catering for people with CVD; group projects to build a website about CVD; or establishing guidelines for website designers to design quality websites that are user-friendly for colourvision deficient users.

Students subsequently completed the Awareness of CVD survey for the second time and the data collected was analysed to identify any change in their mental models. Students were exposed to the CVD problem in the early part of the semester and a delayed post-test survey was taken in the final week of semester allowing the lecturer to establish whether there was any further change in student's mental models of CVD.

Implementation of the e-learning modules

Technical investigations resulted in the e-learning modules being produced using a combination of Quicktime Pro and Microsoft PowerPoint 2001 (Macintosh) which supported the embedding of Quicktime based video clips within a PowerPoint presentation (allowing for the easy addition of text and graphics). This was then converted with a simple save operation into a Quicktime movie with embedded Quicktime video. This process gave rise to a non-hightech development solution accessible to staff using Office 2001, resulting in the quick and easy development of Quicktime Pro e-learning modules. The resulting Quicktime movie can be edited with Quicktime Pro and additional tracks added to the finished product at a later date. However, the use of PowerPoint as the initial e-learning module design environment was considered by the designers to be particularly attractive as it is a tool that most academic staff are comfortable with using and hence the opportunities for takeup amongst staff of e-learning module creation is promising. E-learning module design could range from very basic to potentially sophisticated depending on the designer's creativity and resources available. For example, Quicktime movies created based on PowerPoint presentations can include multiple images per slide, embedded filmclips with static images in the background, sound and voiceover tracks, hotlinks to other Quicktime movies and hyperlinks to websites. With the potential to develop Quicktime movies using a range of other sources and the ability to edit these to combine movie segments into sophisticated e-learning modules, we believe that this provides a foundation for a wide range of development opportunities that are in essence a mainstream easily accessible solution.

The Quicktime-based modules can be provided to students on CD ROM, downloaded from a WebCT or Blackboard environment, delivered online in smaller segments or streamed to students.

We chose Quicktime as an e-learning module vehicle for students primarily as it was non-platform specific, very easy for students to manipulate and particularly offers students the option to return to specific areas of an e-learning module to replay segments as many times as they wish. A negative aspect of this solution was the potentially large file sizes of the final Quicktime movie modules. We address this problem by providing full length modules on CD ROM with only short 'teaser' segments available online.

Survey Results

Figure 3: E-learning module trial illustrates the evaluation process. 103 students were tested on the e-learning modules. Preliminary results indicate that 93% (97 students) of the students appeared to completely change their mental models over the short term (6-8 weeks), acquiring a fairly accurate picture of what CVD involved. 5% of students

did not change their mental model, and 2% achieved a worse score on their post-test than on their pre-test.

In the pre-test 97 students scored between 0% and 20%, 48 of them having never heard of colour blindness. These students did therefore not have a prior mental model, but immediately began to form one from the term “colour blindness”. In their written descriptions of colour blindness or colour vision deficiency, they hypothesized with explanations such as “if a person is colour blind, and there is a girl in a red jumper, the person will not see the girl”, and “instead of seeing golden arches at McDonalds, a colour blind person might see pink arches or something” were common. 14 (13.5%) students interpreted colour vision deficiency as not being able to see colour at all. Of the remaining 6 students, 1 had CVD, so scored high in the test, and the other 5 scored between 70% and 90% on the test.

All of these students were tracked for the post-test, and scored between 75% to 95%. Their written explanations of colour blindness were more cogent, and many referred to the video of the interview with the colour blind person.

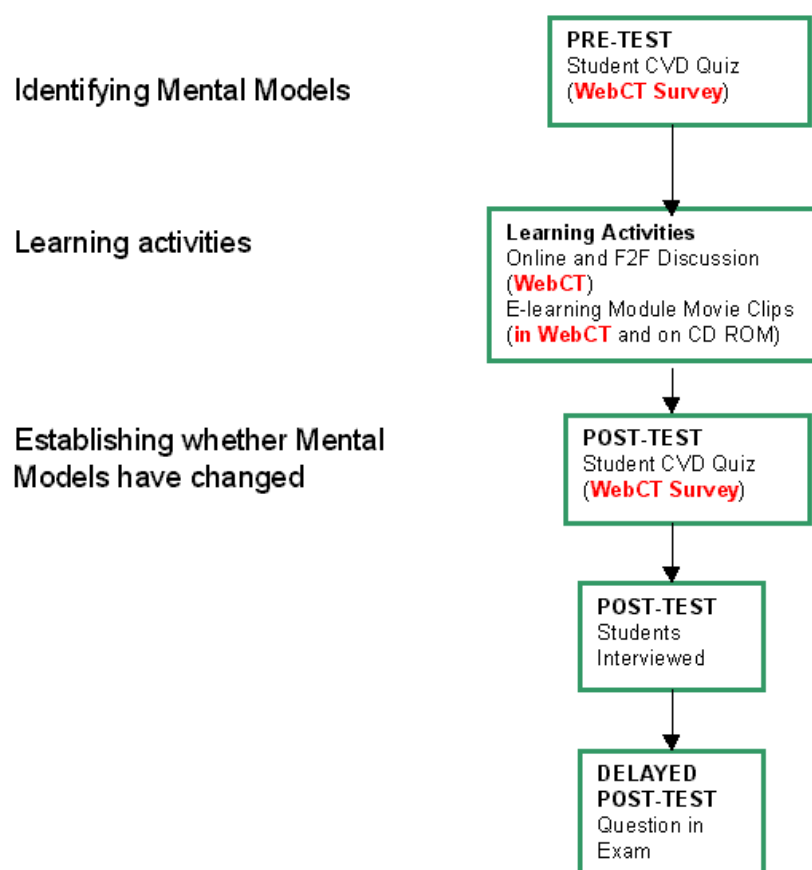


Figure 3. E-learning module trial

63 students have so far undertaken the delayed post-test, and of these, 58 students achieved identical scores to their post-test. This represents almost 95% of students having acquired the correct mental models for CVD (2% more than in the post-test).

The growth in percentage of correct scores was not explicable without interviewing the students. This is proposed in the next stage of the evaluation process.

Students were asked about the learning process and 100% claimed that they enjoyed using the modules, that they could identify with Peter (the interviewee), and that he made CVD concepts understandable. About 60%, however, disliked the student interviews, claiming that they would rather view videos of people with CVD, than other students talking about their own mental models. Future iterations of the unit will reduce the emphasis on students and include another interview with a person with a different type of CVD. The students were also interested that the simulations did not always match with what Peter saw. This had the potential to create problems with their web page design, so a further, small module on the impact of colours on each other was introduced.

When asked, the students generally felt that their learning experience had been enhanced by the use of the e-modules. As one student said: “the pre- and post-test gave me concrete evidence of how I didn’t know much, and now I can see that my understanding has changed incredibly”. Another stated: “you could do all this in a lecture, it would take twice as long to say it all, and it wouldn’t have the impact – Peter’s comments like the grass comment, came back to me in the exam, it made the discussion on the question so easy”.

The students also enjoyed being able to review the material, as evidenced by the following comments: “I went over it a few times and then I read the articles you gave us side by side with the video, it made them [the articles] more meaningful”, and “Much better than just listening to a lecture (no offence), but you can’t hit the replay button if you fall asleep for a minute. I used the videos a few times, specially before the exam. It would be good if everything could be done like this, but I can see it’s a bit impractical”. Another student, who was studying completely online, had the following to say: “they [the videos] broke up having to read the articles. I looked at the videos, read the articles, then looked at the videos again. I felt less left out somehow”.

There were two students who did not enjoy the videos: “I would rather read the articles than look at a video, didn’t add much”, and “they were ok, I still can’t see why I need to know this stuff. If someone’s blind, why do we have to worry?”. This student was one of the few whose mental model did not change!

Conclusions

Overall, it was felt that the improvement in the mental model, and subsequent improvement in the exam score for that topic, justified the effort in making the videos. The workshop on e-modules conducted for staff at ECU has now produced e-modules in other units, and is the topic of a further grant application by a different group of staff.

Although the e-learning modules utilise simple technologies, they were found to enhance student engagement with the topic, and did succeed in increasing their understanding and fundamentally changing their mental models of CVD.

The project addressed an area of teaching and learning that is of concern to most lecturers teaching externally and online, that of addressing incorrect mental models. It will also be useful in teaching difficult concepts online, as it will give students an alternative source and format of information. As the e-learning module solution developed is not high-tech, and does not require any interactive multimedia programming or technical expertise, it is a solution that will be accessible to almost all staff. A facility for academic staff to be able to generate and edit digital video footage is being setup in the Faculty of Business and Public Management at Edith Cowan University. This facility will greatly improve the opportunities for development and overall accessibility of video media in this faculty. Staff will be able to develop their own e-learning modules with or without embedded Quicktime Video and deliver these to students in a variety of formats, on CD ROM or online. The authors intend to run a series of training workshops to assist staff in creating their own e-learning modules and to provide educational design advice in adapting the CVD model solution to other areas where lecturers wish to address learning difficulties and misconceptions.

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The recent terrorist tragedies in Kenya (2001), New York, Washington (s9/11), Bali (2002), Morocco and Saudi Arabia (2003) have emphasised the need for high quality professional education in security risk and security technology for the protection of assets. As a result, the demand for Security Science courses in the national and international contexts is high. Security Science in the School of Engineering and Mathematics at Edith Cowan University has been providing professional education for the protection of assets at international and national domains. This project is an extension of these courses and has developed the online learning resources for the four security science units of the Graduate Certificate in Security.

The materials in the course have unique attributes as they were specifically designed to provide simulations and interactivity in the learning process. The physical security unit will be presented to illustrate the development of the online course, with learning strategies and interactive activities presented. Features of the Mode B online units in the course include graphics, simulations, and videos to present aspects of security that are not normally available to students.

The characteristic of uniqueness of the online course is a consequence of content of the units, and the application in the protection of assets. The strategies of graphics, simulations, and interactive activities will be applied to the following learning activities:

- *Defence in Depth principle.*
- *Security lighting.*
- *Flowchart application to Defence in Depth.*

Field scenarios have been developed for the activities to make the learning experiences as realistic as possible. The simulations and graphics provide these experiences, together with security site images for actual security barriers, systems and technologies. The philosophy and pedagogy underlying the design and development of these Security Science online units is provided with examples of the interactive activities from the Physical security unit.

Terrorism to training

The recent terrorist tragedies in Kenya (2001), New York, Washington (9/11), Bali (2002), Morocco and Saudi Arabia (2003) have emphasised the need for high quality professional education in security risk and security technology for the protection of human and physical assets. These events have focussed national and international attention on the necessity for professional security education and training for government, private organisations, and community services. Although the extent of the security industry in Australia is considerable (five fold on the total of all police services in Australia), it has a relatively small professional component of education and training.

Since the terrorism events, international and Australian governments have realised the necessity for professional training of personnel in security technology, security management, and security risk to protect assets in security facilities. The Security Science programme in the School of Engineering and Mathematics at Edith Cowan University (ECU) has been established on the themes of security technology and security risk. These courses have been offered at ECU for about eight years, and have developed both a national and international reputation for quality. Security Science at ECU is widely recognised by government and industry as the foremost security programme in Australia.

All Security Science courses (except for research based courses) are currently being delivered by distance learning, using print-based materials. As a consequence, Security Science has distance education students on all continents, as well as the eastern states of Australia. The terrorist events in USA and Bali will have the effect of considerably increasing the demand for Security Science courses, through national and international marketing initiatives.

ECU Strategic Online Projects

Strategic Online Projects target courses are of particular importance for ECU because of their potential to function as high-quality exemplars and to generate revenue above costs. To progress this initiative, the University has contributed 50 percent of the development cost for a select group of online courses. The Strategic Online Projects was selected through a competitive process where proposals were required to demonstrate how they would meet specified objectives:

- The products created will demonstrate high quality DEST Mode B (online with other learning resources) and Mode C (exclusively online) teaching and learning.
- The products created will generate income through enrolment.
- The projects will incorporate relevant professional development and course improvement to meet ECU's Online Quality Guidelines (http://www.ecu.edu.au/lds/rd/units/quality_guidelines.html).

Key Features of Successful Strategic Online Projects

As these projects progress, factors are being identified that appear to contribute significantly to their success, including:

- 1 Project leaders and teams have had prior online teaching experience. They have a good sense of the scope of work that is required, and can anticipate what is needed for effective online units.
- 2 Project staff engage fully in planning the online learning environment they want to create, and developing unit specifications. This work happens before any unit development begins, and typically consumes most of the first semester of the project.
- 3 Staff charged with adapting or developing online units are given substantial released/assigned time to do this work. This is essential for ensuring the creation of high-quality learning environments, rather than just transposing existing print materials onto the Web. Unit development begins in the first semester, but most occurs during the second semester. It is critical that project leaders and Heads of Schools work to assure that team members share released/assigned time slots for project work, especially in the second semester.
- 4 Learning and Development Services (LDS) resources and services are used judiciously. Expectations are appropriate. For instance, projects do not book development services until they are ready to embark on unit development. Project leaders understand the roles of Instructional Designers as consultants and facilitators. Project teams engage in appropriate professional development before embarking on unit development.

[\(http://www.ecu.edu.au/lds/rd/sop/\)](http://www.ecu.edu.au/lds/rd/sop/)

Structure of the course

Security at ECU has been providing face to face professional education for the protection of human and physical assets in the international and national domains for over 10 years. This project is an extension of these courses and has developed the online learning resources for the four security science units of the Graduate/Executive Certificate in Security Management, which comprises:

- **Physical Security** will develop an understanding of the principles and applications of technology used in physical security systems. The scientific foundation for physical security technology in modern security applications and techniques has been presented. The technology treated will include: locks, safes, strong rooms, perimeter protection, structural strength of buildings, vehicle control, physical barriers, and properties of material of security protection.
- **Security and Risk Management** introduces the student to security and risk management concepts, and examines the development of security, and the application of criminological theory to security. An introduction to risk theory, and the assessment, analysis and management applied to risk will develop the requirements for conducting and documenting security surveys. An introduction to crisis management theory, security planning, policy and procedures will be presented.

- **Electronic Security 1** develops and outlines the principles underlying applications of electronic security technology for the protection of assets of an organisation. As the security technologies and devices become more sophisticated, so increases the need for law enforcement agencies and security professionals to have a comprehensive knowledge and understanding of security technology principles and practices. This unit develops an understanding of the principles and applications of technology used in security systems. It includes the scientific foundation for security technology in barrier detection, open ground detection, and intruder detection systems.
- **Facility Management 1** will be introduced with emphasis placed on the interaction between fire protection and technology management of large facilities. Fire protection will include detection systems, alarm systems, codes and standards, high-rise fire management, industrial fire management and evacuation procedures. Technology management systems include the topics of energy management and light control, air conditioning systems, lifts and escalators, and audio system control.

Both the Graduate and Executive Certificates in Security Management courses seek to provide the content and generic skills and the knowledge necessary for the protection of the assets of organisations, and individuals through appropriate learning activities. The course provides the principles underlying the protection of assets of an organisation, and will encourage the learner to seek examples and applications of the security practices in the community consistent with ECU's preference for constructivist learning practices. ECU is committed to a constructivist approach to learning for both face-to-face and online learning (Steffe & Gale, 1995).

This design primarily adopted *exogenous constructivism* (Moshman, 1986) approach which recognizes the role of direct instruction but emphasizes learners directly constructing knowledge representations (Dalgarno, 1996). Elements of *endogenous constructivism* (Moshman, 1986) were also incorporated into the design in the form of simulations that allowed the learner to explore aspects of the security world first hand (Dalgarno, 1996).

For example, the *Defence in Depth principle* simulation (Figure 3) requires learners to develop their own physical, psychological and procedural methods to deter attacks on a facility. Matching and grouping of symbols allows the learner to get feedback on their knowledge constructs. Another example is the *Security Lighting Simulation* (Figure 5) activity which permits students to test and evaluate the effects of street lighting through colour rendition on a typical street scene. This simulation provides learners with realistic security scenario to apply the information about illumination.

The field of security, in addition to the subject/professional knowledge, embraces a large number of generic skills preparing students for a variety of careers in government agencies, social services and industry. The knowledge domains to be addressed by each component of the course have been endorsed by expert committees to meet the accreditation requirements for core areas of learning.

The Graduate/Executive Certificate in Security Management course seeks to provide the content, generic skills and the knowledge necessary to protect the assets of organisations and individuals through appropriate learning activities. These units emphasis the application of professional best practice through reducing the risk of

asset loss from high threat situations. The course provides the concepts and principles underlying the protection of assets of an organisation, and will encourage the learner to seek examples and applications of the security practices in the community.

Graduate/Executive Certificate Security Management units are also presented in the Diploma courses and the Bachelor of Science courses. This project is an extension of these courses. Online learning resources are being developed for the four security science units of the Graduate Certificate in Security Management. Multiple benefits can be achieved by the development of the units with common course content that can be delivered over the web.

Conducting a training needs analysis is an established starting point for the instructional design process. ECU's strong market focus and this analysis was highly motivated by the opportunity to generate revenue from the Security course.

Needs analysis

The Security Science programme is one of a very small number of high quality security education courses in the international context. The strengths of the ECU programme are the major emphases on security risk, security technology, and security management and so provide a comprehensive professional education for government, commercial and industrial security management and consultancies. Demand for Security Science courses is high in both the national and international contexts.

As the amount of crime continues to increase and it impacts on the community in financial and social terms, so does the need for better strategies of protecting assets increases (Smith & Robinson, 1999). Communities and individuals have always used physical security methods to protect their valuables, a trend that continues in this era. However, as the tools and devices available to criminal elements become more sophisticated, then law enforcement agencies and security professionals need to have a comprehensive knowledge and understanding of the threats, risks, and security principles necessary to protect the assets of society.

The need for the proposed online development of two Security Science technology units in the Graduate Certificate in Security Management can be demonstrated by the following sources of potential enrolments by full fee-paying students:

- Graduate/Executive Certificate in Security Management in eastern Australia and international locations.
- Graduate Diploma of Science (Security Science) in eastern Australia and international locations.
- Distance learning enrolments in Bachelor of Science (Security) locally, eastern Australia and international locations.
- International enrollees for Bachelor of Science (Security), Graduate/Executive Certificate in Security Management, and Graduate Diploma of Science (Security Science) from major international companies.
- Discussions are currently occurring with Hong Kong Police for Security Science programmes.

The security market

The market for the Security Science courses is extensive both within Australia, and in the international context. All forms of work and leisure in the community have a security component that needs to be planned and implemented. The national and international demand for professional security managers and consultants is increasing rapidly, with a scarcity of high quality education and training programmes in the international context. Effective training is becoming increasingly important to Australian industry because of the legal responsibility of a company to ensure that employees have adequate training to carry out their work safely and the need to achieve a competitive advantage through increased productivity (Hosie, 1993).

ECU's Security Science courses are recognised to have high status by government agencies, employers, and current students. Security Science has provided courses for government agencies such as ASIO and Defence Security. There is no direct national or international competitor (only marginal competitors) for the Security Science programme at ECU, with the themes of security risk, security technology, and security management. There are no competitors of online delivery of security courses. The development of online security units will be well received by the international security industry. As a consequence, information technology is a potential source of competitive advantage for delivering courses internationally in the education industry (Hosie & Mazzarol, 1999).

The field of security, in addition to the subject/professional knowledge, embraces a large number of generic skills preparing students for a variety of careers in government agencies, social services and industry. The knowledge domains to be addressed by each component of the Graduate/Executive Certificate in Security Science have been considered for professional accreditation. The formal knowledge of security processes provides an ideal basis for specific graduate attributes.

Major learning outcomes: Graduate Attributes

According to ECU's Academic Board, the responsibility for embedding Graduate Attributes into the curriculum falls to the Faculties who are encouraged to address the first group of four ECU specific graduate attributes as a first priority. LDS Instructional Designers have developed an interpretation of the graduate attributes. Table 1 sets out the focus areas of Graduate Attributes of each unit in the course.

Mapping the appropriate graduate attributes across the course provides a framework for structuring learning events and learning outcomes. This may be achieved by documenting what is common practice across the curriculum and then planning to extend the development of attributes in later semesters.

Table 1

Graduate Attributes: Focus of units in the Graduate /Executive Certificate in Security Science

Graduate Attributes										
Units	Core Attributes					Generic Attributes				
	Enterprise, Initiative & Creativity	Professional Knowledge	Service	Workplace Experience or Applied Competencies	Awareness of Political, Social & Ethical Issues	Communication	Internationalisation/ Cross Cultural Awareness	Problem Solving/ Decision Making	Teamwork	Use of Technology Information Literacy
SCY 1103/4103 Physical Security		✓	✓	✓		✓		✓	✓	✓
SCY 2104/4104 Electronic Security 1		✓	✓	✓		✓		✓		✓
SCY 1101/4101 Security and Risk Management	✓	✓	✓	✓	✓	✓	✓	✓	✓	
SCY 1202/4202 Facility Management 1		✓	✓			✓		✓	✓	✓

It is not expected that all 10 attributes is to be embedded in every unit. Rather, it is expected that by the time a student graduates they have acquired all 10 of the attributes by virtue of having completed an ECU course. However, University documentation on graduate attributes should not be interpreted as reasonably giving the impression that ECU was giving an implied guarantee that its graduates will in fact possess such attributes.

LDS Instructional Design process

Course development facilitated by the LDS Instructional Design process can ensure compliance with the Quality Assurance framework that will support the creation of effective and innovative learning environments and quality learning resources. Figure 1 represents an overview of the process of course design and development documentation that form part of the LDS Instructional Design quality process.

(http://www.ecu.edu.au/lds/pdf/course_design.pdf)

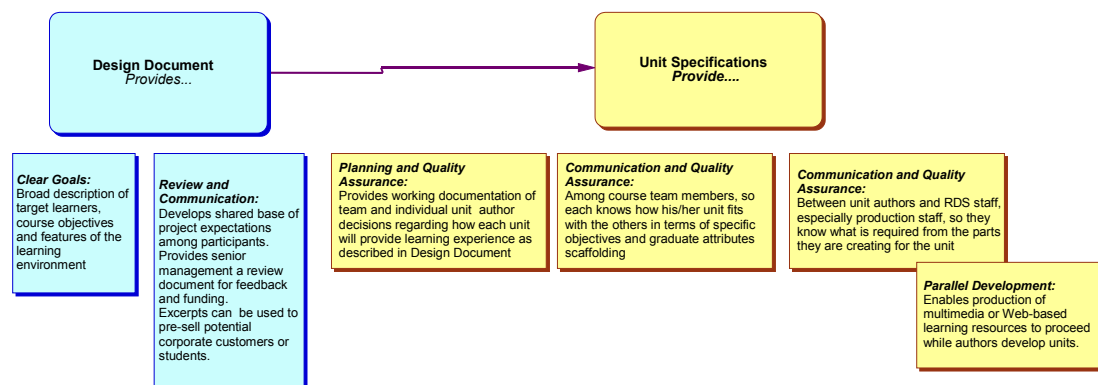


Figure 1. ECU Learning and Development Services course design and development documentation

Online delivery

The online version of the Graduate/Executive Certificate in Security Management course will also allow ease of distribution in the international context. Instruction has been sequenced within modules and within units of the course. Interactive multimedia is being used in the mode B instruction to simulate real world models, and to build scenarios with common experiences as a basis for feedback for these learning activities.

Levels of online learning

Until recently there were no common definitions for describing the different types of "onlineness". Definitions offered by institutions or individuals offered little basis for comparison or usefulness for articulating strategy and developing subsequent business processes. The Australian Federal Department of Employment Training and Youth Affairs's latest version of their survey instrument describes three modes of online – Web Supplemented, Web Dependent and Fully Online, as presented in Table 2.

The units in the course will be offered in Mode B and will therefore include some compulsory online components, as well as face-to-face lectures/workshops. Some print-based resources may remain until such time as suitable online/digital resources have been sourced and made available. To ensure that the project meets the Mode B requirement, assignments have been structured for incremental submission and formative feedback from peers and tutors before final submission for marking.

Table 2
DETYA Online Unit Definitions

Mode	Definition
Mode A – Web Supplemented	Participation online is optional for the student. Enrolled students can access information on units of study that is additional to that available in the university's calendar or handbook. The information may include course descriptions and study guides, examination information, assessment overview, reading lists and other online learning resources. The information is used to supplement traditional forms of delivery.
Mode B – Web Dependent	Participation online for each activity described in (i), (ii) or (iii) below is a compulsory requirement of participation although some face-to-face component is retained (i) students must use the web to interact with the education content necessary for study (ii) students must use the web to communicate with staff and/or other students (iii) students must use the web both to interact with content and to communicate with staff and/or other students
Mode C – Fully Online	There is no face-to-face component. All interactions with staff and students, education content, learning activities, assessment and support services are integrated and delivered online.

Assignments will be submitted for assessment through the Digital Drop Box facility in Blackboard. The Drop Box facility permits students to submit files to a tutor and for the tutor to retrieve and return files to students. The facility also permits the tutor to upload files for a particular student or the entire class. For students, the Drop Box is bi-directional, permitting students to transfer files to the tutor and the tutor to send files to that student. The tutor's Drop Box is multidirectional. Tutors can receive files from students enrolled in the online course and send them onto any individual student, or opt to deliver a file to all students.

Interactive multimedia

Features in the course include graphics, simulations, and videos to present aspects of security that are not normally available in this combination to students. The characteristic of uniqueness of the online course is a consequence of content of the units, and the application in the protection of assets. The strategies of graphics, simulations, and interactivities will be applied to the following learning activities:

- Defence in Depth principle.
- Flowchart application to Defence in Depth.
- Security lighting simulation.
- Video clips.

Multimedia Materials being developed for the course by LDS Interactive Multimedia staff have unique attributes as they are specifically designed to provide simulations

and interactivity in the learning process. Features of the online course include graphics, simulations, and videos to present aspects of security that are not normally available to students. The physical security unit will be presented to illustrate the development of the online course, with learning strategies and interactive activities presented. Field scenarios have been developed for the activities to make the learning experiences as realistic as possible. The simulations and graphics provide these experiences, together with security site images for actual security barriers, systems and technologies.

Graphical animation

The principle of Defence in Depth applied to a facility or building will have a succession of barriers to protect the valuable assets of the organisation. The strategy of a succession of barriers can be applied to a commercial or industrial situation to prevent access by intruders. Field scenarios have been developed for the activities to make the learning experiences as realistic as possible. The simulations and graphics provide these experiences, together with security site images for actual security barriers, systems and technologies.

Defence in Depth principle

The purpose of physical security is to delay an intruder by barriers for sufficient time until a response group arrives to apprehend. This is best achieved by a series of barriers, rather than a strong single barrier. The principle of Defence in Depth imposes a succession of barriers, which require access, between the public and the resource (Figure 2).

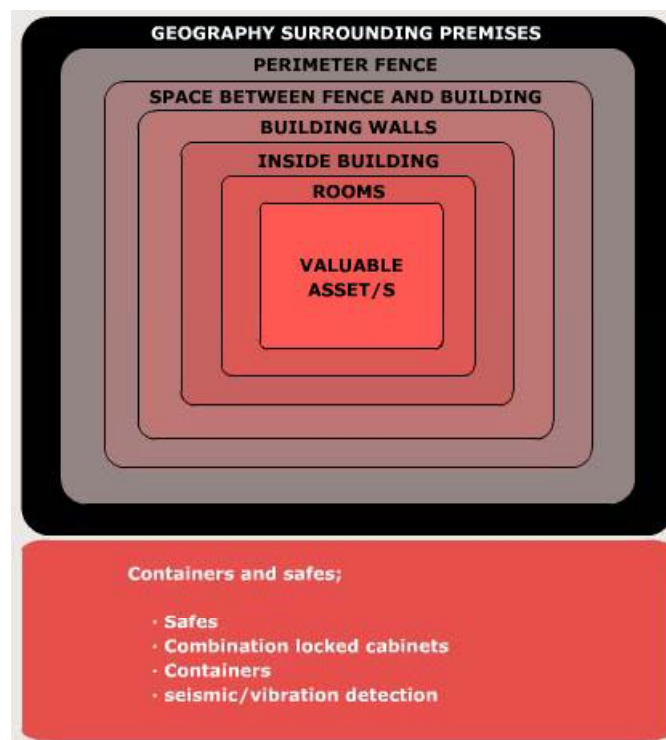


Figure 2. Defence in Depth principle where students drag and drop icons to construct the strategy.

This principle has been developed to gain time for the protection of a facility, and Figure 2 shows the conceptual presentation of the Defence in Depth principle applied to typical valuable assets of an organisation. In an associated activity (Figure 3), learners are instructed to drag and drop an icon barrier onto the appropriate physical description in the activity.



Figure 3. Defence in Depth principle

The flow chart activity in Figure 4 shows the paths taken for a successful deterrent to an attack on a facility. The diagram produced by successive clicking indicates input events and possible outcomes from the application of the functions of physical security through the Defence in Depth functions of **Deterrence**, **Detection**, **Delay**, and **Response**.

The Security Lighting Simulation activity provides an opportunity for students to test and evaluate the effects of street lighting through colour rendition on a typical street scene, with the intention of observing fine detail from the observation (Figure 5). The street scene appears as a view from the monitor of a CCTV camera with a reasonable field of view and depth of field in focus. You have the ability to change the lighting levels on the scene and to observe the degradation of information that you can observe as the intensity of illumination decreases. A record of objects that can not be observed with clarity should be made (for evidence in court!) by adjusting the levels of illumination and make judgements of the effectiveness of the camera image.

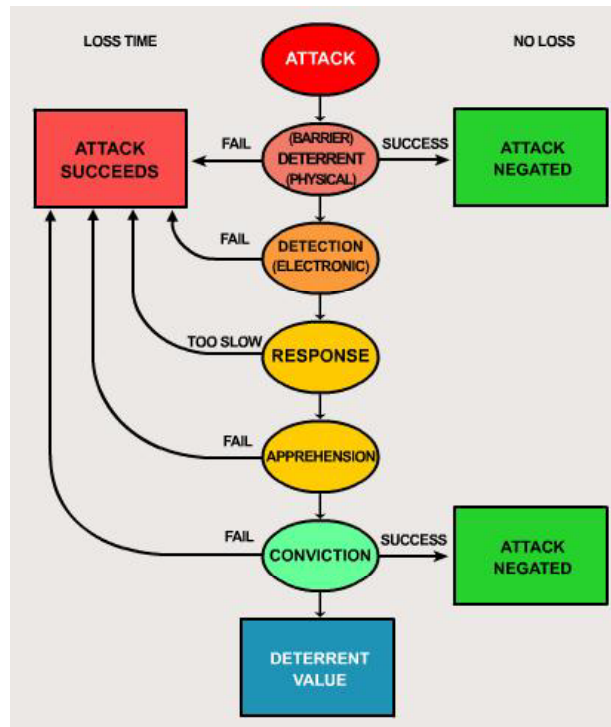


Figure 4. Generic flowchart application to Defence in Depth to a facility

Also the quality of the illumination can be changed to simulate the various types of lamps used in street lighting, such as mercury, sodium and metal halide. Learners are instructed to "Observe the colour rendering effects on the coloured objects that you observe with the range of street lighting available to you". Then, learners are instructed to "Again, record your observations in order to justify the appearance colours of the objects suffering colour rendition." As such, the security lighting simulation challenges learners to apply the information about the quality of illumination to a realistic security scenario. Learners are illuminated as they explore the various effects of each type and intensity of lights possible with this simulation.



Figure 5. Security lighting simulation of CCTV image of a street scene

A selection of video clips has been embedded into the online learning materials, in order to provide learners with scenes and images that would not normally be available in public to learners.

Figure 6 shows a video of a working model of the first constructed lock found in Egypt with a key and key code to uniquely operate the lock.

Egyptian Lock



Figure 6. An image from the video clip showing the operation of the first locking system.

My ECU and Blackboard

My ECU is the portal to online learning environments. It is a personal page and offers a number of customisable management tools. The page contains a number of modules of which the content is unique to each individual user.

Online Learning with My ECU

My ECU is the institution-wide online learning environment at ECU, developed and implemented using software called Blackboard. All currently enrolled students and currently employed staff can login to and use *My ECU*. It has a customisable home page and offers a number of personal management tools. The page displays a set of standard modules that contain content relevant to each individual user.

All ECU students obtain access to *My ECU* and its resources when they are enrolled via ECUWES, but only units that are created using Blackboard, and in which the student is enrolled, will be listed on *My ECU*. In a similar way, staff has access to *My ECU* when they are recorded as current ECU staff in the HR system, but only Blackboard units in which they have a role will be listed on *My ECU*.

[\(http://www.ecu.edu.au/MyECU/\)](http://www.ecu.edu.au/MyECU/)

What is Blackboard?

Blackboard is a suite of software products and services that enable and manage a virtual learning environment. The Blackboard software platform encompasses course management, academic portal and online campus communities. Blackboard was

chosen by ECU from a list of other similar products because of its flexibility and ease of use. As a Learning Management System, it:

- facilitates anytime access to study materials;
- assists in assessments and record-keeping associated with a unit or course;
- engages students in active and collaborative learning through asynchronous participation in discussion boards and group Web pages;
- provides contact with academic staff and among off-campus and international students through announcements, threaded discussions and e-mail;
- provides contact among academic staff and students between lecture sessions. Users can post announcements of late breaking changes to keep students and their class assignments up to date. They can administer quizzes and surveys online, and even have them scored automatically. Results can be posted online, accessible securely to each student. Students can also submit assignments electronically.

(http://www.ecu.edu.au/lds/rd/units/online/blackboard_ecu.html)

Online Elements

Other learning resources for the project units will be distributed to participants on CD, with online links to ECU and other relevant sites. The reading materials accompanying each of the units will initially be distributed in print form, and participants will be informed of all resources in print form.

Unit website structure

The Blackboard template will be used for all units of study in the project. The unit site structure in Blackboard will comprise a cohort-specific site. However, there is a possibility of setting up a common content site that can be shared with other cohorts enrolled in each of the units, but this should be considered with caution as the needs of international students in the International Diploma are likely to be specific rather than generic.

The initial configuration of unit web sites will provide for the essential online elements. Blackboard provides flexibility that will allow instructors to add other elements as required. Content and information will be located in the Blackboard default areas. Students will submit assignments for formative feedback and assessment using the electronic drop box facility. The Discussion Board will be used for enquires about administration of the unit and about learning resources. Contents and information posted in these areas will be applicable to the specific student cohort.

The Progressive Revelation function will be incorporated into the review questions, and then provide model responses after students have completed answers to the questions. A series of review questions have been provided for students to practice best responses in the learning process. The feedback for review questions is immediate, consistent and positive model responses for novice learners, which is intended not to overburden the lecturer.

Instructional Design

Flexible learning technologies have been embraced in the development of online security courses to orchestrate quality course delivery across boundaries at low cost (Mazzarol & Hosie, 1997). Well-conceived and implemented use of technology is a means by which training can be made more flexible and supportive of the principles of adult learning (Hosie, 1993). Courseware incorporating Technologically Mediated Learning needs to be professionally designed and evaluated, adopt effective learning strategies, and encourage a self-directed approach (Hosie, 1993). This view is also supported by Rossett and Barnett (1996), who maintain that basic instructional design principles must guide the development of computer-based training and recommend an approach based upon analysis, scenarios, discovery and expert advice.

A databank of learning objects has been created from available still and moving images to illustrate facets and activities in security that are either too dangerous, expensive or are inaccessible to students.

Assessment

Assessments have been designed to:

- Ensure that all objectives and competencies are assessed
- Provide a balance of online submissions and invigilated work, as a precaution against cheating
- Assign tasks that integrate the acquisition and application of professional knowledge with other competencies (eg. Interpersonal, communications, IT)
- Situate learning in contexts that have personal relevance to students wherever possible (eg. research, report, problem solving)

Pedagogies used in quality learning materials

Pedagogies include the learning activities that underpin learning with the various attributes described in this framework are intended to reflect the constructivist learning principles for resources and learning support, as detailed in the ECU's Teaching and Learning Management Plan.

ECU framework for assessing quality of online learning materials

A framework has been developed at ECU to provide a means for consistent assessment and evaluation of online learning materials. It has been designed in the form of a checklist of items considered to be the critical elements of effective learning environments. The framework is intended to provide users with the capacity to investigate the potential effectiveness of online units through a determination of the scope and extent of these critical elements.

Based on the attributes in Table 1, the online quality checklists have been developed for use in evaluating online learning materials to determine areas of strength and weakness. The checklists were not intended to be used to deliver a numeric score that provides a definitive evaluation of the courseware. Rather, this checklist is intended to

reflect and to indicate areas of the materials that are pedagogically strong and identify weaknesses that need further attention. A completed checklist will provide a detailed description to the user of the strengths and weaknesses of an online unit.

Checklist to evaluate Pedagogies, resources and delivery strategies.

The checklist is based upon the determination of critical elements within three main areas, which describe the complete online setting:

Pedagogies: the learning activities which underpin the unit;

Resources: the content and information which are provided for the learners; and

Delivery strategies: issues associated with the ways in which the course is delivered to the learners.

Procedures derived from ECU's Online Quality Guidelines will be incorporated into product reviews and the first offerings of the units. Analysis of findings, collected incrementally, should be used formatively to both revise existing materials and approaches, and to inform the design of new units. These units will be evaluated using a context bound approach (Hosie & Scibeci, 2002) and the ECU quality framework for assessing quality online learning materials (Oliver, Herrington, 2001; Herrington; Herrington; Oliver; Stoney, & Willis, 2001). The attributes and assessment framework developed by ECU Quality Online Working Group (March, 2001) describe the essential components of quality online learning materials. Oliver and Herrington (2001) and Herrington; Herrington; Oliver; Stoney, and Willis (2001) provide consideration of the critical elements within each of these sections and provide examples of how these elements can be manifested in on-line settings.

Conclusion

Rises in the incidence of global terrorism have underscored the need for high quality professional education in security risk and security technology. As a result, the demand is high for Security Science courses in the national and international contexts. Edith Cowan University delivers professional education for the protection of assets at international and national domains.

This article describes the philosophy and pedagogy informing the design and development of Security Science online units, and provide examples of the interactive activities from the Physical Security unit. Learning materials developed for this course have unique attributes as they were specifically designed to provide simulations and interactivity in the learning process. The Physical Security unit will be used to illustrate the development of the online learning strategies and interactive activities.

Australian Universities with offshore teaching programmes can gain a competitive advantage in international markets using existing and emerging information technologies to package and deliver interactive educational services on demand over long distances (Mazzarol & Hosie, 1997). The ECU Security Science programme is acknowledged to be a high quality programme by government and industry both within Australia and in the international context.

The Graduate/Executive Certificate in Security Management course seeks to provide the content and generic skills and the knowledge necessary for the protection of the assets of organisations, and individuals through appropriate learning activities. The course will provide the principles underlying the protection of assets of an organisation, and will encourage the learner to seek examples and applications of the security practices in the community. The emphasis of the unit will be on best practice through reducing the risk of asset loss from high threat situations.

The field of security, in addition to the subject/professional knowledge, embraces a large number of generic skills preparing students for a variety of careers in government agencies, social services and industry. The knowledge domains to be addressed by each component of the Graduate/Executive Certificate in Security Management are set out in the endorsed unit outlines and are further guided by accreditation requirements for core areas to be covered.

The market for the Security Science courses is extensive both within Australia and in the international context. The national and international demand for professional security managers and consultants is increasing rapidly, with a scarcity of high quality courses in the international context.

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Breaking down cross disciplinary barriers: Integrated teaching exercises



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This paper reviews the effect on student learning of a collaborative cross-disciplinary unit in the Faculty of the Built Environment, Art and Design at Curtin University of Technology. The concept of the unit is to link students of architecture and construction management together on an active learning exercise they undertake in teams. Industry teams that carry out projects are only assembled for the duration of the project lifecycle and this division can provide an environment that nurtures a negative culture of fragmentation. It is therefore hoped that this unit will encourage a culture of collaborative teamwork that the students will carry with them into industry. The exercise is based on a real project using a scenario that duplicates industry parameters as closely as possible. Students divide into project teams identical to those in industry that replicate the roles of architects, project managers, quantity surveyors and builders. Active learning exercises, based on actual scenarios, enable students to quickly develop problem-solving skills that can satisfy practicum requirements. Students feel more attuned to an exercise that involves a “real-life” situation such as a project they can visit and touch rather than have to imagine. The message continually emphasised to students is that project objectives, are more likely to be successfully delivered where professionals in the project team have collaborated. The structure of this unit is therefore developed with the aim of continuing that theme and to encourage a culture of integration and collaboration between the two disciplines of construction management and architecture.

Construction projects involve a unique process where the production phase is undertaken separately from the design phase. This demarcation has traditionally created a corresponding environment of division between various professions engaged on projects. Research has shown that where integrated strategies are used to manage project processes, many professional divisions can be avoided. However, the success of an integrated approach relies on extensive collaboration between members of the project team (APCC 2000).

The Department of Construction Management at Curtin University recognised the opportunity to introduce change by encouraging a collaborative culture amongst students, which they can carry into their working life. The message continually emphasised to students is that project objectives are more likely to be successfully delivered where professionals in the project team collaborate.

To examine the accuracy of this statement it was decided to pilot a new unit that brought together architecture and construction management students in a team exercise. The architectural students acted as the superintendent to the client and were required to produce fully detailed designs for the addition of sunscreens to the Health Services building on the Curtin University campus. Their professional role also required them to fully document the process being undertaken. The construction management students acted as the contractors carrying out construction of the building and also provide project management and quantity surveying services.

Although there is nothing new in team learning there did not appear to be any other undergraduate courses in Australia that integrate architecture and construction management. One of the major hurdles to overcome was finding a suitable vehicle to implement a team based cross-disciplinary collaborative exercise. Current final year students in the architectural and construction management streams are given the choice of several option units and it was decided to amalgamate two of these to create the new unit.

This paper describes the concept of linking students from the Departments of Architecture and Construction Management into groups to undertake a joint problem-based learning exercise.

Active Learning

Current developments in education, particularly IT, reflect the move away from traditional direct instruction by a single teacher to a more flexible learner-centred mode of delivery. According to Candy & Crebert (1991) it is vital that every attempt be made to prepare today's students to be the responsive, creative, adaptive and flexible learners that tomorrow will demand.

For this reason it was decided that the exercise for the collaborative unit should be based on a real building using a scenario that duplicated industry parameters as closely as possible. Active learning exercises, based on actual scenarios, enable students to quickly develop problem-solving skills that satisfy practicum requirements. Students feel more attuned to an exercise that involves a "real-life" situation such as a project they can touch rather than have to imagine.

This strategy will equip students for lifelong learning, but Reid (1999) emphasises that it will require shifting the normal emphasis from teacher-dominated instruction to self-directed and distributed learning. Active presentation, in lieu of passive, is also supported by Meyers & Jones (1993) and Rubin & Hebert (1998). Passive presentation involves storage of information by students memorising facts without much thought, or a surface approach. Active presentations emphasise thought rather than memory, the deep approach. Bligh (2000) goes even further and feels it behoves lecturers to lecture less, convince students of the intellectual aims of their courses and create opportunities, in lessons and outside, in which thinking can flourish.

Group Work

When effective group management processes are employed, clear assessment guidelines developed and communicated and valid and fair grading processes employed, the likelihood of positive learning outcomes and student satisfaction with group activities is significantly increased (James, McInnis & Devlin 2002). The conditions under which group work is conducted are crucial to its success:

Group work, under proper conditions, encourages peer learning and peer support and many studies validate the efficacy of peer learning. Under less than ideal conditions, group work can become the vehicle for acrimony, conflict and freeloading. It may also impose a host of unexpected stresses on, for example, students with overcrowded schedules living long distances from the University. (University of Wollongong assessment policy, 2002)

The educational benefits of students working cooperatively in groups are well recognised. However a further factor adding impetus to the development of the group collaborative unit is generated by industry. The construction management course at Curtin University is accredited by the Australian Institute of Building and the Australian Institute of Quantity Surveyors. Feedback from accreditation debriefing has revealed that industry requires graduates who possess teamwork skills. Curtin recognises this need as do James, McInnis & Devlin (2002) who state that employers value the teamwork and other generic skills that group work may help develop.

There are also sound educational reasons for requiring students to participate in group activities because it enhances student understanding. Group work provides an opportunity for students to clarify and refine their understanding of concepts through discussion and rehearsal with peers (James, McInnis & Devlin 2002).

Exercises develop the student's power of problem solving, analytical thinking and ability to interact in a group or team situation. Students will feel more attuned to an exercise that involves a real life situation such as that studied in a site visit. The problems posed in the exercise will take on a more meaningful role and the student's natural curiosity on how to solve them will be aroused much greater than if the exercise was based on a textbook or some fictional example (Meyers & Jones, 1993).

Group Selection

The groups for the unit were based on project teams identical to those in industry that replicated the roles of architects, project managers, quantity surveyors and builders. It was felt that the environment faced by professionals at work should be faithfully reproduced to maximise the value of the learning experience. This approach is supported by NCVER (1998) who feel it is vital that the rapidly changing nature of work and of learning at work is researched in such a way that it can be transmitted back into the academy, so that the required skills may be developed there.

Selection of the members of each group was not left to the students but was based on random selection process carried out by the four lecturers delivering the unit. It was felt that this method would avoid friends choosing each other and would replicate the unknown element of groups formed in industry.

Unit Format

The development and delivery of the new unit was carried out by two lecturers each from the departments of architecture and construction management. The unit was based on a real project in the form of the recently constructed Health Services Building located on the Curtin University campus. The scenario was that the project was at 80% completion, with two stages of the building in occupation but the client now required a variation to install sunscreens to the upper windows of the building.

The construction management students would act as the contractors carrying out construction of the building. They would provide project management services for the contractor but also act as quantity surveyors for the client. This unusual arrangement created added complications for the construction management students because they in effect had to wear two 'hats' at the same time. The situation was made feasible by allocating each student to two separate teams. In one team they acted as the contractor and in the second team they became quantity surveyors for the client. The value of this arrangement was that the student could see both sides of the argument at the same time and in fact most students agreed that it enhanced the value of their learning experience.

The architectural students acted as the superintendent to the client and were required to produce fully detailed designs for the sunscreens. Their professional role also required them to fully document the process being undertaken. However, unlike the norm in industry they were expected to involve the construction management students at all stages of their design process.

All teams were required to hold regular project meetings to discuss issues, submit minutes of the meetings, produce progress reports and then submit a final report covering the 14 week process they had undertaken during the semester.

Teaching Structure

The teaching structure of this unit was developed with the aim of promoting professional integration and encouraging a culture of collaboration between students of construction management and architecture. The teaching delivery format comprised a series of one hour lecture sessions followed by one hour tutorials where the students and lecturers discussed the project in their project groups. The topics discussed in the tutorial sessions were teased-out during discussion and feedback from the lecture sessions.

Assessment

Assessment of the unit was based on several components all of which were subject to a mark. The Architectural students were required to produce the following components all of which carried an individual mark:

- Initial outline sketch design
- Estimate of cost of variation
- Final approved detailed design

- Agreed quotation
- Final written report to the client.

The construction management students were required to produce:

- A series of four reports and minutes from the project group discussions
- A series of four interim progress reports
- Fully detailed cost breakdowns
- Final report describing the process carried out during all 14 weeks.

The report is not a simple representation of what the students observed during the site visit, but is required to contain an analysis of the project covering program, site management, technology and finance. The groups identify any perceived or actual problems and address those issues with a view to offering strategies and initiatives to resolve them.

The purpose of the exercise was clearly defined and the desired outcomes explained and explored before commencing. The problems the students were expected to address included program overruns, budget overspend, site methods, site management and technical problems. Ample time was allowed in the tutorial sessions to encourage group discussion, problem analysis and solving. After analysis, each group discussed their findings with the lecturers in individual group tutorials.

The lectures took on the form of a general meeting in industry allowing full interaction of the whole class at any stage of the topic being discussed. It was felt that this format allowed for a fuller and freer exchange of views and ideas by the students. Questions were raised after each presentation and a general discussion held at the end of the tutorial.

Methodology

As the unit was in effect a pilot study of cross-disciplinary collaborative teaching it was essential to obtain regular feedback from students concerning the success or failures of their learning experiences. At the end of each weekly session students were given the opportunity to ask any general questions about the unit and encouraged to give full and frank criticism of any problem areas. Where possible, this feedback was used to modify the content or delivery approach used in subsequent weeks.

Also, a questionnaire was used to obtain student feedback concerning the success or failure of the unit. In particular they were asked to provide their views of the success of providing positive learning outcomes and to identify any areas of the unit that required modification.

Analysis

Question 1. Students' views of working in teams.

Question 1 asked the students how effective the unit was in teaching the advantages or disadvantages of working in project teams. A six stage Likert scale was used to measure the degree to which students saw the effectiveness of team learning. Position 1 on the scale indicated that team learning was very effective whereas position 6 indicated that it was very ineffective.

The results of answers received to Question 1 are summarised in Table 1. And with over 73% in the range from slightly to very effective there is obviously significant student support for the effectiveness of team learning. Only a few students provided further written comment to the question in the space provided. However, in the main, they referred to the benefit of being able to experience the role of other professions in the team and to appreciate the problems that they had to deal with.

Table 1

The effectiveness of working in teams.

Very effective	Quite effective	Slightly effective	Slightly ineffective	Quite ineffective	Very ineffective
6	15	9	5	3	3
14.60%	36.60%	22.00%	12.20%	7.30%	7.30%

Question 2. Negative and positive experiences of the unit.

Question 2 asked the students whether their experiences of working with the other disciplines been positive or negative? A six stage Likert scale was used to indicate whether student's experiences had been positive or negative. Position 1 on the scale indicated that their experience had been very negative whereas position 6 indicated that it was very positive.

The results of the answers to Question 2 are summarised in Table 2 where it can be seen that over 68% of the students found the experience of working in a team to be a positive one. Of the students surveyed about 20% cited a number of reasons that made the team experience a negative one. Most of the students in this group had experienced some problems with other team members being absent from the weekly meetings which they felt reduced the positive outcomes of working in teams. A small number of students also felt that the contribution made by some team members was much less than their own which created inequity. This problem was discussed with the students but it was felt that no further action was required by the lecturers as all assessments were individual.

Table 2
Positive and negative experiences

Very positive	Quite positive	Slightly positive	Slightly negative	Quite negative	Very negative
5	9	14	5	5	3
12.20%	22.00%	34.10%	12.20%	12.20%	7.30%

Question3 Cross-disciplinary collaboration.

Question 3 asked the students whether they agree that the unit provides a valuable opportunity for cross-disciplinary collaboration. A six stage Likert scale was used to indicate the value that students attached to the collaborative exercise. Position 1 on the scale indicated that they strongly agreed that it was a valuable opportunity whereas position 6 indicated that they strongly disagreed.

The results of the answers to Question 2 are summarised in Table 3 which shows that 78% of the students surveyed agreed the unit provided a valuable opportunity for collaboration. Although a small number of students had experienced problems with group dynamics, mainly as a result of personality clashes, the result indicates an overwhelming positive outcome for the integration of different disciplines.

Table 3
The value of collaboration

Strongly agree	Slightly agree	Agree	Disagree	Slightly disagree	Strongly disagree
11	7	14	3	4	2
26.80%	17.10%	34.10%	7.30%	9.80%	4.90%

Additional Comments from Students

Opportunity for additional comment was provided with each question in the survey instrument however only about 40% of students responded. The range of comments was very wide and involved a mixture of positive and negative reactions. On the positive side students remarked that:

The unit provides a better learning experience than the traditional lecture format

Integration of the two student streams was a good idea because it practices a multi-disciplinary approach to problem solving

The unit was worthwhile because it provided some insight into industry practice.

On the negative side students felt there were difficulties in arranging meetings where everyone was present and some teams received better input from the individual members.

Outcomes

It was established that group work can facilitate the development of skills, which include:

- teamwork skills (skills in working within team dynamics; leadership skills);
- analytical and cognitive skills (analysing task requirements; questioning; critically interpreting material; evaluating the work of others);
- collaborative skills (conflict management and resolution; accepting intellectual criticism; flexibility; negotiation and compromise); and
- organisational and time management skills: 'Having to do group work has changed the way I worked. I could not do it all the time before. I had to be more organised and efficient'

The overall value of the unit was assessed by students from their questionnaires and the lecturers on their own experiences. It was generally agreed that the unit provided:

- Experience for the students in cross-disciplinary working
- Encouraged a culture of collaborative teamwork that the students will carry with them into industry.
- Opportunity for students to appreciate the skills of other professions and the values they contribute to the project team.
- Opportunity for architectural and construction students to gain an insight into the construction process.

Conclusion

A debriefing held by the four lecturers involved with the collaborative unit examined the outcomes in comparison to the expectations of each lecturer. A general consensus was reached that the positive values of the unit far outweighed the operational problems of teaching a large cross-disciplinary group. This view is also supported by Rubin & Hebert (1998) who have found that, among various active learning methods, the collaborative approach is particularly encouraging. The lecturers agreed that the positive teaching and learning benefits of the unit justified using a collaborative approach and it was unanimously decided that further thought should be given to:

- continuing with the unit in future years
- considering online delivery of the unit
- the use of web-based discussion forum so that groups can interact with each other
- extending the format to other units in architectural and construction courses.

The lecturers agreed that using class exercises based on real projects were more meaningful for the students than fictional scenarios and aroused a greater natural

curiosity on how to successfully solve problems. Meyers & Jones (1993) also hold the view that class exercises develop the student's power of problem solving, analytical thinking and ability to interact in a group or team situation. Feedback from the student survey also confirmed this and that the unit provided them with a positive learning experience in collaborating with students outside of their own discipline. This culture of collaboration is particularly vital and desirable as an attribute that graduates should take with them into industry. This point is developed further by Candy & Crebert (1991) who emphasise the difficult transition from the university to the workplace as a learning environment and that every attempt should be made to prepare today's students to be the responsive, creative, adaptive and flexible learners that tomorrow will demand. Although it is presumptuous to draw any definite conclusions from this pilot unit it is hoped that further trials will eventually prove the pedagogical value of this type of format.

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Partnerships in outcomes based education



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Outcomes based education promises to initiate new partnerships in learning as part of a global, national and statewide movement. However, for many tertiary sector educators this development is an uncertain proposition. For this reason, this paper aims to generate productive discussion and debate among its practitioners.

At its most essential, outcomes based education is a teaching and learning strategy that makes explicit to every student the goals or objectives of their education. Our interest lies in the partnerships this model of learning encourages. Why are they important? How might we, as facilitators of learning, initiate and meet them? What challenges might we face? What are our responsibilities, as teachers, in these new outcomes based education partnerships? What responsibilities might students, the Faculty and the University be expected to assume?

This paper will address what outcomes based education means for tertiary partnerships and the effects of its incorporation into course curricula for teachers and students in the tertiary environment across disciplines. We also explore how we might be empowered to make these new partnerships productive for everyone involved in the process.

Outcomes Based Education (OBE) promises to initiate new partnerships in teaching and learning that span the micro- and macro-structures of university education. OBE has its critics as well as its enthusiasts, and without wishing to circumvent the debates such positions engender, this paper addresses the partnerships this model of learning encourages and how these partnerships may influence traditional teaching and learning processes.

The motivation for this study arose as much of the existing OBE literature focuses on teacher-student partnerships. This emphasis has meant that other associations, for example administration-teacher and teacher-teacher partnerships, have been largely overlooked. A notable exception to this is the work of A. Jarvis, which investigates the relations between learning outcomes and a new form of managerialism that OBE can produce (Jarvis, 2000). Jarvis's article deliberately presents a 'worse case scenario,' and cautions that OBE runs the risk of delimiting creative and critical thinking in higher education. We take this study as a provocation for rethinking the new collegial relations OBE fosters, and our aim here is to provide some initial thoughts on a

subject that is currently not well-researched, with the hope of encouraging further philosophical reflection and empirical investigation. Our primary focus is on the tertiary institution in which we work, with an eye to wider issues that higher education workers face across disciplines and universities.

Background

Our interest in OBE stems in part from the Academic Council's decision at the university in which we work, the University of Western Australia, to sanction the introduction of outcomes based teaching throughout the University in the 2004 academic year (Centre for the Advancement of Teaching and Learning). The decision reflects an international movement in education philosophies and practices, and on the local level, it is consistent with the Curriculum Framework the Western Australia school system has adopted, and which is broadly committed to OBE (Curriculum Council of Western Australia). In addition, the endorsement acknowledges the anticipated findings of the recent Australian Universities Quality Agency (AUQA) review which, in David Treloar's words: "is expected to argue that it must be possible to make firm statements on standards in assessment in Australia's universities" (p. 11). What this means is that all academic staff, as well as many general staff members, must have some critical familiarity with the principles, partnerships and practical applications of OBE.

With this context established, it is useful to look at a definition of OBE proposed by William Spady (1994), an educational theorist whose work has heavily influenced the development of OBE philosophies. He writes:

Outcomes Based Education means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning process. This means starting with a clear picture of what is important for students to be able to do, then organizing the curriculum, instruction, and assessment to make sure this learning ultimately happens (p. 1).

In short, Spady's theory of OBE advocates a holistic, constructivist approach to learning, encompassing educational theory and structural issues in education as well as classroom practice. Notwithstanding the collapse of various, competing epistemological positions in this constructivist philosophy (Kanuka and Anderson, (1999), it most significantly encourages educators and students alike to centre their efforts on demonstrating the achievement of pre-determined outcomes. Put another way, OBE works to set clear outcomes for learners that shape the curriculum, assessment styles and teaching strategies to enable learners to achieve and display the designated outcomes.

This paradigm contrasts most notably with other teaching and learning frameworks. Consider one well-known example - content-based models - in which the content of a course or program is given precedence over outcomes: at best, content is expected to produce certain, if often intangible, outcomes. By contrast, the first consideration in an OBE model is the outcomes students will be able to demonstrate on exit of the program as well as at specified intervals during its constituent courses. However, we would add that we are wary of prescriptive learning, one possible consequence of

OBE. The value of the heterodox and the contingent cannot be underestimated. In our experience, often the most exciting and fertile tutorials, for example, are those in which students take up an idea and push at its limits by introducing into the discussion experiences and impressions that learning outcomes may not readily recognise.

Partnerships in OBE

On the basis of this understanding of OBE, it is pertinent to identify and question what partnerships OBE may produce.

Considerations of the historical meanings of the term, 'partner', are interesting and important. Prior to 1600, 'partner' carried significant negative connotations, referring to someone perceived as an associate in evil deeds. The word has lost much of this disapproving sentiment and contemporary meanings, largely antithetical to the pre-1600 definition, are marked by an emphasis on positive social associations in which these relations are created as a consequence of the sharing of something between people. Simply, although somewhat dispassionately, 'partner' nowadays refers to an agent who is associated in a function or course of action.

Of course, there are other definitions linked with the word 'partner'. However, this meaning is of particular interest in the current context because it points to two issues that must be considered in relation to OBE:

- Partners and partnerships are bound up in social relations, particularly relations of power; and
- Partners are linked with action.

These concepts are integral to an OBE model as one of its fundamental principles is that learning is an effect of active social relations. Indeed, one of the most repeated catchphrases in OBE literature is that *teachers and students are partners in the education experience*. Unlike teacher-centred models, in which the teacher functions as the gatekeeper and transmitter of knowledge, OBE encourages facilitation. As a facilitator, a teacher must motivate students to know how to learn and to demonstrate this learning. One consequence of this approach is that students are no longer thought of as passive recipients of information, as they are in the teacher-centred model. Instead, they become active participants in the education process: ideally, coupled with the principles of critical pedagogy, they are empowered to take control of their own learning (Kincheloe, 1993; Hooks, 1994; Giroux, 1997).

So for learning to be successful in an OBE framework, active partnerships between teachers and students are crucial. However, we would suggest that an uncritical acceptance of this partnership declines to interrogate the power relations it is founded on and generates. It also sidesteps the assumptions about autonomy and independence that underpin such a model (Marsh, Richards and Smith, 2001). Furthermore, the prominence of this particular partnership in OBE literature shifts attention away from the production of other partnerships in those tertiary education systems onto which OBE is grafted. Indeed, these university systems have their own in-built apparatuses including grading systems, assumptions about the relationships

between learning and time, and a largely hierarchical organizational culture, all of which are potentially contrary to the transformational principles of OBE. Hence, there is considerable scope for discussion concerning the many other partners and partnerships that can be, and are, created from the synergy between OBE, tertiary institutions and their agents.

We propose to acknowledge two potentially new OBE partnerships:

- Administration-teacher partnerships; and
- Teacher-teacher partnerships

What is important to stress is that while varying and shifting power relations mark these partnerships, their ultimate aim and concern is student-centred learning. One way of thinking about them in more detail is to give some consideration to what is known in the OBE literature as the ‘designing back’ principle (Figure 1).

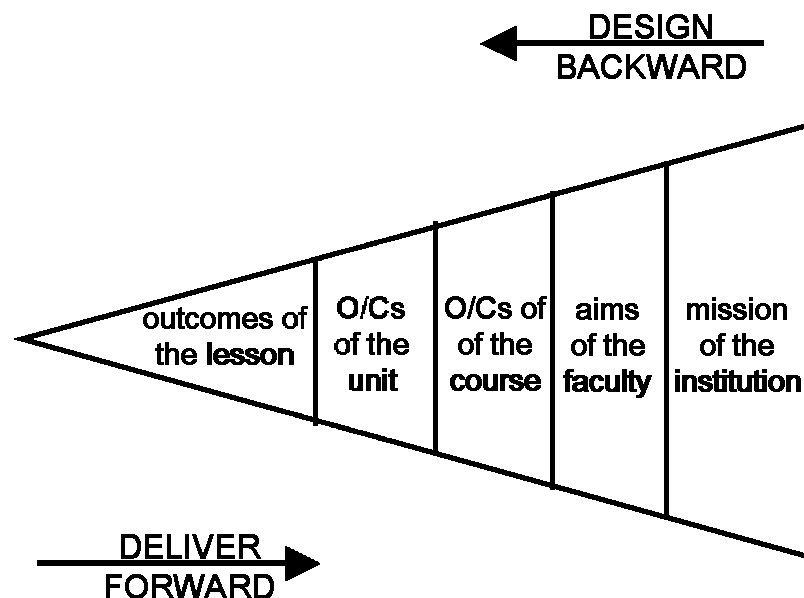


Figure 1. The OBE ‘designing-back’ principle (EdCent, 2002, p. 10)

Figure 1 makes explicit OBE's concern to identify outcomes as the starting point for all curriculum development, assessment design and learning strategies. We would add quickly, though, that we are wary of the simple linearity of process that this diagram suggests.

Admittedly, the designing-back principle is a useful one at the micro-level for setting assessments and course curricula. Rather than functioning on the all too familiar supposition that assessments produce outcomes, by considering the outcomes students should achieve at exit in terms of aptitude and knowledge, the assessments that ought to be set for students to demonstrate these skills can be determined.

In practice at the macro-level, though, faculties might well determine their aims on the basis of outcomes that departments, discipline groups and individual teachers assemble and forward. In our own university, as we work to meet the deadlines set by the institution to write outcomes for our courses and degrees, we have found this latter, collaborative process to be operative. It is too early to comment in detail on this procedure, but we can report from our own experiences that it has been undertaken with some initial success.

Administration-teacher partnerships

If we accept this designing-back model as a working, albeit simplistic, exemplar, what is striking is that it relies on the formation of partnerships between pre-determined levels of university authority. Following its logic, we could say that, in consultation with the community, the university sets its educational principles which faculties then translate into desirable learning outcomes, and which teachers then encourage students to achieve through appropriate choices of curriculum, assessments and modes of delivery.

In other words, partnerships within the university hierarchy are essential for OBE, but the distribution of power to define and set outcomes is potentially unequal. This inequality can cause tensions within the university itself and could result, in the worst case, in the breakdown of the very partnerships on which OBE relies.

In raising this point, though, it is crucial to recognize that in the designing-back model teachers are empowered to decide how students can achieve the stated outcomes by their choice of course content, assessment and delivery. This is an important issue because at first glance, OBE appears to be underpinned by a top-down model of power that is less about 'sharing' partnerships and more about authoritative instruction. However, in OBE both teachers and administrators are active in the learning process and the development of successful partnerships between administrators and teachers - and successful does not mean without productive conflict or interrogations of power relations - is a crucial aspect of OBE.

Teacher-teacher partnerships

Again, if we take the designing-back model as a provisional way of thinking about OBE, it becomes clear that this whole-institution approach to integrated learning turns around outcomes and not disciplines.

This is arguably one of the most provocative implications of OBE in university contexts where disciplines are largely institutionalized, if not taken for granted. Within the OBE model, partnerships between university teachers may be grounded less in a broadly shared interest in a discipline, which is often imagined, somewhat controversially, to carry an intrinsic value, than on the basis of shared concerns to support students' demonstrable achievement of outcomes. This is not to say that disciplines will disappear, although it does usefully recognize that disciplinary borders are artificial and transmutable (Friedman, 2001). Instead, what is called for is that discipline subjects are reoriented so that their use value relates to students' learning outcomes that are cross-disciplinary and indeed extra-disciplinary in the sense that they extend beyond the period of institutional learning. With the implementation of OBE, teacher-teacher partnerships may well become increasingly outcomes orientated rather than subject orientated.

Conclusion

OBE is an initiative that promises to introduce new and diverse possibilities and partnerships that call into question many of the premises that underline tertiary teaching and the institutional structures that support it. With respect to the emphasis of this paper a concluding remark for cogitation is our responsibility to consider these developments critically and creatively to ensure effective student learning.

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Building a responsive and effective service teaching program



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The University of Sydney's Teaching Improvement Fund (TIF) is designed to improve teaching and the student experience by supporting major projects. This TIF project was a collaborative activity between four disciplines (Biological Sciences, Chemistry, Mathematics and Statistics, and Physics) in the Faculty of Science and involved a partnership with three other Faculties (Agriculture, Education, and Engineering). The project was centrally managed and evaluated by UniServe Science. The aim of the project was to improve the first year experience, particularly in client faculties, and to identify teaching development models that could be transferred from discipline to discipline. This included recognising the requirements of professional degree programs and hence providing teaching experiences, both on campus and in flexible mode, that are in the context of the profession. The project has facilitated the development of two models – 1) 'value-adding' to an existing course, and 2) development of small online teaching modules that can be used within a number of courses and across various degree programs. To assess the effectiveness of these teaching and learning innovations, in particular the value to the institution, an evaluation model based on Kirkpatrick's Four Levels of Evaluation was developed. This paper outlines the theoretical background to the developments, gives an overview of the project, including a brief summary of the four developments and the evaluation methodology, and discusses the results. A major benefit of the collaborative development is that the models and the lessons learned are being used to influence similar developments within a broader context.

Service teaching, the supply of teaching by a department with expertise in the required discipline to students from a different faculty, forms a significant component of the teaching of all science departments, especially at the first year level. Often this teaching is in the form of a core course within the student's degree program and traditionally this form of teaching has been marred by a number of issues including:

- a lack of responsiveness to concerns of and by students, client faculties, and providers;
- a lack of understanding of the client profession; and
- funding mechanisms that discourage and constrain such teaching.

However, service teaching provides several educational benefits to the students, such as:

- courses are taught by staff who have expertise in research and education in the discipline; and
- a broader undergraduate experience and opportunity to mix with students from other faculties.

There are also benefits for the institution, including, opportunities for greater efficiency, and promotion of efficient use of resources by discouraging duplication of courses, expertise and facilities. (Northern Territory University 2000; The University of Queensland 2001)

One of the most significant problems with service teaching in the past, particularly in cases where students from the 'client faculty' are required to attend mainstream courses within the provider faculty, is the apparent lack of linkage between the service course and the students' professional program. For example, when biological science courses were taught only within the scope of biological science, not in the context of nursing, the nursing students had difficulty applying the theoretical basis of biological science to nursing practice (Choe 2001). In addition, because of a lack of communication between the nursing faculty and the non-nursing provider, there was considerable overlap of content between the biology and the nursing courses (Choe 2001). However, service teaching, if well integrated, can show the students how course content relates to possible professional pathways (Turner, Noah and Nemetz 1998). When every day professional scenarios are added to this the impact is even greater – students apply content and/or skills from the science courses to their other courses and vice versa – forcing students to see the relationship between the core areas of their degree program.

One of the essential features of service courses must be the inclusion of authentic learning opportunities. Providing students with such opportunities means that there is congruence between the learning activity, its meaningful context, its potential relevance to the lives of the students and to real-world practitioners, and the ability of the students to perceive the activity as relevant and meaningful (Barab, Squire and Dueber 2000). However, an effective learning opportunity, in which the students see value and meaning, must be in context and the authenticity must be in terms of the life-world of the student and their intended profession (Barab, Squire and Dueber 2000). Pennell et al. (1997) agree that using an authentic context that reflects the way the knowledge will be used in real life provides the students with purpose and motivation.

In order to develop authentic learning experiences good collaboration between the discipline faculty members and the client faculty staff and students is crucial. This must include regular constructive communication as the content offered will need to be tailored to suit the client's needs and may need to be delivered in a manner to which the students and the client are accustomed. This project involved a number of faculties and disciplines at the University of Sydney. The primary purpose of the project was to improve the delivery and learning opportunities within service programs and whilst an action research cycle of review, plan, act and evaluate was followed, focus was on curriculum reform. The project used an independent

facilitator to take a broad overview and handle reporting, administration and overall scheduling. Some of the key dilemmas faced by such an approach, concerning the balance of time between reflection and action, the need to complete the reforms within the constraints of the project and the university calendar, and the balance and tension between local solutions and institution and national perspectives are discussed by Burchell (2000). This paper reports on the development of more effective service teaching courses in four science discipline areas to students in degree programs in three other faculties at the University of Sydney.

The project

The Faculty of Science at the University of Sydney teaches in client degree programs, including Agriculture, Education, Engineering, Pharmacy, and Veterinary Science. For some of these degree programs the Faculty offers courses that are only taken by the client faculty students (for example, there is a first year chemistry course for Veterinary Science students) but for some of the client degree programs the students attend courses that have been developed for a variety of clients (for example, the first year human biology course may be taken by students from seven or eight degree programs). The Faculty is conscious of the need to provide suitable learning experiences for students from client faculties who are required to study first year science courses as part of their professional degree program.

In 2000, the Faculty was the recipient of a University Teaching Improvement Fund grant that enabled the Faculty to look at various ways of enhancing teaching and learning experiences of students from client faculties. Four discipline areas (i.e. Biological Sciences, Chemistry, Mathematics and Statistics, and Physics) within the Faculty were involved in developing either appropriate curriculum reform within an existing course or introducing a new course or new delivery modes for client faculties (i.e. Agriculture, Education, and Engineering). These innovations include the development of small modules both within and across courses and the development of contextualised strands within courses.

Summary of developments

Biological Sciences delivering to Education

A separate course for first year education students taking the Human Movement and Health Education degree program was developed from an existing human biology course. The course allowed for a mix of core lectures (also given within other courses) and guest lectures covering topics designed to help illustrate the content of the course in the context of the students' professional pathway. The practical program included cameo presentations of more contextually relevant materials that would appeal to the students. The students were supported in their learning through a WebCT site.

Chemistry delivering to Agriculture

All first year chemistry courses use a suite of computer-based learning modules, called *ChemCAL*, that were originally developed by the School of Chemistry at the University of Melbourne. This development enabled changes to be made to some of

the *ChemCAL* modules to better suit the clients in Agriculture. This type of module has been designed for just-in-time learning and just-in-time revision. In addition the two universities agreed that the new version of *ChemCAL* would be delivered to students in an online environment and this change formed part of this project. In all, 27 *ChemCAL* modules were supplied under licence to the University of Sydney.

Mathematics and Statistics delivering to Engineering

To overcome the distance in time between the teaching of mathematics to engineering students (in years 1 and 2) and the need to apply the learned mathematics within the engineering degree (from year 3 onwards), small web-based components of mathematics topics of essential importance to engineering have been developed. The content of each component is extremely focused and consists of core material (narrative), illustrative examples (general and engineering), self-assessment tasks, and a glossary. The accompanying metadata defines the level of mathematical maturity needed to utilise each component, provides explicit prerequisites, provides a statement of the learning objective and of the expected skills attainable by completing the component and clarifies how the components interact. Thus an important feature of the components is that they make explicit the topic's relationship to other mathematical ideas.

Physics delivering to Agriculture

The physics components of an existing agriculture course were modified to enhance the learning outcomes for the client students. Three main changes occurred: a move to web-based delivery to include increased opportunities for the students to engage in the materials (through the development of interactive scenarios); the compilation of a comprehensive paper-based student coursebook; and the introduction of mindmaps as student activities within the workshop sessions. These course materials were supported by a *WebCT* site.

In summary, two of the groups, Chemistry, and Mathematics and Statistics, worked on modules across courses; Physics worked on modules within a course; and Biological Sciences focused on a new stream within a course.

Evaluation methodology

Evaluation for this project was quite complex as it was to provide feedback to the Science Schools involved, the Faculties, the College of Sciences and Technology, and the University. Kirkpatrick's four-level model for assessing training effectiveness was seen as a useful starting point (Kirkpatrick 1994). The model was adapted to suit the evaluation needs, defining the levels to be:

- level 1 – *reaction*, a measure of student satisfaction, assessed through questionnaires, surveys, focus groups, etc.
- level 2 – *learning*, a measure of skills and knowledge learned, assessed using observations, interviews, etc.
- level 3 – *transfer*, a measure of transfer of the knowledge, skills and understanding gained in the first year course to an appropriate second year course, assessed using observations, interviews, surveys, etc. For groups where it was

appropriate we correlated the second year student's awareness of relevant objectives of first year courses with his/her second year results.

- level 4 – *value to the organization, including dissemination*, a measure of cost effectiveness and organisational benefits, such as, does the innovation meet the long and short term goals of the organisation, has the innovation produced the results the organisation expected.

Evaluation was planned and carried out in consultation with the Institute for Teaching and Learning. To assist with the planning of the evaluations we also referred to the *Evaluation Cookbook* prepared by the Scottish Learning Technology Dissemination Initiative (Harvey 1998). Surveys with both quantitative and qualitative questions were developed. Staff interviews were conducted to evaluate the project management. The evaluation design identified student satisfaction with the actual course materials/activities (level 1 of the model) for all of the discipline developments, a measure of transfer of knowledge and concepts (level 3 of the model) in the biology and chemistry developments and value to the Faculty of Science (level 4 of the model). The evaluation types for each discipline are illustrated in Table 1.

Table 1
Evaluation conducted during the project

Type of evaluation	Biology	Physics	Chemistry	Mathematics
Student survey at end of course looking at the innovation (materials developed)	✓	✓	✓	✓
Course experience survey	✓	✓	x	x
Transfer of knowledge survey in a follow-on course	✓	x	✓	x
Perceptions of teaching staff about the innovation	✓	✓	✓	✓
Prototype testing	x	x	x	✓

Results and Discussion

As to be expected when managing a suite of discipline specific activities within one project it is difficult to summarise the results and at the same time it would be disadvantageous to the overall project to present them independently. During the project two curriculum reform models emerged from the developments and these will be discussed along with a review of the way in which the materials developed were contextualised to provide an effective service teaching program.

The models

Model 1 took the form of ‘value adding’ to an existing course and was used by the School of Biological Sciences and the School of Physics to modify current first year materials so that they better suited the needs of Education and Agriculture students, respectively. Model 2 developed small online teaching and learning modules to be used within a number of courses across various degree programs. These were used by the School of Chemistry and the School of Mathematics and Statistics to cater for introductory teaching and just-in-time revision in Agriculture and Engineering.

Student reaction – level 1 evaluation

The innovations were assessed using surveys and focus groups. Two types of survey (a project specific survey and a course experience survey) were used in the biology and physics innovations whilst only a project specific survey was used in the chemistry and mathematics innovations. Students from all the client faculties (Agriculture, Education, and Engineering) viewed the innovations in a positive manner, indicating that they had found them useful in supporting their learning. In addition, the use of two different surveys (for two of the innovations) gave confirmation of the data. This was further supported by the information from the focus group discussions. Detailed information about the evaluations can be accessed at http://science.uniserve.edu.au/projects/service_teaching/.

Transfer of knowledge – level 3 evaluation

It was hoped that by contextualizing teaching materials and making the learning experiences more relevant to the professional degree programs this would have facilitated a transfer of knowledge from the course with the innovation to subsequent related courses and other contexts. In two of the four developments, Biological Sciences and Chemistry, we attempted to gauge if any transfer had taken place. The results were inconclusive. Cornford (2002) notes that ‘attaining effective transfer represents one of the longest recognized, most complex problems in learning and one that is always present’ (p. 86) and that ‘with novice learners even relatively minor changes in task demands in the same context are likely to cause performance problems and failure to recognize the appropriate, previously learned knowledge to apply’ (p. 87). Stokes and Baer (1977) go so far as to say that if transfer is a desired learning outcome from teaching then there is a need to train for this quite specifically. However, Cornford (2002) goes on to say that ultimately effective transfer is dependent upon the individual making conscious decisions about the appropriateness of applying past learning. In hindsight the expectation of a recognisable/measurable transfer of knowledge was unreasonable and the method used to test for it, namely correlation between students’ perceptions and end of semester marks, was poorly constructed.

Staff reaction

Academic staff involved in the project felt that having an external/independent facilitator had assisted in keeping each project development on schedule. They also felt that critical reflection had been encouraged throughout the project and that the final outcomes had been more extensive, more professional and more complete than they had expected to achieve.

Value to the organization – level 4 evaluation

The most obvious value of the project to the Faculty is the portability of the curriculum reform models to other disciplines and courses. The School of Physics has already adopted the Biological Sciences model and created a new course for the first year physics component of a professional degree program in Education. Materials from the School of Physics development have been used in two other Physics courses, materials from the Mathematics and Statistics development have been used with students from outside Engineering and the Chemistry modules are being used with all first year Chemistry students. As a result of the coordinated development, all four teaching innovations are sustainable, and the Chemistry, and Mathematics and Statistics modules have the potential to service very large numbers of students, especially first years.

The Faculty has also benefited from the dissemination of information relating to the project that has taken place within the Faculty, the University and the wider academic community. This has been in the form of published articles, conference presentations and seminars. In addition, the project has raised staff awareness of the need to make service teaching more responsive to client faculty needs and has resulted in a more effective service teaching program.

Futures

The Faculty of Science has initiated a number of projects in line with University and external trends toward student-centred flexible learning and web-enhanced teaching and has an ongoing strong commitment to the provision of a positive total experience for its students. The project is expected to further strengthen the move to a stronger culture of understanding of the needs of incoming first year students and a closer alignment between faculty offerings and client requirements. In addition the conversion tool developed as part of the Mathematics and Statistics innovation has a wide potential application in the delivery of mathematics via the Web. In 2003 the Faculty has commenced a project aimed at skills development entitled *Enhancing the employability of Science Graduates: Increasing the awareness of staff and students to the needs of the employers*.

Acknowledgements

We would like to thank our colleagues in the Faculties of Science, Agriculture, Education, and Engineering for their enthusiastic involvement in this project and the students for their tolerance and constructive feedback. In addition we would like to thank the University, through the College of Sciences and Technology, for the Teaching Improvement Fund grant.

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Interdisciplinary teaching: Taking the fear out of the unknown



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As knowledge advances, we more commonly see the blending of traditionally disparate areas of study. Computational linguistics, for example, represents a synthesis of knowledge from linguistics and computer science. In university teaching, this interdisciplinarity offers unique strengths: students gain experience in a hitherto unknown area, and learn to combine knowledge from several domains. However, interdisciplinary teaching also presents challenges for students; they may have some experience in one area, but little in another. They may feel some anxiety at moving outside their area of knowledge. This paper discusses current work on assisting the teaching process in interdisciplinary fields. It relates some experiences in teaching computational linguistics to linguistics students at the University of Western Australia. This area poses some difficulty for linguistics students, most of whom have no prior knowledge of computer science. This paper presents ideas and recommendations for increasing students' comfort with new material in interdisciplinary fields, including the use of examples close to students' experience, and moving from the known to the unknown.

The rise of interdisciplinarity

The last two decades have seen a rise in interdisciplinarity. More and more courses of study are hybrids — fields created from the intersection of converging disciplines. For example, cognitive science comes from the combination of psychology, linguistics, and computer science. The discipline known as international relations results from the union of history, political science, languages, and economics. Environmental law, bioethics, information management — these and other recent innovations show the intersection of formerly separate areas of study. As a result of this intersection, many students (and faculty) in traditional disciplines will come into contact with these hybridised disciplines.

This interdisciplinarity has advantages: students can benefit from learning about closely related knowledge. They also have the opportunity to combine knowledge from several domains.

However, interdisciplinarity presents some challenges. Students who have experience in their field may feel some anxiety at moving outside their area of knowledge. In particular, an interdisciplinary setting will see some students having to learn about a previously unfamiliar field very quickly.

So it was when I began teaching in the Linguistics discipline at UWA. My specialty is computational linguistics, which represents the convergence between linguistics and computer science. I wanted to help first- and second-year students become aware of computational linguistics, but I was aware that many of these students would have little experience with computer science. I was also aware that getting linguistics students “up to speed” on the computational aspect would require exposing them to a good deal of material in a short amount of time.

For those interdisciplinary fields that involve computers, there is another dimension. A small percentage of students expressed a loathing and mistrust of computers, as seems to be the case among the general population. Some students privately expressed feeling anxious about the computational side, saying “I’m not good at computers.” Others felt anxious at the amount of new material covered.

Students sometimes resist or feel anxious about new areas. Instructors may have to face the prospect of presenting or coming into contact with material that comes from outside traditional discipline boundaries.

Anxiety: What is the instructor’s role?

While the effects of anxiety in test situations are well-documented (see for instance [1]), little has been written about the instructor’s role in reducing classroom anxiety. One resource [3] suggests identifying anxious students, and putting them through psychological ‘desensitisation’ exercises to increase their comfort with the material. These exercises would probably be effective, if one could only overcome the anxiety generated by the prospect of such a regime. More recent work [2] suggests using medication along with psychological help, although the study does recognise that cognitive-behavioural approaches are more helpful in the long term.

I do not try to eliminate tension from the classroom because I do not believe that anxiety is a disorder that must be treated. Anxiety can be a useful method of adaptation, but students do not always use it in helpful ways. My experience suggests that anxiety can have a positive effect in “sharpening students up”.

I tend to put the responsibility for managing student anxiety on the students, since they are the ones most capable of monitoring and controlling it. However, as an instructor I try to offer a classroom environment where

- students can express uncertainty or difficulty,
- students are aware of my expectations for them, including what they need to know, and
- material is presented in a way that presents students with as low an amount of unnecessary anxiety as possible.

As instructors or facilitators, we have the responsibility for setting the ‘tone’ of the class. We have an opportunity to reduce the level of tension in the classroom, and I would argue that it would be advantageous for us to do so.

Our goal is not to eliminate anxiety, but rather to provide an environment where anxiety about learning and performance do not interfere with learning itself.

Suggestions for moderating anxiety in the cross-disciplinary classroom

What follows is a set of suggestions for moderating anxiety in the interdisciplinary classroom. They come from my teaching experience, and are by no means exhaustive.

Humour

Teachers are not comedians, nor should they consider themselves ineffective if they don't "entertain". However, instructors are responsible for setting the tone of the class. Keeping an undercurrent of levity in one's own way can lighten the classroom atmosphere, and reduce anxiety. This style should be natural and unforced.

The art of the ridiculous

I have found that if I start with a situation that is both comfortingly familiar and suitably bizarre, it can get students thinking more about the problem at hand, and less about their gaps in knowledge. I then introduce key concepts and vocabulary that links the situation to the topic at hand.

An anecdote from my teaching illustrates this point. One day in class, I was covering machine learning algorithms to a class of linguistics students. "A machine learning algorithm" I said "is a way to tell the future. Using machine learning, you can tell which of your emails is 'spam' before you read it. You can predict what word will come next in a sentence. You can tell who's a bad credit risk, or who will have a heart attack.

"You can even predict what I'm going to have for dinner tonight."

There were sceptical looks from some students.

"But," I continued, "you have to give the computer some information. What information would you want to know in order to predict what I'm having for dinner?"

After a pause, some students suggested responses. "I'd want to know what you had for dinner last night," said one.

"What's in your fridge," said another.

"Are you vegetarian?" asked another.

I wrote the suggestions on the board without comment. Then I explained, "These things you're suggesting are called *features*. Some features are important, and some are irrelevant. It's not always easy for us to tell the difference, but the machine learning algorithm will sort that out for us automatically."

I then presented them with a *datafile*, found in Figure 1. I was careful to explain that they would not be required to use the software at this stage; the data was only presented for interest.

```

@relation predictDinner

@attribute hungry {peckish, hungry, ravenous}
@attribute dayOfWeek {Monday, Wednesday, Friday, Saturday}
@attribute whoCooks {me, my_wife}
@attribute beenToShopLately {yes, no}
@attribute meal {soup, soy_burgers, pizza, stir_fry, tacos}

@data
peckish      Monday      my_wife      no      soup
ravenous     Wednesday  my_wife      yes     soy_burgers
hungry       Friday      me           no      pizza
hungry       Saturday   me           yes     stir_fry
ravenous     Monday      me           no      soy_burgers
peckish      Wednesday  my_wife      yes     soup
hungry       Friday      my_wife      no      pizza
hungry       Saturday   my_wife      yes     tacos
ravenous     Monday      me           no      pizza
peckish      Wednesday  me           yes     stir_fry
ravenous     Friday      my_wife      no      pizza
hungry       Saturday   me           yes     soy_burgers
hungry       Monday      my_wife      no      soup

```

Figure 1. The datafile from the predictDinner activity

Each attribute shows a feature and the values they can take. Some of these came up during the brainstorming discussion. The items in the *@data* part correspond to these attributes.

I then explained a bit about how the machine learning algorithm would build a structure known as a *decision tree*. A decision tree is a diagram with nodes and branches. By answering the questions at each node, one eventually arrives at a *leaf node* that gives a classification. The decision tree for this activity appears as Figure 2.

We then discussed the applicability of this kind of algorithm to text classification tasks in general.

I used several ways to moderate anxiety during this activity:

- Use an example close to their experience
- Use an example far enough from the field that they had to concentrate on the task at hand, rather than on gaps in their knowledge
- Invite students to respond as a group
- Encourage all answers during the brainstorming stage
- Let students know what knowledge they are responsible for learning
- Bring in terms naturally throughout the discussion as appropriate

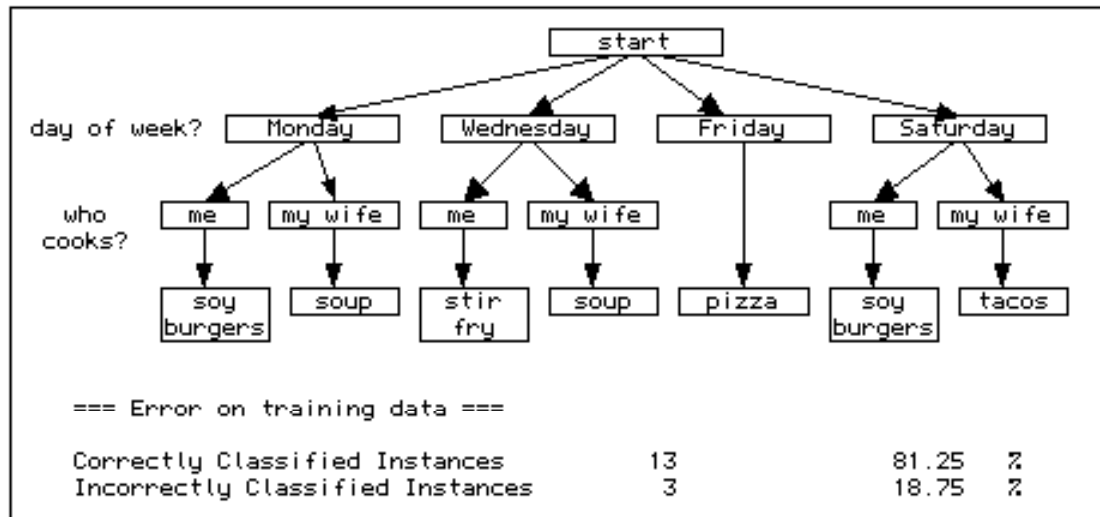


Figure 2. The resulting decision tree from the predictDinner activity

Think like the enemy

Many students are intimidated by computers. To circumvent this, I sometimes get my students to take the place of the computer.

Computers are very obedient helpers, even if they are a bit literal-minded. The following exercise helps the student think their way through a set of rules originally written for a phrase structure grammar of English noun phrases.

A noun phrase is a part of a sentence that involves a noun and words that modify it. Students are given the worksheet as it appears in Figure 3, and a die.








By constructing English noun phrases in the same way as a computer would, students get a chance to understand the concept of computational “rules” in a simple way. They also see that human language activities can be approximated without the need for human intelligence. Once this groundwork is laid, students are then asked to modify the existing rules to allow for new and more accurate phrases. Complex discussions of morphology and syntax have arisen naturally from this seemingly mechanistic activity.

Construct your very own noun phrase







Here are some phrase structure rules for a simplified English grammar of noun phrases.

Start with NP. Roll the die to choose a phrase structure rule.

When you come to a bold item, roll the die to select a word from the lexicon.

	NP → noun
	NP → det + noun
	NP → det + AP + noun
	NP → det + AP + noun + PP
	AP → adj
	AP → adv + adj
	PP → prep + NP

Here is your lexicon.

	det	noun	prep	adj	adv
	a	man	in	green	really
	an	dog	with	beautiful	very
	the	valley	by	colourless	quite
	a	idea	for	good	amazingly
	an	picture	beyond	friendly	overly
	the	table	beside	useful	rather

Generate three NP's.

- 1.
- 2.
- 3.

Discussion questions:

1. Did you get any ungrammatical NP's? How would you fix the grammar to prevent this?
2. How do you know whether a sentence is ungrammatical or just "silly"?
3. How could you alter this system to include number?
For example, get the grammar to generate the following sentence:

The man with two dogs

Figure 3: The "think like the enemy" activity. Students use dice with the worksheet to imitate the functioning of a computer program that generates noun phrases.

Figure 3. Student worksheet

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Golf links: A case study of integrating university programs, vocational education and the golf industry.



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As Australian educational organisations seek to be more competitive nationally and globally, training and education providers must affect new vision and change by venturing beyond existing parameters. The Australian Institute for Golf Management – Edith Cowan University [AIGM-ECU] connection operates on the premise that there can be congruence in the delivery of university academic disciplines, business skills training and golf management education. This fulfils the needs of the new employment scenario that expects that graduates will have generic credentials, attributes and skills and also be prepared for specialised industry needs.

The AIGM-ECU collaborative learning program addresses four key approaches:

- 1. Collaboration with ECU in the proposed delivery of Golf Management majors as part of ECU's Bachelor of Business degree. ECU and AIGM are focused on providing innovative and practical courses aimed at preparing graduates for constantly changing labour markets. AIGM's curriculum ensures comparability of standards and content with undergraduate programs of ECU's Faculty of Business and Public Management.*
- 2. Implementation of knowledge and skills in Vocational Education and Training (VET) to determine that competency standards are met.*
- 3. Consultation with academia to maintain parity with university curricula.*
- 4. Consultation with industry experts who hold the essential practical knowledge needed in the management and operation of golf clubs.*

It is essential that the underpinning knowledge and key competencies in Vocational Education and Training courses be made explicit to promote better understanding and acceptance by universities. By ensuring that internal curriculum planning and development is effective in meeting university standards as well as vocational curriculum frameworks, AIGM is able to achieve this objective.

This paper expands these principles and outlines course structures to demonstrate an effective, yet efficient means of relevant course design and delivery through collaborative efforts.

This paper is a case study of the relationship between a university and a private training provider to deliver a unique education package in Sport Management, specialising in Golf Management. It is presented in two parts. First, the development and structure of the Edith Cowan University (ECU) Sport Management program is described and the Bachelor of Business (Sport Management) is outlined. Secondly, the emerging relationship between ECU and Australian Institute for Golf Management (AIGM) and the creation of the Golf Management major is discussed. The course structure resulting from this relationship will provide a pathway for vocational graduates into tertiary education.

The paper is essentially anecdotal as it reports the experience of the course developers in arriving at an understanding of each other's courses and systems at the crux of this learning partnership. It is about merging competency-based learning with the more self-directed and critical approach to academic learning at university. It is an accommodation of two administrative and funding models that is currently being resolved. This approach also fits well with the University's strategic plan, the strategic goals of the Australian National Training Authority (ANTA) for seamless training and education, and the strategic intent of AIGM. This project fits well with the title of this year's Teaching and Learning Forum – "Partners in Learning".

Some background

Tertiary learning occurs in the context of course structures devised to deliver units of study that focus on a particular discipline area. For many years course structures were 'sacred' features of universities. The introduction of the Federal Government's Australian National Training Authority (ANTA) in 1992 (ANTA, no date; ANTA, 2003) opened the way for a range of providers and more flexible course structures. The ANTA Act and the subsequent Australian Qualifications Framework (AQF) encourage educational institutions to work towards smooth transitions through the various levels of education. All training and education programs are now part of the unified system of twelve national levels of qualifications since 1995 (Table 1). All training and education agencies and institutions are part of the Australian Qualifications Framework (About the Australian Qualifications Framework, 2003).

Table 1
AQF Qualifications by Educational Sector

Schools Sector	Vocational Education and Training Sector	High Education Sector
Senior Secondary Certificate of Education	Advanced Diploma Diploma Certificate IV Certificate III Certificate II Certificate I	Doctoral Degree Masters Degree Graduate Diploma Graduate Certificate Bachelor Degree Advanced Diploma Diploma

(Source: AQF Implementation Handbook, 2002)

The introduction of the new training programs by TAFE and the private providers at first seemed to threaten university courses, especially those with a more applied or vocational orientation, such as the ECU Leisure and Sport courses. These training agencies were filling the gap in the training - education continuum. Leisure and Sport Management is one discipline area that has, only in the last 10 years, become a focus for vocational training courses at Certificate and Diploma levels in Community Recreation, Outdoor Recreation and Sport Management.

Sport Management in particular has emerged as a rapidly growing career aspiration and destination for school leavers. It is a specialised sector of the leisure industry. The professionalisation and commercialisation of sport and sports management in the last 20 years has resulted in an increasing demand for qualified sports managers who find work in sport venues, sport events, sport journalism, and in specific sport organisations, from community to elite and professional sports, such as golf. Courses in Sport Management have blossomed around Australia in the last 12 years with an increasing demand from school leavers, but also from mature aged students seeking a career change.

ECU was a leader in those early years, as now in this area, by ensuring its Recreation, and subsequent Leisure Sciences program included Sport Management as a specialised focus of study, with several course design options since 1998. ECU offers a suite of undergraduate, graduate and postgraduate sport management courses. These courses cater to school leavers, experienced professionals without formal sport management qualifications and those interested in higher degree studies. Figure 1 shows this suite of courses and educational pathways.

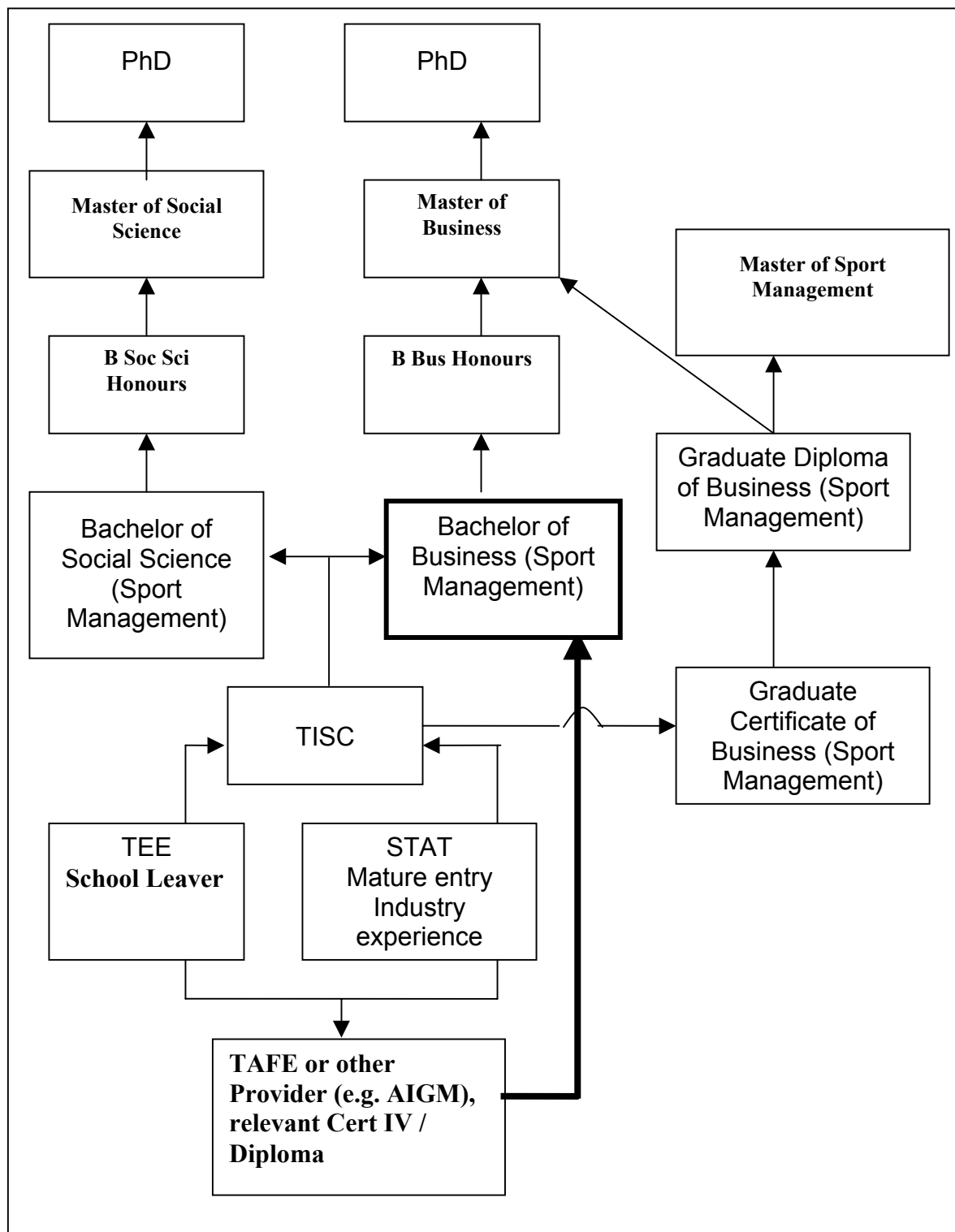


Figure 1. Sport Management pathways at ECU. Pathway for AIGM Golf Management students is shown in bold.

ECU and Sport Management

ECU for 28 years has held almost a monopoly on Leisure and Sport Management education in Western Australia – as distinct from Sports Science, Physical Education and Human Movement courses, although these are also strong at ECU and with its main competitor University of Western Australia (UWA). More recently, Curtin University introduced a Sports Administration stream in its Bachelor of Commerce program, and UWA has added a fourth year of Management studies to its degree in Human Movement studies.

Prior to 1994, Sport Management was subsumed in the Recreation courses at ECU. As part of course restructuring in 1992/3, a sport management supporting studies program (supporting major and minor studies), was explicit in the new Leisure Sciences program introduced in 1994. By 1998 Sport Management was offered in two stand-alone degrees. There is a Bachelor of Social Science (Sport Management) with a more flexible structure and community orientation, and the Bachelor of Business (Sport Management) with business oriented options offered by this course structure.

The Sport Management major in both these degrees is multi-disciplinary, drawing from disciplines of management, sociology, history, marketing and planning. It also has a strong practical emphasis. Students are required to complete professional, industry practice from which a practice portfolio is developed.

ECU, AIGM and Golf Management

The structure of the ECU Sport Management major in the Bachelor of Business comprises 8 units. This provides the basis for the Golf Management major. The adaptation of this major to the Golf Management major includes 4 units to be taught by AIGM with a selection of units from the Sport Management major. The core 8 Sport Management units and the 4 Golf Management units are shown in Table 2.

Table 2.

Sport Management major and Golf Management units

Sport Management core units:

- SPM2112 Sport Service Delivery II
- SPM2111 Sport Organisation Management II

LMS2104 Leisure Research Methods II

- SPM2114 Sport & Leisure Economics & Finance II
- LMS3111 Sport and Leisure Planning III
- SPM3113 Sport and Leisure Law III
- SPM3114 Sport Venues and Events III
- SPM3221 Sport Business Planning III

Golf Management units:

- X506261 Golf Club Management
 - X506265 Golf Facility and Services Operations
 - X506371 Golf Course Operations & Maintenance
 - X506375 Principles of Golf Course Design
-

The structure of the total course for the proposed Bachelor of Business (Golf Management), with suggested second major options, and its relationship to AIGM's Diploma course are detailed in Figure 2.

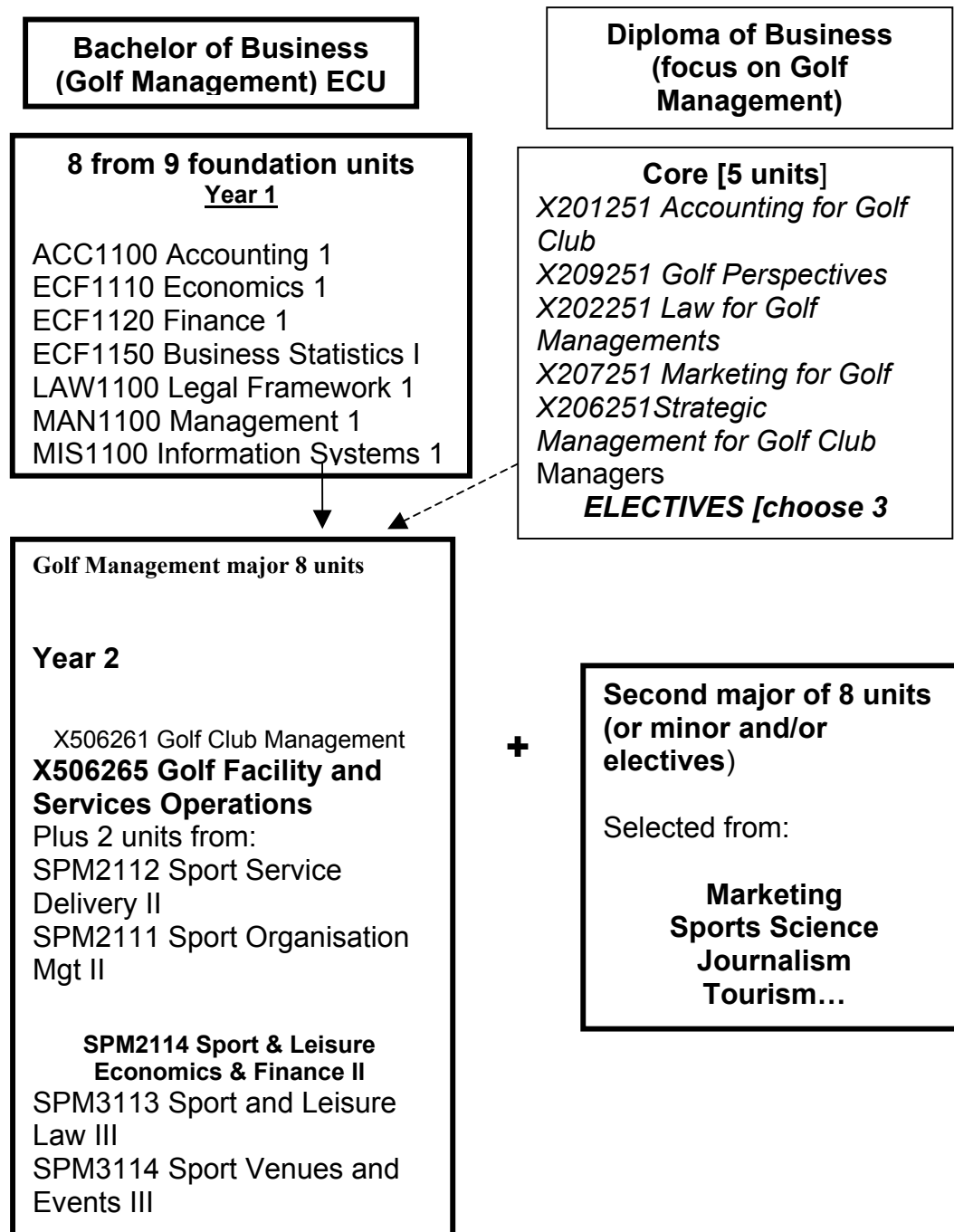


Figure 2. Proposed Bachelor of Business (Golf Management) course structure

Again ECU leads the way in the development of leisure and sport management education. This case study reports the development of a new flexible, yet integrated course in the specialism of Golf Management. There will be readers and other critics of specialised sports management courses who may echo the words of King James II in 1457 when he demanded that “fute-ball and golfe be utterly cryed down and not to be used” (Did you know? – Origins of Golf, 2003). He was concerned that the citizens were so involved in leisure pursuits that they were neglecting the Royal and vital sport of archery to protect him against the enemy (Did you know? – Origins of Golf, 2003). Much the same criticisms are often levelled at golf and business people these days! However, golf, like other professional sports, is a multi-million dollar business and professional component of the sport industry. In the 21st century this industry needs and demands competent managers skilled in management, marketing, accounting and planning, and with an understanding of the peculiar characteristics of sport, and particularly, of golf.

VET, Golf Management and Education Pathways

The second part of this paper outlines the origins of AIGM and its Golf Management programs. It discusses building the relationship with ECU against the background of the Vocational Education and Training framework. The more practical issues of industry collaboration and retaining course integrity to meet both university and training provider requirements are also considered.

Overview of AIGM's Golf Management programs

The Australian Institute for Golf Management has had a monopoly on golf management education in Western Australia since it was established in 1998. At that time, the Certificate IV in Golf Management provided vocational pathways into the golf industry as well as matriculation into business and commerce undergraduate degree courses at Curtin University and ECU. In 2003, the Certificate IV in Golf Management was reaccredited as the Certificate IV in Foundation Studies with the same focus on golf management as before. This is to ensure that while students have specialised skills in golf management, they also have the foundation for tertiary education. There are plans to convert to Training Packages in 2004.

The Diploma of Golf Management was developed in 2001 to complement vocational training and university studies. The Training Package units of competency were used as guidelines to establish a framework for AIGM's courses. The full conversion to Training Packages in 2003 necessitated a change in qualification title from the Diploma of Golf Management to the Diploma of Business with the same focus on golf management as before. The change of qualification title was influenced by two factors. The first is the constantly changing labour market. The new employment scenario expects that graduates have generic credentials, attributes and skills as well as the ability to function in specialised areas. The second is the opportunity to create an integrated pathway to undergraduate business and commerce programs with the option of specialising in sport and golf management.

Course design and delivery

Market, student and academic requirements necessitated course planning to meet the requirements of vocational education as well as university curriculum. In line with Vocational Education and Training policy, it was also necessary to establish a framework consistent with the standards set by the Australian Quality Training Framework (AQTF). The AQTF was developed in June 2001 by the National Training Quality Council (NTQC) of the Australian National Training Authority (ANTA) Board in conjunction with States and Territories, the Commonwealth and industry and endorsed by Ministers for vocational education and training to provide the basis for a nationally consistent, high quality vocational education and training system (Australian National Training Authority, 2001)

At AIGM, the AQTF guidelines were used to develop learning programs to benefit and meet the needs of clients as well as match competencies required in the industry. These programs will provide students with broad process skills and vocational competencies for work and life. The AQTF sets the benchmarks for high quality vocational education and training within Australia and the courses meet its benchmarks for delivery and issue of qualifications. The qualifications certify achievement of learning outcomes generally identified as sets of competencies for levels of workplace performance (Australian National Training Authority, 2002). Consultation with relevant professional bodies, for example, Golf Management Australia, WA Division, has given AIGM practical and operational competencies. AIGM courses are now customized to meet specific needs of clients, industry sectors, enterprises and individual learners and contextualised to meet industry competencies. Course advisory committees, comprising professionals, employers, community representatives, academics and students, are an important component of this process.

To ensure acceptance of AIGM's courses by universities, it was also a priority to match AIGM's diploma level competencies to critical aspects of university curriculum and hence maintain parity with university standards. AIGM's units ensure comparability of standards and content with undergraduate programs at ECU's Faculty of Business and Public Management. This is also important for articulation and credit transfer, which have been obtained on AIGM's application and through documented evidence and approved by ECU. AIGM aims to be part of the new educational scenario that produces university graduates who have vocational skills and attributes as well as a rational and informed awareness of the critical world of the university. Through collaborative efforts with ECU, VET and the golf industry, it is obvious that there can be congruence in the delivery of university academic disciplines, business skills training, as well as golf management education.

The university connection

Initial research has revealed that, although AIGM courses provide progression from Certificate IV into Diploma, there is still a demand to move beyond the maximum qualifications achievable through the VET sector (refer Table 1). University studies at ECU fill the gap because they provide business qualifications as well as opportunities of specialization in sport, and more precisely, golf management. ECU's strength in Leisure Sciences and Sport Management and its recognition of the need to develop courses that meet future challenges, work well with AIGM's mission of ensuring excellence in golf management training and education through collaborative efforts with industry and university.

AIGM's Diploma of Business offers five core units that provide the foundation equivalent to first year units at university. The electives allow for specialisation in specific academic units or golf playing skills. This provides students with the choice of either concentrating on units they may need for golf club management and university studies or further improving their golfing skills. AIGM graduates can enter the business and social science degree programs at ECU with the option of majoring in Golf Management while taking up other units as part of a second major or as a minor. In other words the underpinning knowledge in AIGM's university level diploma provides a smooth transition into golf management majors delivered by AIGM in collaboration with ECU as part of its Bachelor of Business degree. In second year, in addition to units at ECU, the golf management units are Golf Club Management and Golf Facility and Services Operations. In third year, the units offered are Golf Course Operations & Maintenance and Principles of Golf Course Design.

In order to maintain currency with industry, enterprise and community as well as university, AIGM has put in place processes for ongoing monitoring and evaluation. This is to ensure that AIGM is in line with any changes to the national competency standards as well as regulatory, licensing or legislative requirements. It also confirms maintenance of university standards. Hence, there is continuous internal auditing for quality assurance as well as continuous improvement in assessment methods.

Conclusion

The final outcome of this partnership between AIGM and ECU will be a specialist Golf Management major stream in the Bachelor of Business degree. The course structure and administrative aspects may provide a model for other sports specific management education when there is a demand and sufficient critical mass.

The collaboration for this learning partnership will provide a win-win result for both partners:

- more students at little or no extra costs.
- a strong relationship between geographically proximate institutions, and
- building a third component in the golf industry and sport education in WA.

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Investigating International School/University Partnerships: Some highlights of the 2002 ECU/Joondalup District Study Tour



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Many Australian teacher education programs are under pressure in a competitive market to strengthen the links between their coursework and professional practice. In 2001 the School of Education at Edith Cowan University (ECU) and the Joondalup Education District established a teacher-education partnership (Compact). The broad aim of the ECU/Joondalup Compact is to develop quality teacher-education opportunities for pre-service and in-service teachers, school and district administrators, and ECU teacher educators. As part of the ongoing collaboration in the Compact, a group of university and district personnel conducted a study tour in October 2002 to the USA and Canada. The general purpose of the tour was to strengthen the Compact's capacity to offer quality teacher-education opportunities by engaging with other educators involved in innovative university/school partnerships.

This paper, which is based on the study tour report, focuses on three noteworthy examples of school/university partnerships in the USA and Canada. Included are some observations and suggestions that aim to stimulate discussion and possible actions to support the continuing development of the Compact, and inform other teacher-education programs.

Professional practice: a changing landscape

Teacher education students consistently report that professional practice plays an invaluable role in their preparation for the teaching profession (Aitken & Day, 1999; Beck & Kosnik, 2000; Shen, 2002). This encouraging sentiment is expressed in a context where many countries, such as the UK, USA, Canada, and Australia are experiencing increasing shortages of teachers. Further, access to professional practice schools known to have high quality programs is becoming increasingly competitive (ECU School of Education Report, 2001).

Against this background, many teacher education courses in Australia are being challenged to reform their professional practice programs. The Report of the Review of Teacher Education in New South Wales (Ramsey, 2000) suggests that there should be a shift from the notion of "practicum", to the concept of "professional experience"

where workplace learning is integrated with academic preparation and educational studies. The Report identified a number of key themes, including the importance attached to practicum by education lecturers and students, the desirability of maximising the amount of time students engage in the practicum, the importance of an effective and close partnership between the university and the school, and the importance of the 'whole school' context of the practicum.

The concept of partnership based teacher education has notable currency in Australia at present. Cherednichenko & Kruger (2001) make the case for this model, and argue that partnership based teacher education constructed as collaborative practitioner inquiry has the potential to change and improve the practice of all participants - students, teachers, student teachers and teacher educators. Key to their model is a focus on the learning needs of the school students. They observe that when the partnership is developed on this principle, the traditional separation of propositional and process knowledge is challenged and clearly defined roles are inappropriate.

Partnership based teacher education requires substantial changes in how schools and universities operate and relate to each other, and will affect the entire organization and curriculum of university courses and the practices of academics (Carpenter, Cherednichenko, Davies & Kruger, 2000). Beck & Kosnic (2000) stress the importance of the involvement and commitment of the university teaching faculty in the practicum for strengthening school university partnerships and the enhancement of both the practicum and campus program experience for students.

Mullen (2000) supports school and university practitioners finding innovative and meaningful ways to develop professionally as colleagues. Marlow and Nass-fukai (2000) describe true collegiality as that which involves ongoing professional interaction from a position of trust, and where each colleague is respected for his or her own unique contribution to the whole. They describe two essential elements for the development of collegiality as the building of strong relationships and the validation of colleagues as equal.

In sum, the changing landscape of professional practice in teacher education in Australia is characterised by increasing pressure on teacher education programs to produce more quality teachers in a context where resources are dwindling and the expense of programs is increasing. It is apparent that partnership based teacher education is the way forward.

The ECU/Joondalup Compact

In response to the changing landscape of professional practice, in particular the "Ramsey Report" (Ramsey, 2000), and a range of other factors, ECU's School of Education has embarked on a process to reform its teacher education programs. One of the major innovations associated with this process was the establishment in 2001 of a teacher-education partnership between ECU's School of Education and the Joondalup Education District - the ECU/Joondalup Compact. The broad aim of the Compact is to develop quality teacher-education opportunities for pre-service and in-service teachers, school and district administrators, and ECU teacher educators.

Developing better relationships and a sense of a learning community between the schools and the university is key to the partnership. The principles of the Compact are focused on enhanced outcomes for children, teachers and the school communities through:

- enhanced learning for children as the focus of the school -university relationship
- reflective inquiry that connects practice and theory
- student teachers, mentor teachers and teacher educators working together as 'learning partners' in the authentic context of schools, to better understand and enhance teaching and learning
- teaching in all aspects of the course constructed so student teachers become researchers of their own practice
- opportunities made available for schools and student teachers to pursue collaborative curriculum inquiry, curriculum development and teaching practice investigations.

Two new teacher education programs were launched at ECU's Joondalup Campus in 2002, namely a Bachelor of Education (Kindergarten through Primary) course and a Graduate Diploma (Middle Years) course. These courses have significant features which relate to the development of partnerships with schools, particularly in their professional practice components.

Traditional supervisory roles are changing within the Compact. University and school staff work collaboratively to establish roles and responsibilities. Teachers are considered to be mentors rather than supervisors. University teaching staff play a more supportive role as colleagues in connecting the theory with the practice. The Compact encourages schools and student teachers to pursue collaborative curriculum inquiry, curriculum development and teaching practice investigations. Krieg & Sharp (2003) provide more detail on how the Compact is developing collaborative inquiry in practice.

The Compact Study Tour

As part of the ongoing collaboration in the Compact, a group of university and district personnel conducted a study tour in October 2002 to the USA and Canada. The general purpose of the tour was to strengthen the Compact's capacity to offer quality teacher-education opportunities by engaging with other educators involved in innovative university/school partnerships.

The study tour aimed to do the following:

- deepen our understanding of how school/university partnerships can contribute to children's learning outcomes
- examine different models of professional teacher-education development, especially in terms of transference of skills to the classroom, and sustaining collaborative partnerships

- deepen our understanding of the mentoring relationship between the assistant (student) teachers, mentor teachers, and university colleagues, particularly with reference to the collaborative development of quality teachers and improved learning outcomes for school children
- provide ideas for planning the future direction and development of the Compact
- establish networks and dialogue with international colleagues engaged in similar types of innovative university/school programs
- foster international publication opportunities
- strengthen collaborative relationships between ECU and the Joondalup district
- further develop common research interests within the Compact and with international colleagues.

Based on the study tour's objectives, a set of seven focus questions guided the group's enquiry into teacher-education partnerships. The group met regularly throughout the study tour to discuss their observations and perceptions in relation to these questions, and to develop a set of recommendations associated with the latter.

This paper, which is based on the study tour report (Albones, Dawson, De Jong, Sharp & Treasure, 2002), describes three significant examples of school/university partnerships encountered in the USA and Canada. The paper highlights some of the group's observations, and presents recommendations associated with these examples. It aims to stimulate discussion and possible actions to support the continuing development of the Compact, and inform other teacher-education programs.

Lesson Study

The group visited Mills College which is an independent college for undergraduate and post-graduate courses in education. It is situated in Oakland, California and enjoys a fine reputation across the US as a small college producing exceptional and dedicated teachers. The Mill's program is guided by the overarching goals of equity and social justice. Community building, collegiality and commitment to urban education are strong features of the program. The College aims to place graduates in disadvantaged schools around Oakland. These schools have high proportions of African American, Hispanic and immigrant children.

San-Mateo Elementary School is one of many schools in Oakland, which has a partnership with Mills. The study group had the opportunity to view a "lesson study" demonstration conducted by classroom teachers at the school. "Lesson study" is a form of research lesson, and is taught to classroom students by their own teacher or a visiting teacher. According to Lewis and Tsuchida (1998), the concept embodies the following special features:

- they are observed by teachers who are usually in the school, and/or from other schools in the district. Observers may include outside commentators
- they are carefully planned, usually in collaboration with one or more colleagues. In some cases strategies are pre-trialed, discussed and modified before the study lesson is conducted for the group

- they are focused, usually on a particular goal or vision of education, such as helping students to become “active problem solvers”
- they are recorded. This could include video or audio-taping, narratives and/or checklist observations. This is usually focused on the issue of interest
- the observers are instructed to focus on children’s learning rather than the teaching process
- the observers discuss the research lesson during a panel discussion. The presenting teachers give feedback first, followed by the observers’ comments and questions.

The study group was impressed with the collaborative practitioner inquiry that characterised the lesson study, particularly as it reflected Cherednichenko & Kruger (2001) assertion that partnership based teacher education constructed on this principle has the potential to change and improve the practice of all participants. The group observed too that the lesson study focus on children’s learning is of particular significance, as this is a principle of the Compact.

With some modification, the lesson study concept could provide a professional development model for mentor teachers and assistant teachers in the Compact schools. An adaptation of the concept has the potential to:

- encourage collaborative teaching strategies and collaborative planning and reflection
- support the development of assistant teachers in the Compact
- assist the development of mentoring processes and professional development of new and experienced teachers within the Compact
- facilitate the development of workshop materials (eg. video, the development of processes and print materials) that can be used for the professional development of teachers within the Compact and in university teaching courses.

Carnegie Academy for the Advancement of Teaching (CASTL)

The study group visited the Carnegie Foundation in Menlo Park, California. The Foundation is an independent institution which aims to strengthen teaching and learning in America’s colleges and schools. A major focus of the Foundation’s projects and programs is the development and enhancement of teaching as a scholarly work. A good example of this theme is the Foundation’s CASTL K-12 program (the Carnegie Academy for the Advancement of Teaching program) which was launched in 1999 with funding from the William and Flora Hewlett Foundation and the Carnegie Foundation. The centrepiece of this program is a national fellowship project that brings together outstanding K-12 teachers (Carnegie Scholars) who are committed to documenting their own teaching and sharing their work with others. CASTL aims to render teaching public, subject to critical evaluation, and usable by others in the field. The program seeks to assemble a diverse group of scholars with complementary interests, strengths and experiences. They are teachers who:

- have been involved in previous efforts to research or document their work
- are currently engaged in studying their own classroom practice

- are committed to sharing their learning with a broad audience, beyond their local school and community (through a book, article, website, CD- Rom etc) (Shulman, 2002).

The most interesting aspect of the CASTL program is the opportunity it offers for the sharing of innovative and exemplary teachers' work, and its encouragement of practicing teacher research. CASTL's use of information technology as both a tool for research, and the presentation and sharing of good practice was impressive. It has great potential to contribute to offering quality teacher-education opportunities, especially in university/school partnerships. Ideas for initiating and modifying this program for the ECU/Joondalup Compact include:

- the opportunity it provides for research by teachers for teachers
- the recognition, encouragement and support for exemplary and innovative teachers to share their work
- the identification of exemplary teachers by curriculum managers, the district director, and Compact university teaching staff. Teachers could be invited and supported to participate through the Compact working party
- setting up templates for teachers to use multi media to display their work and to assist them with technological support
- using the Compact website as a site for these electronic displays
- investigating various funding opportunities to assist and encourage and support teachers' involvement (eg. QTP, Centre for Excellence)
- the opportunities for ECU to make use of current, relevant and local good practice to inform its teaching programs
- an opportunity to encourage and share research in middle schooling
- finding a technology supplier to sponsor the project.

With the above in mind, the Compact plans to investigate a process for identifying, encouraging, supporting and displaying the work of exemplar teachers within Compact schools. Some of the processes required include:

- setting up a process for the identification and support of exemplar teachers to undertake research and/or to record and present their work
- investigating funding opportunities to support a visiting scholar from the Carnegie Academy in San Francisco (CASTL project) to assist in the development of the website display, assist in the development of a template to suit the Compact's local needs and support teachers in the use of such a technology template to describe and display their work
- ECU staff exploring ways in which this work can enhance ECU's teaching and learning programs.

The Cohort Model

The study tour included a visit to the Ontario Institute for Studies in Education of the University of Toronto (OISE/UT). The Institute is one of the largest faculties at the

University and one of the largest faculties of education in North America. A key feature of the mission of OISE/UT is the development of partnerships, an example of which is the cohort model that is used to organise the Institute's one-year postgraduate pre-service program. Below is a summary of the program and key elements of this model:

- the program consisted of a cohort of approximately 1300 student teachers, 600 of whom were in the elementary stream (K-8)
- the elementary stream was divided into cohorts of about 65 students, each with 2 coordinators and its own faculty team of approximately 4 staff
- the coordinators were responsible for the design of the program and set their own schedule and timetable
- each cohort, while required to follow a set of curriculum criteria, had developed an identity of their own, or a particular focus. For example, some of the foci included community building, the arts, and information technology
- a feature of the cohorts was the development of a strong, collegial relationship between the students and staff
- each of the coordinators dealt with about 10–12 schools. They took responsibility for all communication with schools and placements of students. Relationship building with schools was considered to be critical to their success
- each cohort developed their own model/timetable of practicum placements. For example, in the Midtown model students were required to do two 4-week blocks of practice teaching during the year, each in a different school. Prior to each block, students spent 1 day per week in STEP (Student Teacher Experience Program) in the classroom where they did their practice teaching. The combination of STEP and practice teaching constituted the practicum.
- five or more student teachers were clustered in each school.

Many of the key elements of this model are closely aligned with the principles of the new Joondalup programs. According to Beck & Kosnik (2002) the following features of the cohort model are noteworthy:

- faculty staff become the “student advisors”, the focus being on building relationships
- it is possible to experiment with different approaches and avoid duplication and superficiality in course content
- better integration of course content and fieldwork is possible
- common understandings are developed between the schools and the university cohort staff
- it provides more opportunity to support assistant (student) teachers
- evaluation of the assistant teachers is conducted by the mentor teachers and this has strengthened their ownership of the program and increased the time and effort they devote to it

- all members of the faculty team, including subject specialists, are required to do practicum supervision. This promotes team building and refinement of program philosophies across the whole program
- support in the form of evaluation rubrics, guidelines and procedures are developed by the team and provided to faculty and school staff
- in-service sessions are provided for mentor teachers, and regular liaison meetings occur between representatives from all partner schools
- faculty staffing is enhanced by seconding practising teachers into the program as these teachers bring both recency and credibility.

The number of student teachers at ECU Joondalup is set to increase considerably over the next five years. For example, numbers in the Bachelor of Education (K-7) have doubled from 2002 to 2003. Associated with this trend are many challenges facing the Compact. How does the Compact develop its own community of learners, an important principle of the partnership between the University and schools? Does the University maintain a small core of university lecturers, and second school personnel to provide recency, credibility and teacher education expertise? If so, how can this be resourced? How do ECU staff maintain responsibility for coursework teaching, liaise with schools and develop significant relationships with students and associate teachers?

The OISE/UT cohort model offers some attractive possibilities to address these concerns. Central to the development of such a model for the Compact is:

- the provision of adequate staffing and resources
- strengthening of relationship building in the first year by affiliation with a defined cohort of students and a university colleague. For example, tutorials will be organised by cohort, and social gatherings will be arranged by cohort
- the possibility of a cohort that is geographically determined, and is based on a central school site instead of the University campus.

Concluding comments

The ECU/Joondalup Compact is still very much in a formative phase. As a model for teacher-education practicum, it embraces a conceptual framework that strives to be responsive to the challenge of ensuring quality professional practice in a context marked by dwindling resources and increasing competitiveness.

The Compact principles reflect key concepts such as ‘learning partners’, ‘collaborative inquiry’, and ‘mentoring’, capturing the ‘flavour’ of educational partnership. In practice, applying these ideas is complex and challenging. Looking to the collective wisdoms and exemplars of good practice in other contexts is one way of developing capacity to address the latter. The study tour has certainly provided a myriad of learning experiences for the Compact. We believe that the three innovative examples of partnerships described in this paper demonstrate how some of the aims of the study tour are in the process of being met. Our understanding of how school/university partnerships can contribute to children’s learning outcomes has been enhanced through the “Lesson Study”. The “Cohort Model” offers a potentially useful

way of addressing resources issues in professional practice, while the Carnegie Academy provides many ideas for recognising exemplary practice, and providing opportunity for research by teachers for teachers. Above all though, we are confident that the outcomes of the study tour will contribute substantively to planning the future direction and development of the Compact, and the national debate on addressing teacher-education challenges.

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Rethinking Relationships in Teacher Education Partnerships: Collaborative research: the possibilities and practices within the Compact Partnership



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Opportunities for collaborative investigations of curriculum, the pursuit of joint research interests and stronger links between the program at the university and professional practice have been facilitated through a collaborative, innovative partnership (established in 2002) between the Joondalup district, schools and Edith Cowan University (the Joondalup/ECU Compact). The Compact provides the opportunity for staff to work differently. Within the partnership, the roles of the university staff, school staff and assistant teacher are changed from those of previous teacher education programs. The changing role of the university colleague enables a mutually beneficial partnership with schools, principals, teachers and assistant teachers to develop.

In this paper, an example of collaborative research, made possible by the new relationships and roles within the Compact, is articulated. Four school principals within the Joondalup district recognised the opportunity to work with university staff and assistant teachers in different ways and initiated research into their kindergarten programs. The principals made the suggestion that 4th year students could assist with the research. Twenty-eight fourth year students responded to the invitation to assist, as part of a research unit at the university. The research is an indication of the possibilities that are real when the education community connects the resources of the university with the current issues in schools.

Building Relationships: The Context for Change

Throughout Australia many universities are looking to reform and restructure their professional experience programs. According to a Report of the Review of Teacher Education in New South Wales (Ramsey, 2000) there needed to be a shift from the idea of a practicum, to the concept of professional experience ie workplace learning which is integrated with academic preparation and educational studies. Boyer cited in Sandmann (2002) asserts that we must connect the rich resources of the university to our pressing social, civic and ethical problems, to our children, our schools to our teachers and to our cities, a process he call "the scholarship of engagement". According to Sandmann (2002), a significant and growing number of universities are

accepting Boyer's challenge, but she raises the question of how higher education can deepen community connections and collaborations in educationally meaningful ways.

Initiatives such as increased professional experience time, shared responsibility between school and university and re-configuring how learning takes place, identified by Ramsey (2000) have influenced the development of the ECU Compact. For more detail regarding the Compact refer to the de Jong and Sharp paper (2003) published in this volume.

A feature of the change process was the organisational development designed to stimulate a re-thinking of the School's delivery of programs. Two new programs with the potential to attract significant market support were launched at Joondalup in 2002. A B.Ed (K-7) course and a Graduate Diploma (Middle Years) course were developed. These courses were designed to be delivered in an innovative way in conjunction with schools in the Joondalup District. Both courses had significant features relating to the development of partnerships with schools in their professional experience component.

The new ECU Education courses were designed within an outcomes based and modified graduate attributes/ initial teacher education framework. Enhanced learning for children was the central focus. Strong links were established with Joondalup schools and the District Office with meetings held with public and private school Principals and staff in the district. New staff were appointed to develop and teach the courses. This paper describes new ways of doing educational research, made possible through the new partnership between the university and schools within the district that has contributed to community understanding of educational change in ways that reduce alienation.

New structures and processes

Distinctive features of the program developed in relation to the Compact included:

- Collaboration with schools/ centres in program delivery and design
- A small number of full time staff whose responsibility is to ensure that links are made between different aspects of the program located at the university and in schools.
- The formation of a learning community made up of students, key staff, school personnel and parents
- Associated sessional staff committed to the principles philosophy of the program, working as part of the teaching team, actively involved with the 'on campus' and in school' components of the program
- Management of teaching practices by the program teams to provide links between content, curriculum and teaching knowledge and the art of teaching
- Focus on reflection, critical analysis, research and informed judgement
- Focus on the development of knowledge based and intellectually challenging teaching approaches that support the integration of curriculum where appropriate

The Bachelor of Education Kindergarten through Primary Course Proposal (2001)

In both new courses the principles of the Compact have focused on enhanced outcomes for children, teachers and the school- communities. Enhanced learning for children remains the primary focus of the school -university relationship.

Another fundamental principle of the Compact is reflective inquiry that connects practice and theory. Partnership based teacher education constructed as collaborative practitioner inquiry about practice and learning according to Cherednichenko & Kruger, (2001), demonstrates the potential to change and improve the practice of all participants- students, teachers, student teachers and teacher educators. Their experience suggests that when the development of the partnership is focused on the learning needs of the students the traditional separation of propositional and process knowledge is challenged and clearly defined roles are inappropriate. Carpenter, Cherednichenko, Davies & Kruger, (2000), state that partnership based teacher education requires substantial changes in how schools and universities relate and will affect the entire organization and curriculum of university courses and the practices of academics. Beck & Kosnick (2000) stress the importance of the involvement and commitment of university teaching faculty in the practicum for strengthening school university partnerships and the enhancement of both the practicum and campus program experience for students.

Establishing new partnerships

Within the Compact traditional supervisory roles are changing. University and school staff worked together to establish roles and responsibilities. Teachers are seen as mentors rather than supervisors with joint enquiry into children's learning a focus. University teaching staff are seen as colleagues connecting the theory with the practice. Mullen (2000) supports school and university practitioners finding innovative and meaningful ways to develop professionally as colleagues, equal but different. Marlow and Nass-fukai (2000) describe true collegiality as that which involves ongoing professional interaction from a position of trust, and where each colleague is respected for his or her own unique contribution to the whole. They describe two essential elements for the development of collegiality as the building of strong relationships and the validation of colleagues as equal.

In the Compact student (assistant) teachers, mentor teachers and teacher educators work together as 'learning partners' in the authentic context of schools, to better understand and enhance teaching and learning. Opportunities are available in the Compact for schools and student teachers to pursue collaborative curriculum inquiry, curriculum development and teaching practice investigations. Evidence of collaborative inquiry in practice is the focus of this paper.

Reducing institutional barriers

The traditional institutional barriers between universities and the communities they serve have often limited the possibilities for collaborative research. The new partnership between the Edith Cowan University and schools within the Joondalup Education District in Western Australia, established in 2001, offered the opportunity to work in different and more equitable ways than had previously been possible. Collaborative inquiry, based on mutual trust, was much easier to achieve within the new structures. The research described in this paper demonstrates educational

research that enacts processes between people that ‘establish networks, norms and social trust and thus contributes to crucial aspects of a civil society’(Cox in Bibby, 1997). In this sense, the partnership has enabled us to realise a situation described by Dahlberg (1999) as one where educators are working differently to ‘make meaning and co-construct emancipatory education’ (p72).

Collaboration for mutual benefit is a feature of such research, and is critical at this point in the history of education. Wain (2000) describes the current situation as one where educators have become increasingly alienated from the communities they seek to engage. The reasons for this situation are complex. Research with communities has the potential to untangle and examine some of the threads of our social fabric, and offers opportunities to explore the role education plays in constructing a better world. The research described in this section of the paper provides an example of a learning community in action.

Research: a negotiated process?

Within the context of attempting collaborative research, many questions arise in relation to aspects of the research process. These questions raise such issues as:

- Whose agenda is driving the research?
- What is the research goal?
- Who are the participants/subjects and how is that negotiated?
- How are the subjects positioned, as participants or as ‘recipients’?
- Who gets to know about who?
- Does the research take a perspective of ‘proving a theory’, reducing ignorance, critiquing, changing?
- Who owns the data? Who has access to the data? What counts as data?
- Is there a commitment to feedback? How is this done?
- How are interpretations negotiated?

These questions will form the framework for describing the research undertaken within the university/ schools partnership.

The research agenda: Whose agenda was driving the research?

Four principals within the Joondalup District initiated conversations with university colleagues regarding the possibility of research into the kindergarten programs being offered at their schools.

In Western Australian schools, school principals have been given the responsibility of administering, staffing and managing kindergarten programs. These programs are funded to operate for four half day sessions, but in recent years, the opportunity to reconfigure sessions has been taken up by many schools, and there are now many different structures in operation. Some programs have moved from traditional 4 half day sessions to two whole days.

There seems to be a lack of substantial evidence on which to base these decisions regarding particularly, the advantages and disadvantages of whole versus half day attendance, and/or morning or afternoon sessions ie attendance models. A better understanding of the implications of changing the kindergarten programs was recognised by the Principals as significant for children, families, staff and the school.

The following research questions emerged from these discussions:

Timing: Is the length and timing of kindergarten programs a significant factor in determining learning outcomes for children?

The *intent* of the research was to contribute to a better understanding of optimal conditions for young children's learning in an Australian context. The research process would involve:

- use of an internationally recognised observational tool (Leuven Scale of Involvement), allowing comparative analysis of young children's learning outcomes within the different kindergarten models
- consulting with local families and communities
- developing ECU students' and teachers' research competence by involving them in the collaborative research process
- contributing to administrators understandings of early childhood pedagogy

Participation: Who were the participants/subjects and how was that negotiated? How were the subjects positioned, as participants or as 'recipients'?

The research project originally involved four schools, all with different models of kindergarten programs. One of the principals made the suggestion that 4th year ECU students could assist with the research. The university staff who were teaching in the 4th year university units took up this suggestion and 28 students responded to the invitation to assist. The research was a significant component of one of the university units. The number of students involved, meant that the original group of 4 expanded to 8 schools (some outside the district).

Schools expressed the desire that information be gathered to account for the different perspectives of the stakeholders involved. The stakeholders identified were:

- *Principals*: Principals to be interviewed to ascertain the administrative constraints and influences on the decisions made about the existing structure of the kindergarten programs in their schools.
- *Teachers*: Focus group interviews with teachers to be conducted to allow teachers to discuss their programs with other participating kindergarten teachers. Of particular interest is how the attendance models have affected their programming decisions and their perceptions of the effects on the children's learning.
- *Children*: Information on the level of children's engagement with learning to be gathered using an internationally recognised and tested Leuven, Child Involvement Scale.

- *Parents:* Parents to be surveyed regarding the influences on their choice of kindergarten program for their children.

At this stage of the research process, the observations of the children are completed. The other stakeholders are yet to be interviewed.

Negotiating the purpose: Does the research take a perspective of ‘proving a theory’, reducing ignorance, critiquing, changing practice?

The collaborative research begun in the eight schools in 2002 seems as if it will contribute to reducing ignorance. The Australian literature, reviews and reports into early childhood, present a very clear picture of the huge variance in the nature and degree of pre compulsory school provision of care and education. They abound with issues related to the:

- separation of health and education in regards to early childhood
- range in quality of programs and outcomes for children
- school starting ages
- diverse funding programs (Commonwealth vs State)
- social, political and economic factors contributing to development of services.

All these issues have had a dramatic impact on the development and delivery of these prior to school programs.

In Western Australia the Education Department proposes that all four year old children are entitled to 4 half day sessions of kindergarten level education per week. The attendance models developed however, (ie 4 half days, two full days, etc) is at the discretion of the school administrators. It seems decisions are usually influenced by:

- competition or coordination with existing local community services
- consultation with families (usually based on the working lives of parents)
- staffing considerations.
- class/group sizes

The assumptions seem to be based on tradition or history and decisions are based largely on the needs of the school and community. Nowhere have we been able to access literature that discusses attendance models in relation to quality outcomes for children.

One of the concerns raised in the 1998 Deetia funded ‘100 Children Go to School’ project (Comber, Hill, Loudon, Reid, & Rivalland, 1998), is the lack of criteria against which to assess quality outcomes for children. What does seem consistent is agreement on what contributes to the provision of a quality early childhood program.

These include:

- Staff/child ratios
- Group size

- Facility conditions
- Staff training and professional development
- Pedagogical frameworks
- Engagement of families
- Quality of teacher / child interactions
- Secure attachments and
- Positive harmonious peer interactions

In none of the readings to date have we discovered any mention of the amount of time spent in kindergarten programs and how this is organised in relation to quality outcomes for children.

A further significance of this study is to address a general concern of those teaching and researching early childhood education, that is, the limited research conducted in Australia. The Senate Employment, Education and Training References Committee report, (Homes et al., 1996) found that 70% of teachers, principals and directors studied perceive they are informed by research and state that research is important for informing early childhood practice in Australia. Yet there seems to be none conducted on the affects of program attendance models.

Negotiating the position of the researchers: Who gets to know about who?

If knowledge is perceived as directly connected to the people who construct, refine and extend it, as being in a constant state of change and transformation as it is used to solve real everyday issues, the division between researcher and researched, and between research and learning, is diminished. In fact as Wells (1995) states' they are often synonymous. The research process in the schools involved a negotiated, shared construction among the learning community.

The first stage of the research involved ECU students observing the children in kindergarten settings. The ECU students participating in the research, and the kindergarten teachers from the schools where the research was being done, undertook professional development in using the Leuven Scale. University staff conducted this professional development.

Each student was responsible for obtaining parental consent and ethical clearance from the university to pursue the research. These processes were requirements for the students' completion of the university research unit. No attempt at judgements on the quality of programs was to be made. The issue of interest was the children's level of involvement at particular times of day.

The observation schedule was as follows :

Each ECU student observed 5 children over a 3 hour period, on 4 different occasions ie over 4 different sessions, 1 session being 9:00-12:00 or 12:00-3:00. In this time they:

- Observed each child for 3 minutes: using the observation scale to record
- Used a coding system to identify each child
- Observed the 5 children each hour i.e. saw each child at about 20 minute intervals
- Repeated the cycle each hour, by the end of the session students had observed each child 4 times
- Negotiating ownership: Who owned the data? Who has access to the data? What counted as data?

Is there a commitment to feedback? How is this done?

Following the observations, students collated the individual school data, analysed and presented their findings to their university peers, as part of the university unit, and shared their findings with the school in which they had worked. The students displayed their findings at a statewide early childhood conference.

The results across the 8 schools have been collated, and are in the process of being analysed. It is anticipated that the final analysis will be shared with individual schools and with the district at one of the district meetings.

Conclusion

As educational researchers, we can engage communities with us in the change process by working differently at each stage of the research process. The experience of working with children, parents and communities, briefly described in this paper, has taught us that there are great gains to be had, when researchers work alongside communities, engaging them in dialogue around the aims and intent of educational change. This type of process enacts research, which is a most important form of teaching and learning, where knowledge is constructed in a joint process of negotiation, inquiry and problem solving. The collaborative research described in this paper, made possible within the framework of the new partnership, enacted a process in which, as Lankshear (1999) articulates, there was ‘... involvement by participants who genuinely ‘owned’ the research process, their part in it, and benefits accruing from it: including the realisation of their voices and namings of the world [Freire 1972] and their enlarged capacity to demystify research and enact it in their own behalf’ (p18).

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